

The Climate Solutions Are Here. Let's Go!

Key takeaways from the IPCC report on Mitigation (AR6 WG3)

4 April 2022

Climate crisis is here, wrecking lives, livelihoods, communities and cultures around the world. Recent large-scale climatic changes are of unprecedented nature in the context of all human history¹, and climate risks are now appearing faster and will get more severe sooner².

It's a critical decade for decisions and investments that will define the scale of further irreversible changes and losses ahead. Pathways still exist for meeting the Paris Agreement goal of limiting global warming to 1.5°C that would substantially limit future harms, risks and losses, and to enable many options to adapt. But the window is rapidly closing.

In the third part of their Sixth Assessment report, focused on mitigation, the Intergovernmental Panel on Climate Change (IPCC) assesses different options for the critical years at hand.

Below we summarise some of our key takeaways from the latest IPCC report, drawing from its Summary For Policymakers and the underlying chapters. **For the exact, original IPCC wording and context of each takeaway, see the references in brackets.**³

Global emissions are still heading the wrong way

Despite increasing climate action, global emissions have continued to grow. Between 2010 and 2019 global emissions growth was slower than the decade before. Yet, it still resulted in the highest absolute decadal increase recorded in human history. Total net greenhouse gas (GHG) emissions are now 54 % higher than in 1990 when international climate negotiations started. (B.1.1)

In developed countries as a group, fossil emissions have declined by about 10 % since 2010 with at least 18 of them demonstrating a decade of declining absolute emissions. Yet, their historical emissions and per capita emissions remain high, and not a single one is reducing emissions at a rate required, on average, for the 1.5°C warming limit. (TS-21, B.5.1; Fig SPM.2; Fig TS.4)

Regional differences in per capita emissions remain large. In production-based emissions, North America still emitting more than double compared to Europe, and over ten times more than Least Developed Countries. Eastern Asia (China & South Korea), on the other hand, is now emitting over 40 % more than Europe, in per capita terms, and more than four times that of Southern Asia (which includes countries such as India). High levels of land-use emissions result in high per capita emissions in South East Asia and Latin America. (Figure TS.1; B.3.1; Figure SPM.2)

Globally, the 10 % of households with the highest per capita emissions contribute 34-45% of global consumption-based household GHG emissions. About two thirds of them live in developed countries and one third in other countries. Those in the bottom 50% in per capita emissions contribute 13-15%. Providing access to modern energy services universally would increase global emissions by a few percent at most. (B.3.4; TS-21, Ch 2, pag. 7)

National economy-wide greenhouse gas emissions targets covered 90% of global emissions in 2020 compared to 49% in 2010. Direct and indirect climate legislation has also steadily increased and this is supported by a growing list of financial investors. Yet, many net zero targets are ambiguously defined, and the policies needed to achieve them are not yet in place. Opposition from status quo interests, as well as insufficient low-carbon financial flows, act as barriers to establishing and implementing stringent climate policies covering all sectors. (TS-11)

¹ IPCC AR6, Working Group 1 report on Physical Science Basis. Chapter 1, Executive Summary, page 5.

² IPCC AR6, Working Group 2 report on Impacts, Adaptation and Vulnerability, Technical Summary, page 6.

³ SPM = Summary for Policymakers, TS-X = Technical Summary, page X; Ch = Chapter. Codes with letters and numbers only, for example "B.1.1" refer to the SPM, statement B.1.1.

Implementing only countries' current emission reduction targets and policies would close the door for the 1.5°C warming limit⁴. While recent improvements in national targets have narrowed the gap between required action and countries' national plans for 2030 by about 15-20%, the Nationally Determined Contributions overall still use up the remaining carbon budget for 1.5°C by 2030. (B.6; B.6.2; B.1.3)

Current fossil infrastructure will emit more greenhouse gases than is compatible with limiting warming to 1.5°C, unless retired early or reduced in use. This underlines the importance of early phasing out of, in particular, existing fossil power plants and continued cancellation of new ones, as the power sector is comparatively easy to decarbonise. If not prevented, the continued installation of fossil fuel-based infrastructure will 'lock-in' high emissions. (SPM B.7; Ch 2.7.3; C.4)

23-42% of global GHG emissions are associated with food systems, while there is still wide-spread food insecurity and malnutrition. Both supply and demand side measures are important to reduce the GHG intensity of food systems. (TS-88)

Progress in the alignment of financial flows towards the Paris Agreement goal remains slow and tracked climate finance flows are distributed unevenly across regions and sectors. Annual tracked total financial flows for climate adaptation and mitigation increased by up to 60% between 2013/14 and 2019/20, but growth has slowed recently. Climate finance flows from developed to developing countries still remain below the level of USD 100 billion per year pledged under the UNFCCC, and public and private flows for fossil fuels are still greater than those for climate adaptation and mitigation. (B.5; B.5.4)

...but there's some REALLY good news too!

Multiple low-carbon technologies have shown rapid progress since the previous IPCC assessment report in 2014 (AR5) – in cost, performance, and adoption – enhancing the feasibility of rapid energy transitions. This results from a mix of policy instruments that have enabled these cost reductions and supported global adoption. (TS-25; B.4)

The rapid deployment and unit cost decrease of modular technologies like solar, wind, and batteries have occurred much faster than anticipated by experts and modelled in previous mitigation scenarios. The political, economic, social, and technical feasibility of solar energy, wind energy and electricity storage technologies has improved dramatically over the past few years. Since 2010 the unit costs of solar energy have dropped by 85%, wind energy by 55%, and lithium-ion batteries by 85%, while the deployment of solar has increased over ten fold and electric vehicles over hundred fold. (TS-25; B.4.1)

The levelised costs of solar and wind are now equal to or cheaper than those of coal and gas, even before accounting for the harm (externalities) caused by fossil fuels. (Fig SPM.3)

Since AR5, there has been a significant breakthrough in the opportunities to reduce transport GHG emissions in an economically efficient way due to electrification of land-based vehicle systems, which are now commercially available. (Ch 10, p 93)

There's an ongoing mind shift around the opportunities of all industries to reach net zero emissions, with electrification and hydrogen emerging among key mitigation options as a result of renewable electricity costs falling rapidly. On the demand side of the industrial sector, there has been renewed attention to end-use demand, material efficiency and more and better-quality recycling measures. (Chapter 11, page 7)

The development of integrated approaches to construction and retrofit of buildings since AR5 has led to the widespread of zero energy/carbon buildings in all climate zones. (Ch9,p.5)

Solutions exist for reaching the Paris Agreement goals

⁴ And from staying very likely (>90%) below 2°C. See Category C1 in Table SPM.1.

To meet the Paris Agreement warming limit global carbon emissions need to be about halved by 2030 from current (2019) levels on their way to net zero by mid century, while all GHGs reach net zero in 2070/2075. This is compatible with pathways that limit warming to 1.5°C with little to no overshoot, with at least 50 % certainty, and would *very likely* keep below 2°C. (C.1.2; Table SPM.1, C1a)

Fossil fuel use needs to decline fast, with fastest reduction rates required in pathways that aim at 1.5°C with low reliance on carbon dioxide removal and low pressure on land and biodiversity and assume using resources efficiently. By 2050, coal use in such pathways would decline by up to 100 %, oil by up to 90 % and gas by up to 85 % from 2019 levels. (C.3.6; Ch 3, Figure 3.8; C.3.2)

Solutions exist for at least halving global GHG emissions by 2030, with more than half of the potential comes with no or low costs (of less than USD20/tCO₂-eq) or negative costs. This means that some of the options, like solar and wind and more efficient mobility and housing, can save money compared to continuing on current trends. (C.12; C.12.1; SPM.7)

Largest contributions in closing the 2030 gap could come from solar and wind energy, energy efficiency improvements, reduced deforestation, restoration of ecosystems, soil carbon sequestration in agriculture and CH₄ emissions reductions. Some of the potential related to the protection and restoration of forests, peatland, coastal wetland and other ecosystems comes with higher costs, when only monetary costs are considered, but also with high rewards in co-benefits, if implemented well, respecting the rights and knowledge of Indigenous Peoples and local communities. (C.12.1; Figure SPM.7; Ch4, p.96)

Implementing immediate, deep emission reductions and systems transformations will be needed in all sectors from energy to urban systems, industry, buildings, transport, land-sector and food systems, and in all those sectors solutions exist. Wide-spread electrification of different end-uses across sectors is needed in replacing fossil fuel use. (Section SPM C.3; TS-46)

The Agriculture, Forestry and Other Land Uses (AFOLU) sector offers significant mitigation opportunities⁵ in short and long-term while providing food, wood and other renewable resources as well as biodiversity conservation. Altogether they cover about a third of the potential by 2030 at costs below 100 USD tCO₂-eq, much of it at low cost (0-20 USD tCO₂-eq). Where carefully and appropriately implemented, such action could deliver substantial co-benefits and help address many of the wider challenges associated with land management. If deployed badly then, when taken together with the increasing need to produce food, feed, fuel and wood, they may exacerbate trade-offs with the conservation of habitats, adaptation, biodiversity and other services, and push millions of additional people at risk of hunger. At the same time the capacity of the land +to support these functions may be threatened by climate change. (TS-84; Table 12.4; Ch 2 p.102)

By 2050, comprehensive demand-side strategies across all sectors could reduce GHG emissions by 40-70 % compared to the projection with stated policies. Such “Avoid, Shift and Improve” strategies aim at delivering wellbeing services (nutrition, mobility, shelter and products) with lower emissions, by changing the *design* and *use* of infrastructure, the *adoption* of end-use technology, and the socio-cultural factors (social norms, culture and behavior) that influence demand. (C.10.2; TS-98; Figure SPM.6)

Rapid and deep changes in demand make it easier for every sector to reduce emissions. The greatest *Avoid* potential comes from reducing long-haul aviation and providing short-distance low-carbon urban infrastructures. The greatest *Shift* potential would come from switching to plant-based diets. The greatest *Improve* potential comes from within the building sector, and in particular increased use of energy efficient end-use technologies and passive housing. (TS-98)

Providing better services with less energy and resource input is consistent with providing well-being for all. Demand-side potential differs between regions, and some regions require additional energy, capacity and resources for well-being and to address malnutrition. (C.10; C.10.1)

Wealthy individuals contribute disproportionately to higher emissions and have a high potential for emissions reductions while maintaining decent living standards and well-being. As an example, while aviation emissions have grown particularly fast, only 2-4% of the global population flew internationally in 2018, with 1% of the world population emitting 50% of CO₂ from

⁵ AFOLU mitigation options include measures related to forests and natural ecosystems (protection, restoration, reforestation), and to food systems: carbon sequestration, shift to plant-based diets, reductions in N₂O and CH₄, reductions in food loss and waste.

commercial aviation. Addressing inequality and many forms of status consumption supports climate change mitigation efforts. (C.10.2; TS-24; Ch5, p26; C.10.4)

Achieving net zero CO₂ or GHG emissions globally or at country level entails the deployment of Carbon Dioxide Removal (CDR) to counterbalance hard-to-abate residual emissions (e.g., emissions from aviation, agriculture, industrial processes). The deployment of CDR faces feasibility and sustainability constraints especially at large scales. Currently afforestation, reforestation, improved forest management, agroforestry and soil carbon sequestration are the only widely deployed CDR methods. Afforestation and reforestation, biomass production for BECCS and biochar potentially compete for land, water and other resources, implying possible adverse outcomes for ecosystem health, biodiversity, livelihoods and food security. The removal and storage of CO₂ through vegetation and soil management can be reversed by human or natural disturbances; it is also vulnerable to climate change impacts. There are concerns that the prospect of large-scale CDR could obstruct near-term emission reductions efforts, might not deliver the intended benefit of removing CO₂ durably from the atmosphere and bring about adverse side effects. (C.11.2; C.11; C.11.1; C.11.3, Ch 12, pag 39, 55, TS Table TS.7)

Conditions for enabling needed emission cuts

Shifting development pathways towards sustainability implies making transformative changes that disrupt existing developmental trends. Climate change is the result of decades of unsustainable production and consumption patterns, as well as governance arrangements and political economic institutions that lock in resource-intensive development patterns. Changes to such development pathways would not be marginal, but include technological, systemic and socio-behavioural changes. (TS-33; TS-141)

Integrated policy, economy wide approaches and enabling conditions will be required in governance, policy, finance, institutions, innovation, behaviour and lifestyle. (TS-112)

In the immediate future, annual investment flows into solutions will need to multiply to achieve the needed 2030 emission cuts. Current mitigation financial flows (public, private, domestic and international) are a factor of three to six below the average levels needed up to 2030 in scenarios that likely limit warming to 2°C or 1.5°C. Investment gaps are widest for the AFOLU sector in relative terms and for developing countries. When investment needs for eg. adaptation, reduction of losses and damages, general infrastructure, and climate-responsive social protection are taken into account, financing gaps and challenges for developing countries become even wider relative to those for developed countries. (E.5.1)

Critical years are at hand for getting the right incentives in place. If investments in coal and other fossil infrastructure continue, energy systems will be locked-in to higher emissions. In urban infrastructure, too, the construction of new and upgrading of existing infrastructure can result in significant committed emissions by 2030. (TS-53; TS-65)

There is sufficient global capital and liquidity to close investment gaps, but barriers both within and outside the financial sector would need to be overcome, and macroeconomic headwinds facing developing regions. Barriers to the deployment of commercial finance include inadequate assessment of climate risks, a mismatch between capital and investment needs, home bias considerations, differences in risk perceptions, country indebtedness levels, economic vulnerability, and limited institutional capacities. Despite the increasing attention of investors and many initiatives by financial regulators and institutions to assess and address climate-related financial risks, there is limited evidence that this attention has directly impacted emission reductions. Risks remain greatly underestimated by financial institutions and markets, limiting the capital reallocation needed for the low-carbon transition. (E.5.2; TS-122)

Political leadership and intervention remains central to addressing uncertainty as a fundamental barrier for a redirection of financial flows. Existing policy misalignments, including fossil fuel subsidies, undermine the credibility of public commitments and limit financial sector action. Clear signalling by governments and the international community, including a stronger alignment of public sector finance and policy, and higher levels of public sector climate finance, reduces uncertainty and transition risks for the private sector. (Ch15, p.5; E.5.4)

Removing fossil fuel subsidies could reduce emissions by up to 10% by 2030 while improving public revenue and macroeconomic performance, supporting low income groups, and

reaping other environmental and sustainable development benefits. A gradual redirection of existing agriculture and forestry subsidies would greatly advance mitigation too. (E.4.2; TS-88)

Tackling barriers caused by fossil-related stranded assets can enable action. Meeting climate goals will strand assets, including fossil infrastructure and unburned fossil fuel resources, the economic impacts of which could amount to trillions of dollars. Countries, businesses, and individuals, who stand to lose wealth, may therefore desire to keep assets in operation even if financial, social, or environmental concerns call for retirement. It will be easier to retire these assets if the risks are communicated, if sustainability reporting is mandated and enforced, and if corporations are protected with arrangements that shield them from short-term shareholder value maximisation. (Box TS.8)

Equity and justice are important considerations for effective climate policy and for securing national and international support for deep decarbonisation, given the differences in GHG emissions contributions, degree of vulnerability and impacts, as well as capacities within and between nations. (TS-5)

Accelerated international financial cooperation is a critical enabler of low-carbon and just transitions, and can address fundamental inequities in access to finance and the costs of, and vulnerability to, the impacts of climate change. Options include: increased levels of public finance and publicly mobilised private finance flows from developed to developing countries in the context of the USD100 billion-a-year goal; increase the use of public guarantees to reduce risks and leverage private flows at lower cost; local capital markets development; and building greater trust in international cooperation processes. International coordination of trade policies is needed too, as misaligned trade and investment agreements may hinder climate mitigation. (E.5; E.5.3; TS-120)

Climate laws enable mitigation action by signalling the direction of travel, setting targets, mainstreaming mitigation into sector policies, enhancing regulatory certainty, creating law-backed agencies, creating focal points for social mobilisation, and attracting international finance. Both market-based and regulatory policies have distinct, but complementary roles. (TS-109)

Shifts in development pathways result from both sustained political interventions and bottom-up changes in public opinion. Collective action by individuals as part of social movements or lifestyle changes underpins system change. (TS-34)

Climate litigation is growing and can affect the outcome and ambition of climate governance. Since 2015, at least 37 systemic cases have been initiated against states that challenge the overall effort of a state to mitigate or adapt to climate change. If successful, such cases can lead to an increase in a country's overall ambition to tackle climate change. Climate litigation has also successfully challenged governments' authorisations of high-emitting projects setting precedents in favour of climate action. Climate litigation against private sector and financial institutions is also on the rise. (TS-111)

Effective climate governance builds on engagement with civil society, political actors, local communities, Indigenous Peoples, business youth, labour and media. The extent to which different actors are engaged influences political support for climate change mitigation and eventual policy outcomes. (E.3; E.3.3)

Social equity reinforces capacity and motivation for mitigating climate change. Impartial governance such as fair treatment by law-and-order institutions, fair treatment by gender, and income equity, increases social trust, thus enabling demand-side climate policies. High status (often high carbon) item consumption may be reduced by taxing absolute wealth without compromising well-being. (TS-120)

Shift away from fossil fuel-based energy economy could significantly disrupt the status quo, leading to a stranding of financial and capital assets and shifting of political-economic power. Ensuring the decision-making process is not unduly influenced by actors with much to lose is key to managing a transformation. (Ch4, page 82)

Greenpeace conclusions for action

*The IPCC is tasked to be policy relevant, but not policy prescriptive. They present a menu of options from which policymakers are expected to draw conclusions for action. Below we present the **Greenpeace conclusions** for action.*

The science is clear, the situation is serious, and now it's all hands on deck. We must do everything faster and bolder, at all levels, leaving no sector behind.

Heading for zero global carbon emissions, through at least halving them by 2030, while urgently cutting other emissions too, provide the minimum benchmarks for action. Those with more capacity and responsibility must lead the way and support others in their journey.

Governments must align their targets with 1.5°C by the COP27 climate conference in Egypt this year. With current policies we are still heading towards a grim 3°C future, and finance keeps flowing to problems instead of solutions.

There can be no new fossil fuel investments anywhere, and existing fossil fuel plants need to be retired early. Governments still plan to produce more than double the amount of fossil fuels in 2030 than what would be inconsistent with limiting warming to 1.5°C. This demonstrates the urgency of aligning 2030 targets, policies, investment plans and financial flows with 1.5°C. Smart, efficient and sustainable solutions are ready to meet all our energy needs, if allowed to.

Carbon dioxide removal offers no silver bullet. It is fundamental that we protect and improve the ability of our forests and soils to sequester more carbon. But relying on carbon removal on a large scale is not an option, given the many uncertainties, barriers and risks. Our utmost priority must be in stopping further emissions from entering the atmosphere right now, rather than relying on theoretical large-scale removals far in the future.

We must protect and restore ecosystems and fix the broken food system to build resilience. Healthy ecosystems are more resilient in the face of inevitable climatic changes. We must protect at least 30% of our land and oceans by 2030 and reduce all pressures on ecosystems in full respect of Indigenous Peoples' and local communities' rights. We must end deforestation and restore forests and other terrestrial ecosystems. We must speed up the necessary transformation of the food system by globally reducing production and consumption of animal products 50% by 2050 (with a 70% reduction in consumption by 2030 in high-consuming groups), phasing out the dependency on chemical inputs, reducing food waste, minimizing the use of land for bioenergy, and shifting towards ecologically-produced plant-based diets.

Financial institutions - banks, asset managers and insurers, as well as the companies to whom they lend and whose shares they own, must align their business with the objectives of the Paris Agreement, to pursue limiting global average temperature increase to 1.5°C, as shifting investment will be key to avoiding high-carbon lock-in. Greenwash with empty net-zero pledges relying on imaginary offsets only add fuel to the problem.

We must deliver in solidarity. Today the true costs of climate change are paid predominantly by those who have caused it the least. Rich governments must deliver on their Paris climate finance commitments, provide technology transfer, take lead in closing the adaptation gap and get serious with addressing loss and damage.

The development model based on infinite growth and extraction is unjust and obsolete. It needs to go. We deserve a future that respects people and the limits and cycles of the earth. We deserve a future where there is no power of economic gains over life; one connected with nature, rooted in a diversity of communities where decisions are made inclusively and equality is assured. A future based on solidarity and cooperation, where progress is measured in collective wellbeing from the local to the global level. Away from profit maximization in the short term and individual value claiming over the limits of nature and the rights of people. Away from overconsumption and overexploitation that depletes the ability of the Earth to regenerate, freshen the air, filter rivers, pack glaciers, regreen forests and fields, heal oceans to create a bountiful and lush environment safe from extreme weather events where life can thrive.

People have rights. Governments have obligations. Let's make them accountable.

The era where the fossil fuel industry and its backers can get away with and profit from their toxic practices is ending. People are holding polluting corporations and governments to account and forcing the change we need to prevent further harm. Governments and corporations have no choice but to act in line with science to meet their human rights obligations as communities made vulnerable by climate change will continue to vindicate their human rights and demand justice.

In the last year alone, an unprecedented number of key decisions with far-reaching impacts were issued. Just like the cascading impacts of climate, all of these climate cases are connected and reinforce a global standard that climate protection is a human right. Join the rapidly growing global movement and [raise your voice!](#)

Let's take control of our future. Together. This is the moment to rise up, be bold and think big. And there's a role to play for everyone.

For more information, contact:

Kaisa Kosonen

Senior Policy Advisor, Greenpeace Nordic,
IPCC Focal Point for Greenpeace International

kaisa.kosonen@greenpeace.org

[greenpeace.org](https://www.greenpeace.org)