

The background features a repeating pattern of overlapping circles. On the left side, a vertical strip of solid blue circles is visible. The rest of the page is filled with a grid of white circles, each containing a complex, multi-layered geometric pattern of concentric lines that resemble stylized floral or mandala designs.

# Section 12

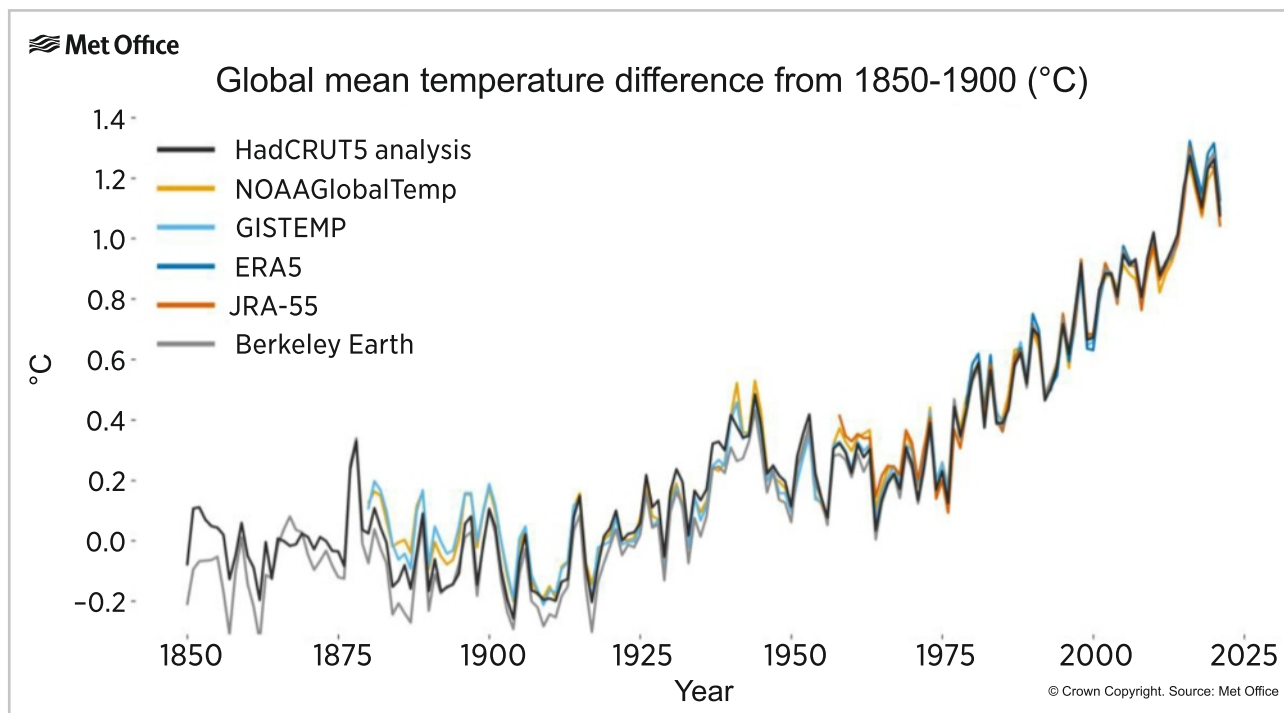
Thematic Reviews

## 12.1. Climate Change

### State of Climate in 2021

According to the provisional WMO Report<sup>106</sup> “State of the Global Climate 2021”, past 7 years set to be the warmest on record. A temporary cooling “La Niña” event early in the year means that 2021 is expected to be “only” the fifth to seventh warmest year on re-

cord. But this does not negate or reverse the long-term trend of rising temperatures. Global sea level rise accelerated since 2013 to a new high in 2021, with continued ocean warming and ocean acidification.



#### Key messages

**Greenhouse gases.** In 2020, greenhouse gas concentrations reached new highs. Levels of carbon dioxide (CO<sub>2</sub>) were 413.2 parts per million (ppm), methane (CH<sub>4</sub>) at 1889 parts per billion (ppb) and nitrous oxide (N<sub>2</sub>O) at 333.2 ppb, respectively, 149%, 262% and 123% of pre-industrial (1750) levels. The increase has continued in 2021.

**Temperatures.** The global mean temperature for 2021 (based on data from January to September) was about 1.09°C above the 1850-1900 average. Currently, the six datasets used by WMO in the analysis place 2021 as the sixth or seventh warmest year on record globally. But the ranking may change at the end of the year. It is nevertheless likely that 2021 will be between the 5<sup>th</sup> and 7<sup>th</sup> warmest year on record and that 2015 to 2021 will be the seven warmest years on record.

2021 is less warm than recent years due to the influence of a moderate La Niña at the start of the year. La Niña has a temporary cooling effect on the global mean temperature and influences regional weather

and climate. The imprint of La Niña was clearly seen in the tropical Pacific in 2021. 2021 is around 0.18°C to 0.26°C warmer than 2011.

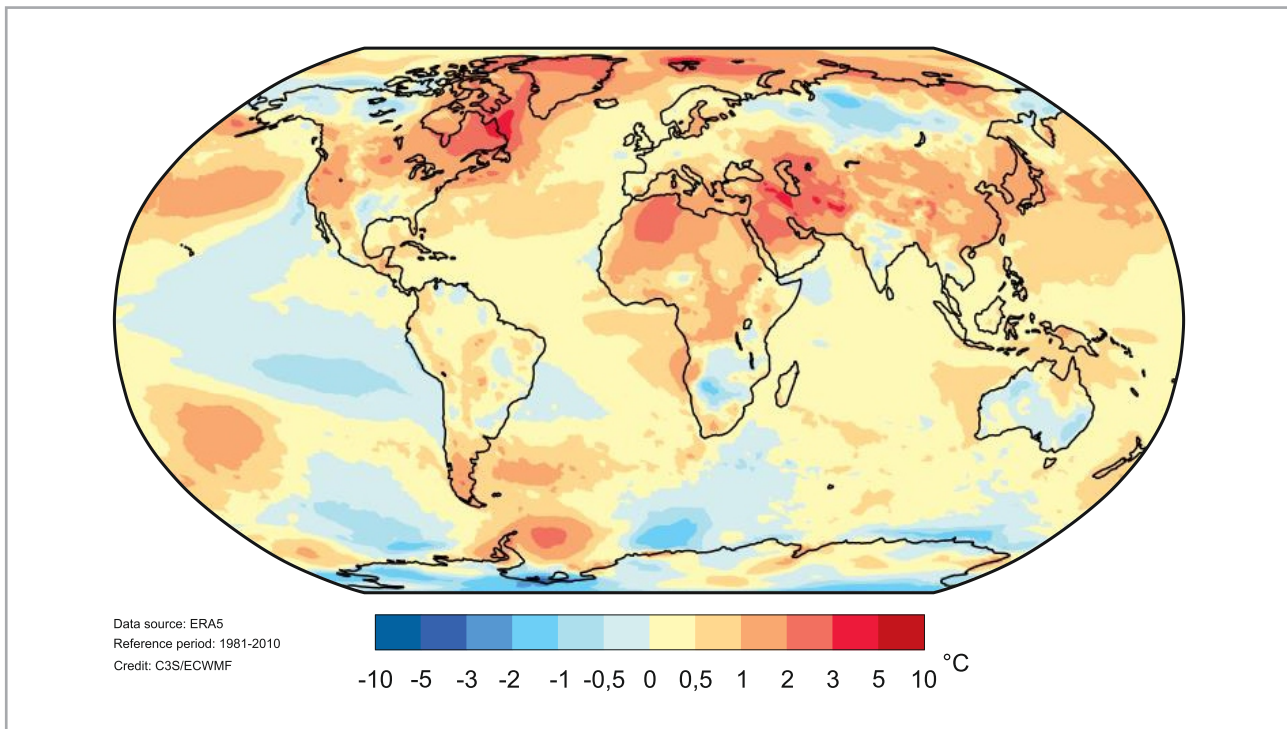
**Ocean.** Much of the ocean experienced at least one ‘strong’ Marine Heatwave at some point in 2021 – with the exception of the eastern equatorial Pacific Ocean (due to La Niña) and much of the Southern Ocean. The Laptev and Beaufort Sea in the Arctic experienced “severe” and “extreme” marine heatwaves from January to April 2021.

The ocean absorbs around 23% of the annual emissions of anthropogenic CO<sub>2</sub> to the atmosphere and so is becoming more acidic. Open ocean surface pH has declined globally over the last 40 years and is now the lowest it has been for at least 26,000 years. Current rates of pH change are unprecedented since at least that time. As the pH of the ocean decreases, its capacity to absorb CO<sub>2</sub> from the atmosphere also declines.

**Sea level.** Global mean sea level changes primarily result from ocean warming via thermal expansion of sea water and land ice melt. Measured since the

<sup>106</sup> Based on data for the first nine months of 2021

Near-surface air temperature differences from the 1981-2010 average  
for January to September 2021.  
The data derived from the ERA5 reanalysis product.



Source: C3S/ECMWF

early 1990s by high precision altimeter satellites, the mean global mean sea level rise was 2.1 mm per year between 1993 and 2002 and 4.4 mm per year between 2013 and 2021, an increase by a factor of 2 between the periods.

**Sea ice.** Arctic sea ice was below the 1981-2010 average at its maximum in March. Sea-ice extent then decreased rapidly in June and early July in the Laptev Sea and East Greenland Sea regions. As a result, the Arctic-wide sea-ice extent was record low in the first half of July. There was then a slowdown in melt in August, and the minimum September extent (after the summer season) was greater than in recent years at 4.72 million km<sup>2</sup>. It was the 12<sup>th</sup> lowest minimum ice extent in the 43-year satellite record, well below the 1981-2010 average. Sea-ice extent in the East Greenland Sea was a record low by a large margin.

Antarctic sea ice extent was generally close to the 1981-2010 average, with an early maximum extent reached in late August.

**Glaciers and ice sheets.** Mass loss from North American glaciers accelerated over the last two decades, nearly doubling for the period 2015-2019 compared to 2000-2004. An exceptionally warm, dry summer in 2021 in western North America took a brutal toll on the region's mountain glaciers.

The Greenland Ice Sheet melt extent was close to the long-term average through the early summer. But temperatures and meltwater runoff were well above normal in August 2021 as a result of a major incursion of warm, humid air in mid-August.

**Extreme weather.** Exceptional heatwaves affected western North America during June and July, with many places breaking station records by 4°C to 6°C and causing hundreds of heat-related deaths.

There were also multiple heatwaves in the southwestern United States. Death Valley, California reached 54.4 °C on 9 July, equalling a similar 2020 value as the highest recorded in the world since at least the 1930s. It was the hottest summer on record averaged over the continental United States. There were numerous major wildfires. The Dixie fire in northern California, had burned about 390,000 hectares, the largest single fire on record in California.

Extreme heat affected the broader Mediterranean region. On 11 August, an agrometeorological station in Sicily reached 48.8 °C, a provisional European record, while Kairouan (Tunisia) reached a record 50.3 °C. Montoro (47.4 °C) set a national record for Spain on 14 August, while on the same day Madrid had its hottest day on record with 42.7 °C. On 20 July, Cizre (49.1 °C) set a Turkish national record and Tbilisi (Georgia) had its hottest day on record (40.6 °C). Major wildfires occurred across many parts of the region with Algeria, southern Turkey and Greece especially badly affected.

Abnormally cold conditions affected many parts of the central United States and northern Mexico in mid-February. The most severe impacts were in Texas, which generally experienced its lowest temperatures since at least 1989. An abnormal spring cold outbreak affected many parts of Europe in early April.

**Precipitation.** The city of Zhengzhou on 20 July received 201.9 mm of rainfall in one hour (a Chinese national record). Flash floods were linked to more than 302 deaths, with reported economic losses of US\$17.7 billion.

Western Europe experienced some of its most severe flooding on record in mid-July. Western Germany and eastern Belgium received 100 to 150 mm over a wide area on 14-15 July over already saturated ground, causing flooding and landslides and more than 200 deaths. The highest daily rainfall was 162.4 mm at Wipperfürth-Gardenau (Germany).

Persistent above-average rainfall in the first half of the year in parts of northern South America, particularly the northern Amazon basin, led to significant and long-lived flooding in the region. The Rio Negro at Manaus (Brazil) reached its highest level on record. Floods also hit parts of East Africa, with South Sudan being particularly badly affected.

Significant drought affected much of subtropical South America for the second successive year. Rainfall was well below average over much of southern Brazil, Paraguay, Uruguay and northern Argentina. The drought led to significant agricultural losses, exacerbated by a cold outbreak at the end of July, damaging many of Brazil's coffee-growing regions. Low river levels also reduced hydroelectricity production and disrupted river transport.

**Socio-economic and environmental impacts.** In the last ten years, conflict, extreme weather events and economic shocks have increased in frequency and intensity. The compounded effects of these perils, further exacerbated by the COVID-19 pandemic, have led to a rise in hunger and, consequently, under-

mined decades of progress towards improving food security.

Following a peak in undernourishment in 2020 (768 million people), projections indicated a decline in global hunger to around 710 million in 2021 (9%). However, as of October 2021, the numbers in many countries were already higher than in 2020.

Extreme weather during the 2020/2021 La Niña altered rainfall seasons contributing to disruptions to livelihoods and agricultural campaigns across the world. Extreme weather events during the 2021 rainfall season have compounded existing shocks. Consecutive droughts across large parts of Africa, Asia, and Latin America have coincided with severe storms, cyclones and hurricanes, significantly affecting livelihoods and the ability to recover from recurrent weather shocks.

Extreme weather events and conditions, often exacerbated by climate change, have had major and diverse impacts on population displacement and on the vulnerability of people already displaced throughout the year. From Afghanistan to Central America, droughts, flooding and other extreme weather events are hitting those least equipped to recover and adapt.

Ecosystems – including terrestrial, freshwater, coastal and marine ecosystems – and the services they provide, are affected by the changing climate. In addition, ecosystems are degrading at an unprecedented rate, which is anticipated to accelerate in the coming decades. The degradation of ecosystems is limiting their ability to support human well-being and harming their adaptive capacity to build resilience.

Source: WMO, [https://library.wmo.int/index.php?lvl=notice\\_display&id=21982#.YrN6uXZBzIV](https://library.wmo.int/index.php?lvl=notice_display&id=21982#.YrN6uXZBzIV)

## Climate Change Agreement

All five Central Asian countries ratified the Paris Agreement and submitted their first nationally determined contributions (NDCs). The [infographic](#) below summarizes the mitigation and adaptation plans in Central Asia countries, as well as the policy frameworks that guide these plans and strategies. To meet the emission reduction targets set out, Central Asia countries need to improve energy efficiency and integrate green economy strategies, especially in agriculture and industrial processes.

**Joint Statement of the C5+1 on addressing the climate crisis.** Uzbekistan, Kazakhstan, Tajikistan, Turkmenistan and the USA made collective and country commitments on addressing the climate crisis. They underlined that climate change already negatively impacts the availability of water in the region, accelerates desertification and land degradation.

The C5+1 countries pledged their NDCs would include specific targets to reduce greenhouse gas emissions and concrete actions to reach those targets; acknowledged the critical need for the world to work

together to advance the transition to a net-zero, clean-energy future by mid-century; noted the significant potential for regional collaboration toward advancing that objective, in areas such as the development of renewable energy and methane abatement; expressed concern about the large-scale consequences of the drying up of the Aral Sea; confirmed their interest in mitigating consequences of climate change in Central Asia through high-tech innovations, environmentally friendly, energy, and water-saving technologies, preventing further desertification and potential climate migration, as well as the development of ecotourism. The C5+1 governments will plan for the Energy and Environment Working Group to meet ahead of COP26 in Glasgow and discuss actions to combat climate change.

**Commitments made by the C5+1 countries.** Uzbekistan intends to submit an enhanced and ambitious NDC aligned with 1.5 degrees Celsius by COP26. Uzbekistan will include its renewable energy target of



# Implementing the Paris Agreement in Central Asia

The Paris Agreement is a legally binding international agreement on climate change that was adopted within the United Nations Framework Convention on Climate Change (UNFCCC) and entered into force in 2016. Its chief aim is to limit global warming to well below 2 degrees Celsius, preferably 1.5 degrees Celsius, compared to pre-industrial levels.

## Ratification timeline

### 2016

- Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan signed agreement.
- Kazakhstan, Turkmenistan ratified agreement.
- Agreement came into force in Turkmenistan.

### 2018

- Uzbekistan ratified agreement.
- Agreement came into force in Uzbekistan.

### 2017

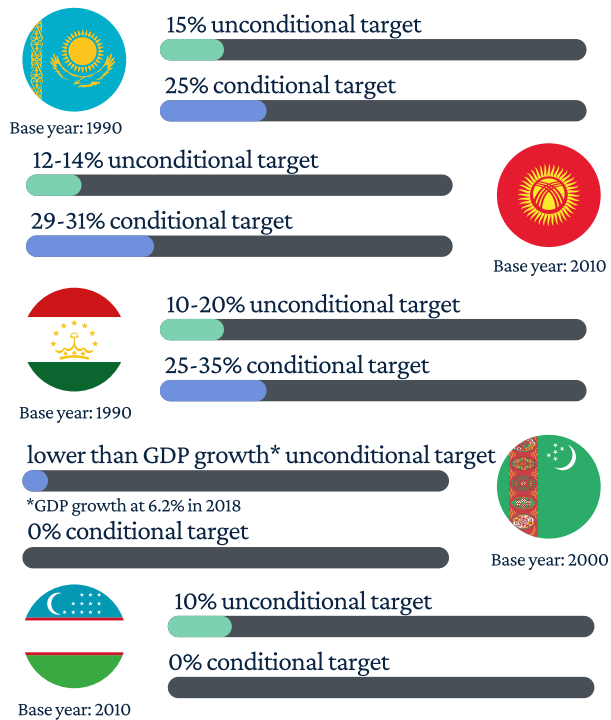
- Uzbekistan signed agreement.
- Tajikistan ratified agreement.
- Agreement came into force in Kazakhstan, Tajikistan.

### 2020

- Kyrgyzstan ratified agreement.
- Agreement came into force in Kyrgyzstan.

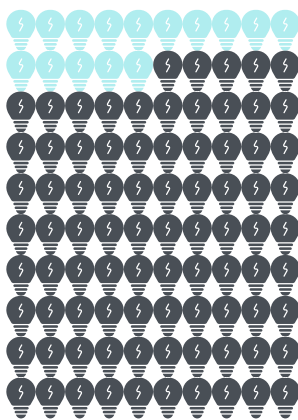
Source: UNFCCC

## Emission reduction targets



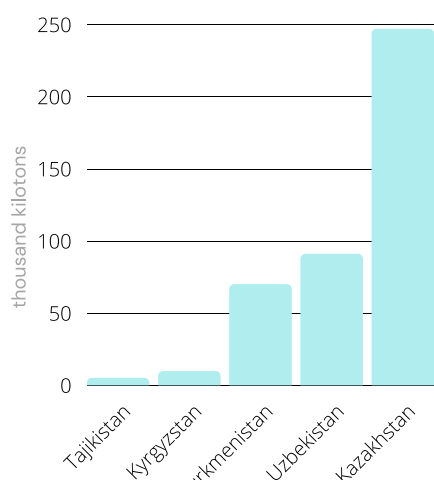
Source: UNFCCC

## Renewable energy consumption



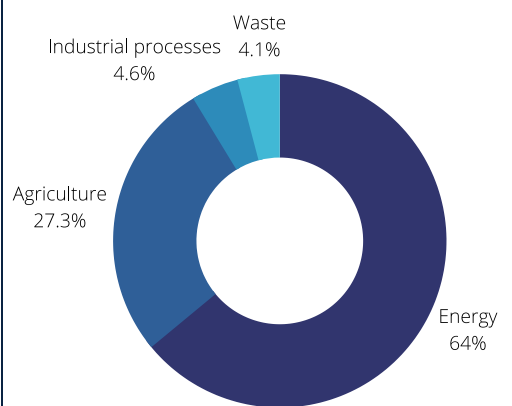
% of total final energy consumption  
Source: World Bank

## Carbon footprint



Source: World Bank

## GHG emissions by sector



Source: UNFCCC

## Climate mitigation and adaptation policies

	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Mitigation	<ul style="list-style-type: none"> <li>✓ Enhance renewable energy sources.</li> <li>✓ Develop clean energy technologies.</li> <li>✓ Restore, conserve &amp; enhance carbon sinks.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Glacier monitoring.</li> <li>✓ Hydro power rehabilitation projects.</li> <li>✓ Emergency disaster risk management.</li> <li>✓ Modernize hydro power plants.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Build institutional &amp; professional capacity and awareness.</li> <li>✓ Monitor hydrometeorological survey</li> </ul>	<ul style="list-style-type: none"> <li>✓ Increase the efficiency of fuel utilization.</li> <li>✓ Mitigate Aral Sea crisis.</li> <li>✓ Increase the share of natural gas in energy mix.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Decrease loss of natural gas in extraction, processing &amp; transportation.</li> <li>✓ Development of financial schemes.</li> <li>✓ Subsidy support to energy saving measures.</li> </ul>
Adaptation	<ul style="list-style-type: none"> <li>✓ Modernize housing and communal services.</li> <li>✓ Develop sustainable transport.</li> <li>✓ Conserve ecosystems. Improve waste management.</li> <li>✓ Enhance forest cover.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Microloans for climate adaptation &amp; energy efficiency.</li> <li>✓ Consider climate impacts in water &amp; energy, land use &amp; mining.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Use greenhouses to grow a variety of crops.</li> <li>✓ Plant drought-resistant varieties of fruit trees.</li> <li>✓ Provide shelter for livestock to lessen the risk of heat stress.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Improve early warnings &amp; weather forecasts.</li> <li>✓ Adapt water &amp; agriculture reforms.</li> <li>✓ Conserve water.</li> <li>✓ Enhance climate resilience.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Diversify food crops.</li> <li>✓ Enhance pasture productivity.</li> <li>✓ Improve irrigated lands affected by desertification.</li> </ul>
Policy Framework	<ul style="list-style-type: none"> <li>✓ Kazakhstan 2050 Strategy.</li> <li>✓ Green Economy Concept for the Republic of Kazakhstan.</li> </ul>	<ul style="list-style-type: none"> <li>✓ National Sustainable Development Strategy of Kyrgyzstan for 2013–2017.</li> <li>✓ National Development Strategy of the Kyrgyzstan for 2018–2040.</li> </ul>	<ul style="list-style-type: none"> <li>✓ National Development Strategy of the Republic of Tajikistan for the period up to 2030.</li> </ul>	<ul style="list-style-type: none"> <li>✓ National Climate Change Strategy 2012.</li> <li>✓ National Strategy for socio-economic development up to 2030</li> </ul>	<ul style="list-style-type: none"> <li>✓ Program of Actions for Environmental Protection of Uzbekistan for 2013–2017.</li> <li>✓ Government Decree No.841 on Measures to Implement National Goals &amp; Targets in the Field of Sustainable Development up to 2030.</li> </ul>

### Common climate change challenges

- Rapidly rising temperature. Extreme heat waves. Droughts.
- Diminished crop productivity. Negative effect on livestock.
- Shrinking glaciers. Water shortage. Increased competition over water.
- Reduced power generation. Power supply interruptions.
- Increased respiratory & cardiovascular diseases. Malnutrition.

31 OCT - 12 NOV 2021  
GLASGOW

# COP26

IN PARTNERSHIP WITH ITALY

The COP26 summit will bring parties together to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change.

#### Mitigation

- Phase out coal.
- Curtail deforestation.
- Invest in renewables.

#### Finance

- Mobilise at least \$100bil in climate finance.
- Public & private sector financing required.

#### Adaptation

- Protect & restore ecosystems.
- Build resilience.

#### Collaboration

- Finalise Paris Rulebook.
- Collaboration between governments, businesses, civil society.

#### Acknowledgement:

This infographic was prepared in July 2021 under the overall guidance of Nikolay Pomoshchnikov, Head, Subregional Office for North and Central Asia, by Aizhan Omirzak and Patricia Wong.

25 percent by 2030, enshrined in Uzbekistan national law.<sup>107</sup> Kazakhstan has committed to achieve carbon neutrality by 2060 and reach 15 percent share of renewables by 2030. **Kyrgyzstan** is in the final stages of considering a revised NDC of 16 percent reduction in greenhouse gas emissions below business-as-usual le-

vels and 44 percent reduction conditional on international support. The NDC of the **United States** is to achieve an economy-wide target of reducing its net greenhouse gas emissions by 50-52 percent below 2005 levels in 2030. The United States also aims to decarbonize its electricity system by 2035.

## COP26

For two weeks, the world was riveted on all facets of climate change – the science, the solutions, the political will to act, and clear indications of action. The COP26 brought together 120 world leaders and over 40,000 registered participants.

The outcome of COP26 – the **Glasgow Climate Pact** – is the fruit of intense negotiations among almost 200 countries over the two weeks, strenuous formal and informal work over many months, and constant engagement both in-person and virtually for nearly two years.

Cuts in global greenhouse gas emissions are still far from where they need to be to preserve a livable climate, and support for the most vulnerable countries affected by the impacts of climate change is still falling far short. But COP26 did produce new “building blocks” to advance implementation of the Paris Agreement through actions that can get the world on a more sustainable, low-carbon pathway forward.

### What was agreed?

**Recognizing the emergency.** Countries reaffirmed the Paris Agreement goal of limiting the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5°C. And they went further, expressing “alarm and utmost concern that human activities have caused around 1.1°C of warming to date, that impacts are already being felt in every region, and that carbon budgets consistent with achieving the Paris Agreement temperature goal are now small and being rapidly depleted.” They recognized that the impacts of climate change will be much lower at a temperature increase of 1.5°C compared with 2°C.

**Accelerating action.** Countries stressed the urgency of action “in this critical decade,” when carbon dioxide emissions must be reduced by 45 per cent to reach net zero around mid-century. But with present climate plans – the Nationally determined Contributions – falling far short on ambition, the Glasgow Climate Pact calls on all countries to present stronger national action plans next year, instead of in 2025, which was the original timeline. Countries also called on UNFCCC to do an annual NDC Synthesis Report to gauge the present level of ambition.

**Moving away from fossil fuels.** In perhaps the most contested decision in Glasgow, countries ultimately agreed to a provision calling for a phase-down of coal power and a phase-out of “inefficient” fossil fuel subsidies – two key issues that had never been explicitly mentioned in decisions of UN climate talks before, despite coal, oil and gas being the main drivers of global warming. Many countries, and NGOs, expressed dissatisfaction that the language on coal was significantly weakened (from phase-out to phase-down) and consequently, was not as ambitious as it needs to be.

**Delivering on climate finance.** Developed countries came to Glasgow falling short on their promise to deliver US\$100 billion a year for developing countries. Voicing “regret,” the Glasgow outcome reaffirms the pledge and urges developed countries to fully deliver on the US\$100 billion goal urgently. Developed countries, in a report, expressed confidence that the target would be met in 2023.

**Stepping up support for adaptation.** The Glasgow Pact calls for a doubling of finance to support developing countries in adapting to the impacts of climate change and building resilience. This won’t provide all the funding that poorer countries need, but it would significantly increase finance for protecting lives and livelihoods, which so far made up only about 25 per cent of all climate finance (with 75 per cent going towards green technologies to mitigate greenhouse gas emissions). Glasgow also established a work programme to define a global goal on adaptation, which will identify collective needs and solutions to the climate crisis already affecting many countries.

**Completing the Paris rulebook.** Countries reached agreement on the remaining issues of the so-called Paris rulebook, the operational details for the practical implementation of the Paris Agreement. Among them are the norms related to carbon markets, which will allow countries struggling to meet their emissions targets to purchase emissions reductions from other nations that have already exceeded their targets. Negotiations were also concluded on an Enhanced Transparency Framework, providing for common timeframes and agreed formats for countries to regularly report on progress, designed to build trust and confidence that all countries are contributing their share to the global effort.

<sup>107</sup> Envisaged by the Comprehensive Program for improvement of energy effectiveness of economic sectors and social sphere in 2019-2022, approved by the Uzbek Governmental Decree on 22 August 2019.

**Focusing on loss & damage.** Acknowledging that climate change is having increasing impacts on people especially in the developing world, countries agreed to strengthen a network – known as the Santiago Network – that connects vulnerable countries with providers of technical assistance, knowledge and resources to address climate risks. They also launched a new “Glasgow dialogue” to discuss arrangements for the funding of activities to avert, minimize and address loss and damage associated with the adverse effects of climate change.

### New deals and announcements

There were many other significant deals and announcements – outside of the Glasgow Climate Pact – which can have major positive impacts if they are indeed implemented. These include:

**Forests.** 137 countries took a landmark step forward by committing to halt and reverse forest loss and land degradation by 2030. The pledge is backed by \$12 bn in public and \$7.2 bn in private funding. In addition, CEOs from more than 30 financial institutions with over \$8.7 trillion of global assets committed to eliminate investment in activities linked to deforestation.

**Methane.** 103 countries, including 15 major emitters, signed up to the Global Methane Pledge, which aims to limit methane emissions by 30 per cent by 2030, compared to 2020 levels. Methane, one of the most potent greenhouse gases, is responsible for a third of current warming from human activities.

**Cars.** Over 30 countries, six major vehicle manufacturers and other actors, like cities, set out their determination for all new car and van sales to be zero-emission vehicles by 2040 globally and 2035 in leading markets, accelerating the decarbonization of road transport, which currently accounts for about 10 per cent of global greenhouse gas emissions.

**Coal.** Leaders from South Africa, the United Kingdom, the United States, France, Germany, and the European Union announced a ground-breaking partnership to support South Africa – the world’s most carbon-intensive electricity producer – with \$8.5 billion over the next 3-5 years to make a just transition away from coal, to a low-carbon economy.

## Climate Change Reports

**The 10 New Insights in Climate Science 2021** report is based on an assessment made by more than 60 world-leading academic experts.

**1. Stabilizing at 1.5°C warming is still possible, but immediate and drastic global action is required:** (1) Estimates of the remaining global carbon budget (the overall amount of CO<sub>2</sub> that can be emitted) indicate that rapid reductions averaging 2 gigatonnes of CO<sub>2</sub> (GtCO<sub>2</sub>) (5% of 2020 global emissions) per

**Private finance.** Private financial institutions and central banks announced moves to realign trillions of dollars towards achieving global net zero emissions. Among them is the Glasgow Financial Alliance for Net Zero, with over 450 firms across 45 countries that control \$130 trillion in assets, requiring its member to set robust, science-based near-term targets.

### Central Asian countries in COP26

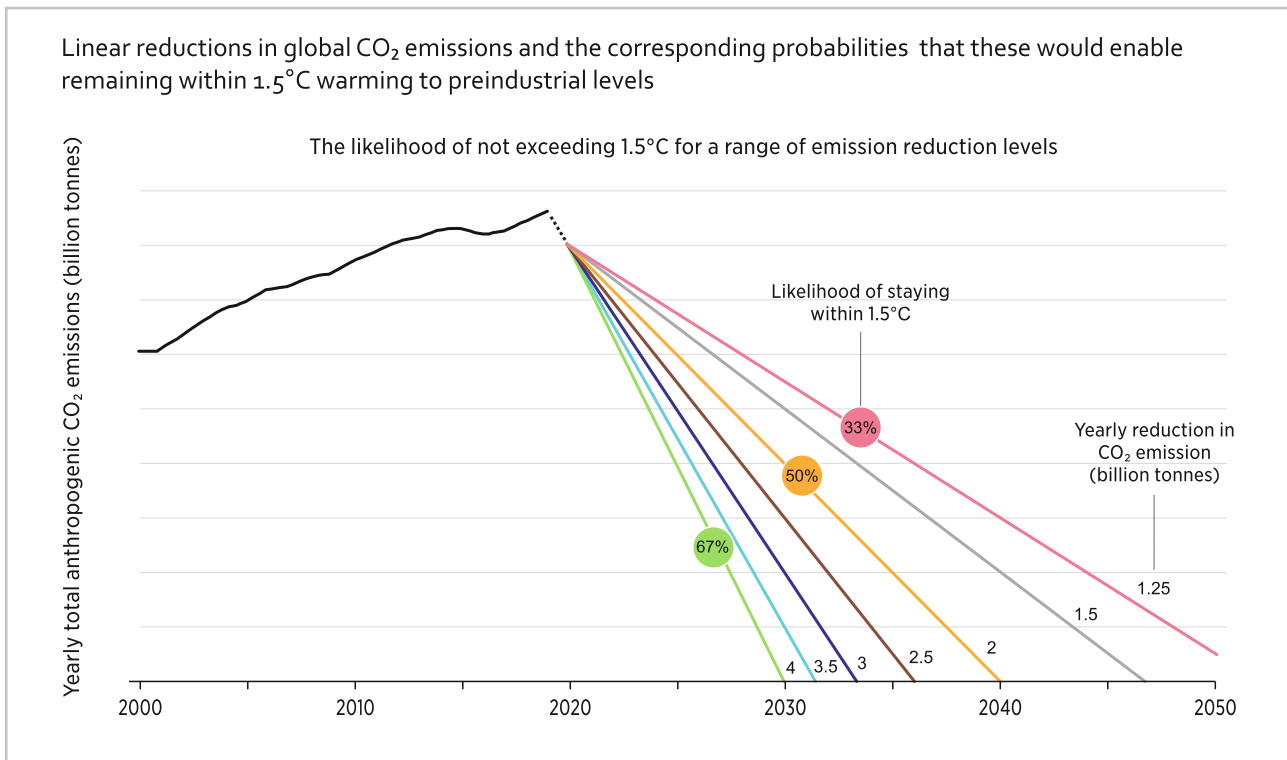
**Draft Regional Statement of CA countries.** For the first time in the 26-year history of the UNFCCC, the CA countries presented themselves as a single region and voiced a draft [Regional statement](#) appealing to the international community, primarily the UN structures, to pay special attention to the critical problems of the CA region caused by climate change and exacerbated by the COVID-19 pandemic and the humanitarian crisis in Afghanistan. The document emphasizes the special geographical position of Central Asia, which has no access to the oceans and seas, which significantly increases its vulnerability to climate change. Particular attention is also paid to the importance of joining forces to combat climate change and adapt to its impacts at the regional and international levels.

**Appeal by NGOs of the Central Asian countries on climate change.** The main message of the [Regional Appeal](#) announced at COP26 is an appeal to the governments of Central Asia to strengthen national and regional programs to prevent the climate crisis in the region. The governments of the countries should “adopt stronger goals to reduce greenhouse gas emissions and take a more proactive position in promoting the region’s interests and role in international climate commitments and processes.”

In addition, NGOs from CA countries are calling on the authorities to create non-declarative legislative conditions to support renewable energy sources, abandon the construction of nuclear power plants and fossil fuels subsidies. The civil sector sees the climate sustainability of the region in strengthening measures to restore and preserve the fertility of soil, mountain, forest, pasture and aquatic ecosystems. It considers it necessary to disseminate climate-resilient technologies at the state level. The appeal also notes the importance of taking into account the transboundary nature of water resources, environmental and climatic risks and opportunities.

year are required to keep global warming to within 1.5°C. This pace of reductions must be maintained until net emissions are zero (around 2040); (2) We may have already exceeded the carbon budget necessary to keep global temperature rise to within 1.5°C of warming; (3) If these unprecedented cuts in emissions are not made, we are likely to exceed 1.5°C warming and require carbon removal technologies on an enormous scale; (4) The short-term emissions drop during the COVID-19 pandemic had a very limited





impact on the overall decarbonization towards meeting the 1.5°C target; (5) The power sector offers the largest opportunity for near-term decarbonization, but all economic sectors need to drastically reduce greenhouse gas (GHG) emissions.

**2. Rapid growth in methane and nitrous oxide emissions put us on track for 2.7°C warming:** (1) Reducing methane emissions is a key lever available to slow climate change over the next 25 years: readily available, low-cost measures (see implications below) could halve methane emissions by 2030 and must go hand-in-hand with CO<sub>2</sub> mitigation and removal efforts to stabilize global temperature in the long term; (2) Rapid reductions in aerosol emissions during the COVID-19 pandemic caused a slight warming of the planet, highlighting the fact that cooling aerosols emitted from fossil fuel combustion to date have partly masked warming from greenhouse gas emissions. While declines in aerosol emissions will improve air quality and benefit the health of billions, this will exacerbate global warming in the short term.

**3. Megafires – Climate change forces fire extremes to reach new dimensions with extreme impacts:** (1) We are entering a new age of intensifying extreme fire regimes (megafires). It is likely that these are induced, and certainly exacerbated, by anthropogenic climate change; (2) Several megafires have been observed across very diverse regions from high to low latitudes, and are now impacting ecosystems; (3) Megafires can affect entire biomes with unprecedented impacts on flora and fauna, threatening also more fire-sensitive ecosystems such as the World Heritage-listed Gondwana rainforests of Australia; (4) Large smoke plumes and aerosols from megafires can impact wide areas due to long-range transport both in the troposphere and stratosphere; (5) More

frequent and more intense fires come with increased risks to respiratory and cardiovascular health, birth outcomes and mental health for rural and urban communities.

#### 4. Climate tipping elements incur high-impact risks:

(1) The IPCC AR6 acknowledges that many human-caused changes, especially to the ocean, ice sheets and global sea level, are high risk and irreversible for centuries to millennia – some of them involving tipping processes – and that these changes are key to a comprehensive risk assessment; (2) Significant destabilization of several key climate tipping elements is already being observed today; (3) In many cases, the dominant driver of this destabilization is global warming. But direct human influence on land cover change, such as degradation and active deforestation of the Amazon rainforest, can play an equal or even stronger role; (4) Some tipping elements, for example melting ice sheets and changes to ocean currents, but also deforestation of rainforests, influence each other. Recent research indicates that interactions among tipping elements can ultimately cause shifts to happen at lower levels of global warming than anticipated.

**5. Global climate action must be just:** (1) Climate action must support just transitions, as it could otherwise slow down improvements in living standards in low- and middle-income countries and burden disadvantaged people globally; (2) Working towards just, equitable and low-carbon development for poorer countries: requires the richest 1% to cut their emissions by a factor of 30, which would enable the poorest 50% of the world's population to increase their emissions up to three-fold; (3) Justice-oriented climate action is more likely to achieve public acceptance, improving uptake of implementation.

## 6. Supporting household behaviour changes is a crucial but often overlooked opportunity for climate action:

(1) Fighting climate change means making changes in lifestyles, particularly for the wealthy, to complement efficiency and decarbonization strategies; (2) Sticking to the status quo in terms of consumption growth puts any supply-side decarbonization achievements at risk (e.g. solar deployment); (3) For changes in individual behaviour to make a difference, they must be combined with mutually reinforcing changes by the public and the business sectors; (4) Lifestyles compatible with the 1.5°C goal can result in a “good life” for all (i.e., “1.5°C lifestyles”).

## 7. Political challenges impede effectiveness of carbon pricing:

(1) Carbon pricing has not yet delivered substantial emissions reductions; (2) To be effective, carbon prices need to increase rapidly in the near term, be sector-specific and be part of larger policy packages; (3) To be publicly accepted, carbon pricing schemes need to consider equity and justice.

## 8. Nature-based solutions are critical for the pathway to Paris – but look at the fine print:

(1) Nature-based Solutions (NbS) can offer multiple benefits to climate, ecosystems and societies, but must not replace or delay decarbonization efforts in other sectors; (2) With further warming, Earth System feedbacks may increasingly destabilize ecosystems and undermine the long-term mitigation potential of NbS; (3) Investing in NbS now to protect biodiversity will make them more climate resilient and strengthen their ability to act as long-term carbon sinks; (4) Much potential for NbS is situated in the less developed and developing countries and in areas inhabited by indigenous peoples who often have limited land rights; (5) To successfully include NbS in National Determined Contributions (NDCs) and effectively implement policies and direct funding, comprehensive metrics and monitoring, reporting and verification (MRV) are needed that include biodiversity, ecosystem services and local livelihoods, alongside carbon sequestration.

## 9. Building resilience of marine ecosystems is achievable by climate-adapted conservation and management, and global stewardship:

(1) The oceans play a key role in regulating the Earth's climate. Protecting the oceans as a carbon sink including marine sediments and vegetation that bind substantial carbon stocks (“blue carbon”) is an important climate change mitigation action; (2) Integrated, tailored and innovative solutions are needed to preserve ocean ecosystems threatened by accelerating climate change and other anthropogenic pressures; (3) There is a growing recognition of the importance of integrated governance in building ocean resilience by: involving all levels from local to global as well as the private sector; providing clear targets, strong actions and global stewardship; (4) In expanding the global network of MPAs the adaptation measures must include climate refugia, areas of high environmental change, corridors for migrating species.

## 10. Costs of climate change mitigation can be justified by the multiple immediate benefits to the health

**of humans and nature:** (1) Benefits of mitigation to human health and nature accrue before the benefits of mitigation are apparent; (2) Health benefits are of higher economic value than the cost of mitigation policies; (3) Rapid emission reductions are needed across all sectors; adopting the right policies can make a big difference to health and wider environmental benefits; (4) The value of health co-benefits can justify rapid scaling up of mitigation policies and technologies, and thus accelerate progress towards a zero-emissions economy.

Source: [https://10insightsclimate.science/wp-content/uploads/2021/12/Report\\_Climate-Science-Insights\\_2021\\_WEB.pdf](https://10insightsclimate.science/wp-content/uploads/2021/12/Report_Climate-Science-Insights_2021_WEB.pdf)

## IPCC report shows that climate change is rapid, widespread and intensifying.

The IPCC finalized the first part of the Sixth Assessment Report, Climate Change 2021: The Physical Science Basis, the Working Group I contribution to the Sixth Assessment Report. It provides the clearest and most comprehensive assessment to date of warming of the atmosphere, oceans and land. The scale of recent changes is unprecedented in thousands, if not hundreds of thousands of years. Many changes due to past and future greenhouse gas emissions are irreversible for centuries to millennia, especially changes in the ocean, ice sheets and global sea level, says the report.

Human-induced climate change is already affecting many weather and climate extremes in every region across the globe. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts, and the proportion of intense tropical cyclones, and, in particular, their attribution to human influence, has strengthened since the last IPCC Assessment Report in 2014.

**More Extreme Weather.** The IPCC report projects that in the coming decades climate changes will increase in all regions. For 1.5°C of global warming, there will be increasing heat waves, longer warm seasons and shorter cold seasons as well as changes in precipitation patterns affecting flooding and drought occurrences. At 2°C of global warming, heat extremes would more often reach critical tolerance thresholds for agriculture and health, the report shows.

The extreme heat we have witnessed in 2021 bears all the hallmarks of human-induced climate change. British Columbia in Canada recorded an incredible temperature of 49.6°C – breaking all previous records – as part of an intense and extensive heatwave in North America.

The Arctic is heating more than twice as fast as the global average. Further warming will amplify permafrost thawing, and the loss of seasonal snow cover, melting of glaciers and ice sheets, and loss of summer Arctic sea ice, according to the report. The report shows also how climate change is intensifying the water cycle. This brings more intense rainfall and associated flooding, as well as more intense drought in many regions.

**1.5°C warming level.** The observed average rate of heating accelerated during the period 2006-2018 compared to the period 1971-2006. The report provides new estimates of the chances of crossing the global warming level of 1.5°C in the next decades, and finds that unless there are immediate, rapid and large-scale reductions in greenhouse gas emissions, limiting warming to close to 1.5°C or even 2°C will be beyond reach.

Emissions of greenhouse gases from human activities are responsible for approximately 1.1°C during the last ten years of warming since 1850-1900. In 2020 the annual mean temperature was 1.2°C above the normal. The averaged temperature estimate over the next 20 years is expected to reach or exceed 1.5°C of warming. The Paris Agreement commits to pursue efforts to limit temperature increase to this level.

**Regional emphasis.** many drivers of climate impacts are projected to change in all regions of the world. Region-specific changes include intensification of tropical cyclones and extratropical storms, increases

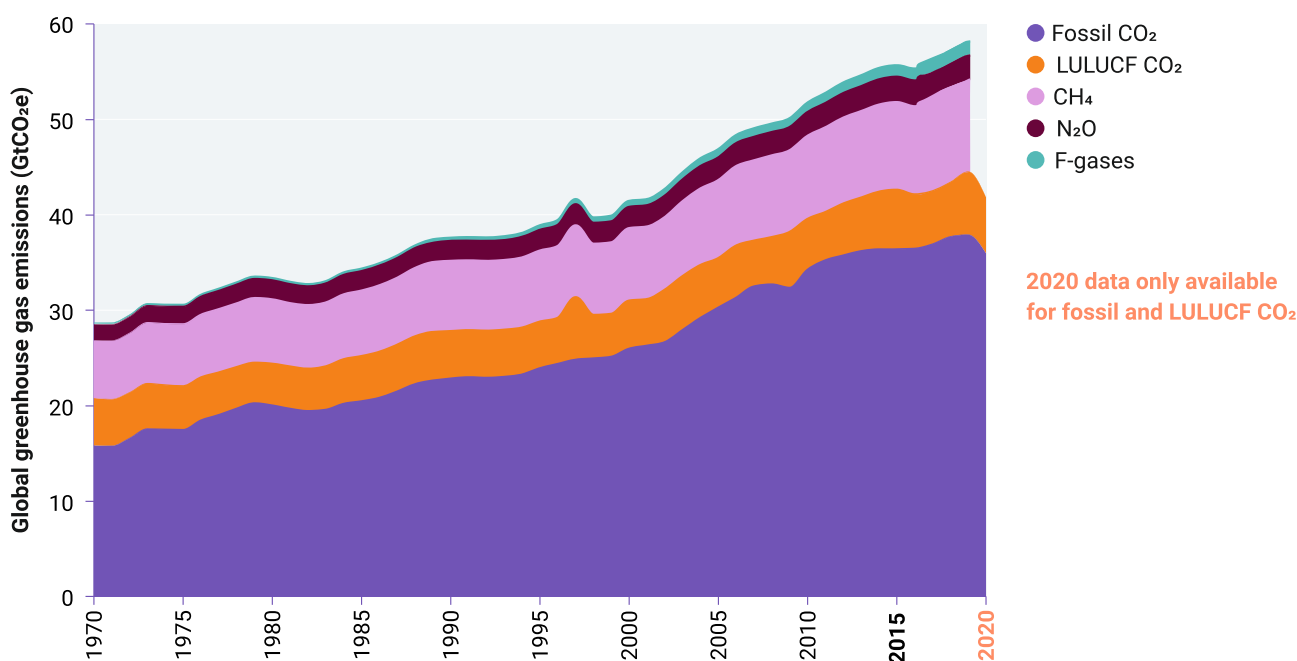
in river flooding, reductions in mean precipitation, increases in aridity and increases in fire weather.

Even at 1.5 °C of warming, heavy precipitation and associated flooding are projected to intensify and become more frequent in most regions in Africa and Asia with a high level of confidence. More frequent and severe droughts are projected in a few regions in all continents except Asia. These changes increase at 2°C of warming. The report is available [here](#).

**The Emissions Gap Report 2021: The Heat Is On** is the 12<sup>th</sup> edition in UNEP annual series that provides an overview of the difference between where greenhouse emissions are predicted to be in 2030 and where they should be to avert the worst impacts of climate change.

1. Following an unprecedented drop of 5.4 per cent in 2020, global carbon dioxide emissions are bouncing back to pre-COVID levels, and concentrations of GHGs in the atmosphere continue to rise.

### Global greenhouse gas emissions from all sources, 1970-2020



2. New mitigation pledges for 2030 show some progress, but their aggregate effect on global emissions is insufficient. As at 30 September 2021, 120 countries (121 parties, including the European Union and its 27 member states) representing just over half of global GHG emissions, have communicated new or updated NDCs. This year's assessment considers the new or updated NDCs communicated to the UNFCCC as well as announcements of new mitigation pledges for 2030 by China, Japan and the Republic of Korea not submitted as NDCs by 30 September.

3. As a group, G20 members are not on track to achieve either their original or new 2030 pledges. Ten G20 members are on track to achieve their previous NDCs, while seven are off track.

4. A promising development is the announcement of long-term net-zero emissions pledges by 52 parties, covering more than half of global emissions. However, these pledges show large ambiguities.

5. Few of the G20 members' NDC targets put emissions on a clear path towards net-zero pledges. There is an urgent need to back these pledges up with near-term targets and actions that give confidence that net-zero emissions can ultimately be achieved and the remaining carbon budget kept.

6. The emissions gap remains large: compared to previous unconditional NDCs, the new pledges for 2030 reduce projected 2030 emissions by only 7.5 per

cent, whereas 30 per cent is needed for 2°C and 55 per cent is needed for 1.5°C.

7. Global warming at the end of the century is estimated at 2.7°C if all unconditional 2030 pledges are fully implemented and 2.6°C if all conditional pledges are also implemented. If the net-zero emissions pledges are additionally fully implemented, this estimate is lowered to around 2.2°C.

8. The opportunity to use COVID-19 fiscal rescue and recovery spending to stimulate the economy while fostering a low-carbon transformation has been missed in most countries so far. Poor and vulnerable countries are being left behind.

9. Reduction of methane emissions from the fossil fuel, waste and agriculture sectors can contribute significantly to closing the emissions gap and reduce warming in the short term.

10. Carbon markets can deliver real emissions abatement and drive ambition, but only when rules are

clearly defined, designed to ensure that transactions reflect actual reductions in emissions, and supported by arrangements to track progress and provide transparency.

**The 5<sup>th</sup> Yearbook of Global Climate Action 2021.** This Yearbook of Global Climate Action reviews the work carried out under the Marrakech Partnership and the High-Level Champions since the last publication, by: (1) summarizing the state and scope of global climate action in 2021 and the challenges and opportunities around how to track and reflect these efforts, as well as the progress of the global action tools launched in the past year; (2) outlining the key messages around what is needed to accelerate sectoral systems transformation; and (3) presenting the Champions' vision on the future of the climate action framework and agenda, and how the work feeds into the global stocktake.

See the Yearbook on [https://unfccc.int/sites/default/files/resource/Yearbook\\_GCA\\_2021.pdf](https://unfccc.int/sites/default/files/resource/Yearbook_GCA_2021.pdf)

## Significant and Major Events

**Water and Climate Coalition.** A new Water and Climate Coalition has been **launched** to achieve more effective integrated policy-making in an era when climate change, environmental degradation and population growth has exacerbated water-related hazards and scarcity. The coalition aims to achieve an integrated global Water and Climate Agenda to support more effective adaptation and resilience and speeding up progress towards SDGs 6 and 13 (climate). The coalition includes current and former government, business and civil society leaders as well as 2 youth representatives from all regions of the world. The Water and Climate Leaders will provide practical guidance on proper integration, information, cooperation and investment.

**The UN Security Council held several high level open debates:** (1) "Addressing climate-related security risks to international peace and security through mitigation and resilience building" (February 23); (2) "Security in the context of climate change" (September 23); (3) "Security in the context of terrorism and climate change" (December 9) (see "[Security Council](#)").

United States organized the **Leaders Summit on Climate**, which brought together 40 heads of state – from big Russia, Brazil and China to tiny Bhutan, Gabon and Marshall Islands. "We are at the verge of the abyss... Global temperature has already risen 1.2 degrees Celsius – racing toward the threshold of catastrophe", UN Secretary-General António Guterres **said** in his address to the virtual climate summit (April 22).

**Global trends in climate change litigation in 2021.** The databases contained 1,841 ongoing or concluded cases of climate change litigation from around the world, as of May 2021 (see [Figure below](#)). Of these, 1,387 were filed before courts in the United States, while the remain-

ing 454 were filed before courts in 39 other countries and 13 international or regional courts and tribunals (including the courts of the European Union). Outside the US, Australia (115), the UK (73) and the EU (58) remain the jurisdictions with the highest volume of cases. 1,006 cases have been filed since 2015 – the year of the Paris Agreement and the land-mark case of *Urgenda Foundation v. State of the Netherlands* – while 834 were filed between 1986 and 2014.

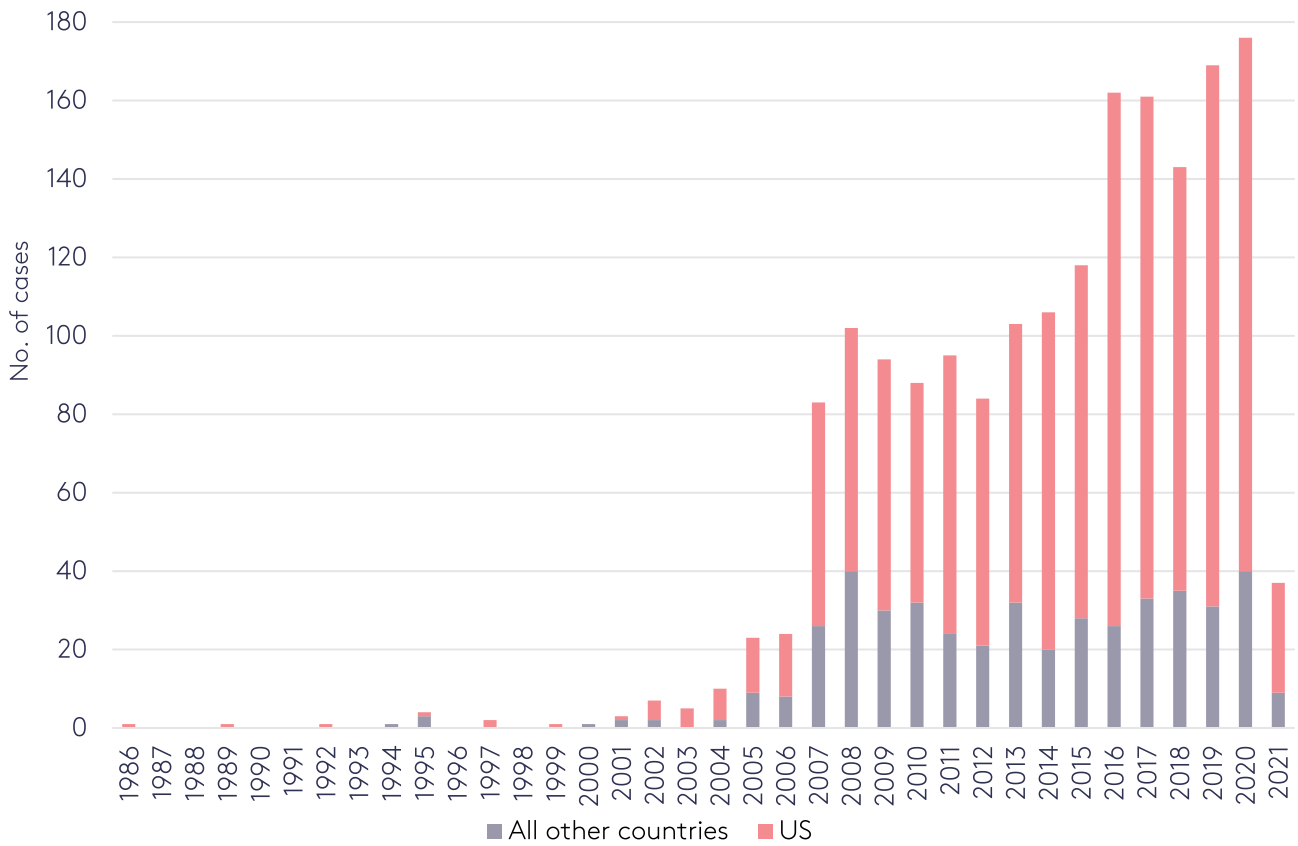
**New cases, 1 May 2020 to 31 May 2021.** Globally, 191 new cases were filed in this period. Cases were filed for the first time in Guyana and Taiwan, as well as the East African and European Courts of Human Rights.

**Source:** Setzer J. and Higham C. (2021) Global trends in climate change litigation: 2021 snapshot. London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, Sabin Center for Climate Change Law; [https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2021/07/Global-trends-in-climate-change-litigation\\_2021-snapshot.pdf](https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2021/07/Global-trends-in-climate-change-litigation_2021-snapshot.pdf)

**Climate change litigation is gaining momentum.** The world's first courtroom battle with corporate titans took place in 2021. The Dutch environmental group "Milieudefensie" succeeded in the court in the Netherlands which ordered global energy company Royal Dutch Shell PLC (RDS) to reduce its group-wide CO<sub>2</sub> emissions by 45 percent by the end of 2030 alleging Shell's contributions to climate change violate human rights. In January, the environmental group demanded that 30 major corporate emitters of greenhouse gases with legal bases in the Netherlands, including BP, Shell, ExxonMobil, KLM and Unilever present concrete and feasible climate plans outlining how they would trim emissions of the heat-trapping gases by 45% from 2019 levels by 2030 during next three months.

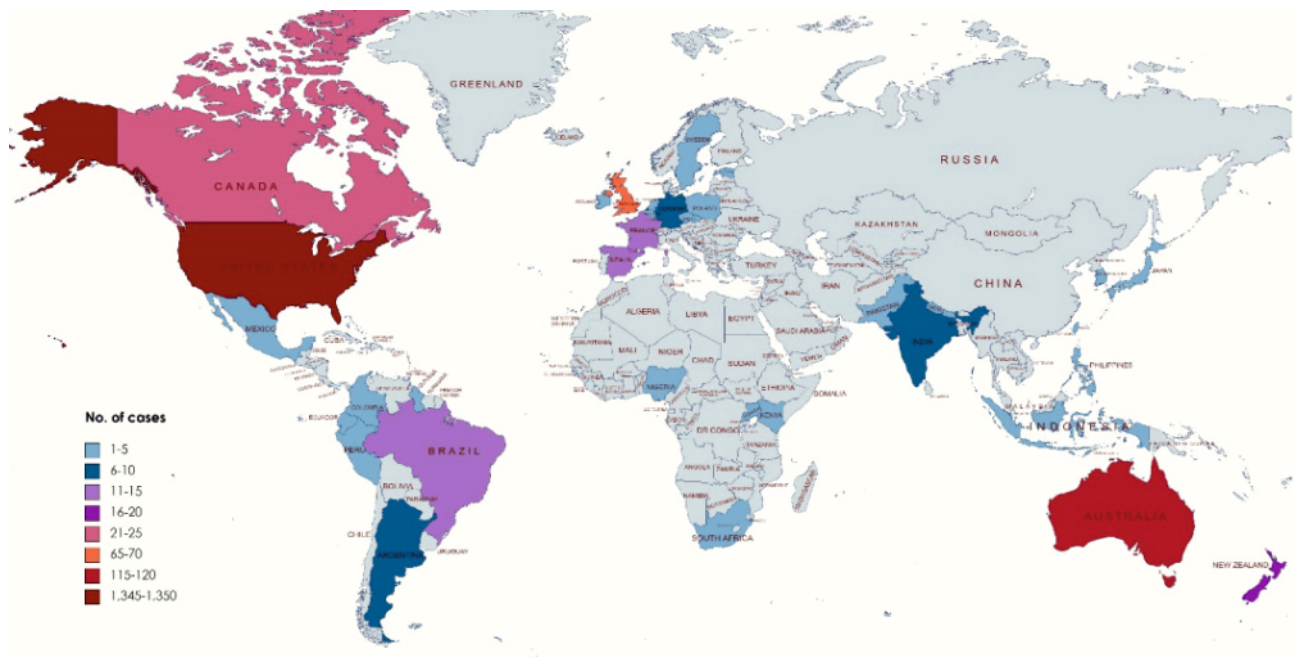


Total cases over time, US and non-US, to 31 May 2021



Note: These data are from the databases and may be incomplete, as discussed in the Introduction.  
 Source: Authors based on CCLW and Sabin Center data

Number of cases around the world, per jurisdiction, to May 2021



Notes: Cumulative figures to May 2021. Map created with mapchart.net.  
 Source: Authors based on CCLW and Sabin Center data

On November 25, three young climate activists – Marina Tricks (19), Adetola Onamade (23) and Jerry Kobina Amokwandoh (22) – **opened the campaign “Young People vs UK Gov”** appealing to the Great Britain’s Supreme Court to consider the case to influence the country climate policy. The defendants try to file a case against the Prime Minister, Boris Johnson, the Chancellor, Rishi Sunak and the Energy Minister, Kwasi Kwarteng, over the Government’s failure to honour its Paris Agreement commitments.

**Juliana v. United States climate change lawsuit.** The first case of its kind, Juliana v. the United States con-

tinued in 2021. 21 American teenagers aged from 9 to 20 filed a lawsuit against the US Government. Their complaint asserts that, through the government’s affirmative actions that cause climate change, it has violated the youngest generation’s constitutional rights to life, liberty, and property, as well as failed to protect essential public trust resource.<sup>108</sup> *State of things*: the youth plaintiffs are awaiting a ruling on their Motion for Leave to File a Second Amended Complaint and the Motion to Intervene filed by 18 states, led by Alabama.

## 12.2. Sustainable Development Goals: Tracking the Progress

In this Subsection we present an overview of SDGs progress based on the ESCAP “Asia and the Pacific SDG Progress Report 2022. Widening disparities amid COVID-19”.

This Report provides an analysis of progress on 17 SDGs and 169 targets in the region and in each of the five subregions, including Central Asia.

The report also provides an analysis of data gaps that prevent the monitoring of progress, and it provides an investigation of sources and priority areas for enhancing SDG data availability.

Progress towards the SDGs in the Asia-Pacific region has slowed as the COVID-19 pandemic and climate change have exacerbated development challenges.

The North and Central Asia subregion is not on track for any of the goals, but progress has been made towards most of the measurable targets under good health and well-being (Goal 3), industry, innovation and infrastructure (Goal 9) and peace, justice and strong institutions (Goal 16). Meanwhile trends on res-

possible consumption and production (Goal 12), climate action (Goal 13) and life below water (Goal 14) have continued to regress for the past five years. Progress has been limited for clean water and sanitation (Goal 6), sustainable cities and communities (Goal 11), and life on land (Goal 15).

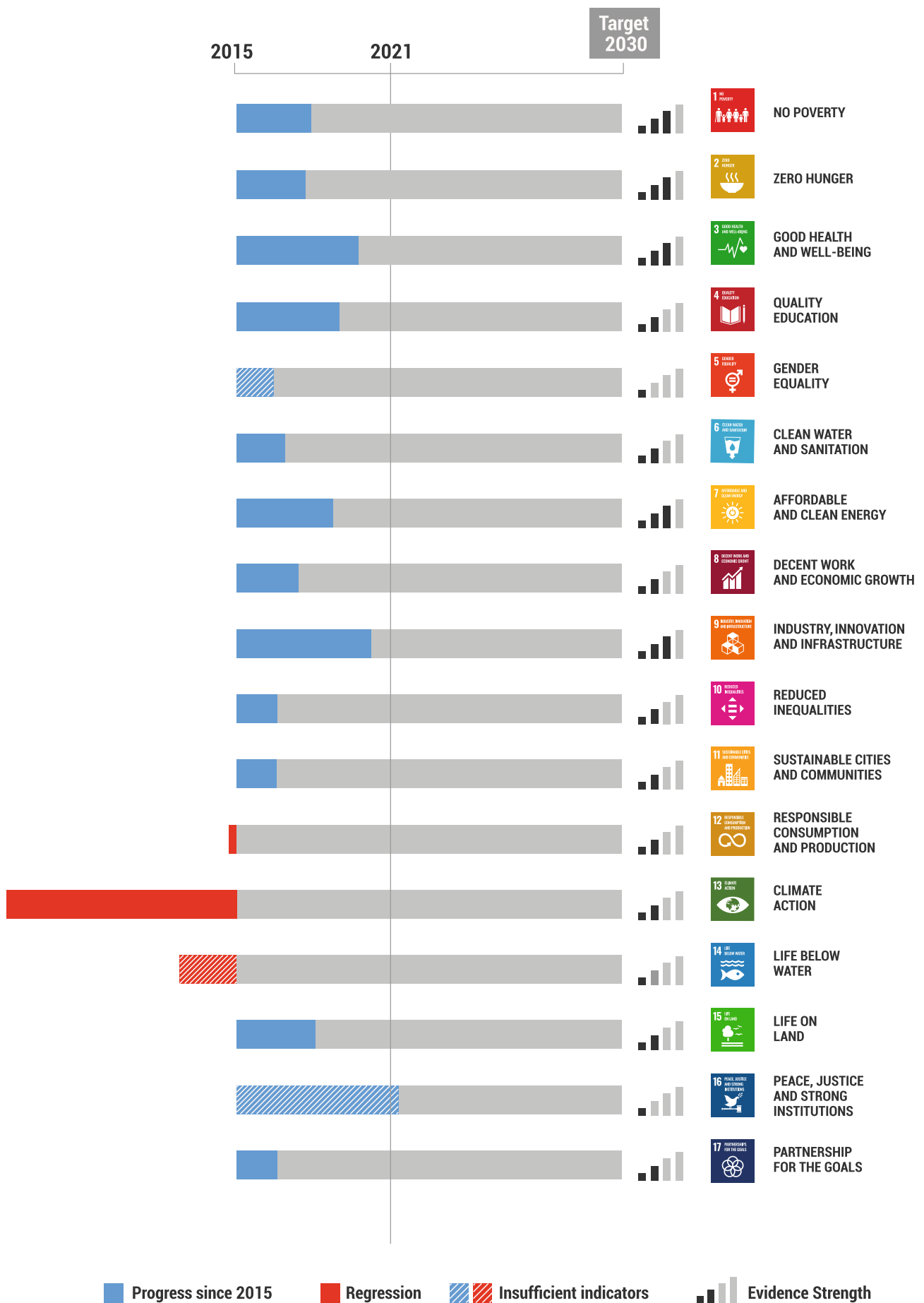
GHG emissions per capita in North and Central Asia are among the highest. Although renewable energy capacity has increased, the share of renewable energy in the total energy supply remains very low, amounting to approximately 3.4 per cent of the total energy supply.

Fossil fuel subsidies as a percentage of GDP in North and Central Asia are higher than in any other subregion, at 12.1 per cent in Kyrgyzstan, 6.9 per cent in Turkmenistan and 4.4 per cent in Uzbekistan. North and Central Asia needs to prioritize improvements in production efficiency alongside increased production capacity to ensure the sustainability of lifestyles and natural resources.

Source: [https://www.unescap.org/sites/default/d8files/knowledge-products/ESCAP-2022-FG\\_SDG-Progress-Report.pdf#page=12](https://www.unescap.org/sites/default/d8files/knowledge-products/ESCAP-2022-FG_SDG-Progress-Report.pdf#page=12)

<sup>108</sup> <https://www.ourchildrenstrust.org/juliana-v-us>

Snapshot of ADG progress in North and Central Asia, 2021



Anticipated progress on SDG targets in North and Central Asia

**1 NO POVERTY**

- 1.2 National poverty
- 1.1 International poverty
- 1.3 Social protection
- 1.4 Access to basic services
- 1.5 Resilience to disasters
- 1.a Resources for poverty programs
- 1.b Poverty eradication policies

**2 ZERO HUNGER**

- 2.2 Malnutrition
- 2.3 Small-scale food producers
- 2.4 Sustainable agriculture
- 2.5 Genetic resources for agriculture
- 2.a Investment in agriculture
- 2.1 Undernourishment and food security
- 2.b Agricultural export subsidies
- 2.c Food price anomalies

**3 GOOD HEALTH AND WELL-BEING**

- 3.1 Maternal mortality
- 3.2 Child mortality
- 3.9 Health impact of pollution
- 3.3 Communicable diseases
- 3.4 NCD & mental health
- 3.5 Substance abuse
- 3.6 Road traffic accidents
- 3.7 Sexual & reproductive health
- 3.8 Universal health coverage
- 3.a Tobacco control
- 3.b R&D for health
- 3.c Health financing & workforce
- 3.d Management of health risks

**4 QUALITY EDUCATION**

- 4.4 Skills for employment
- 4.6 Adult literacy & numeracy
- 4.1 Effective learning outcomes
- 4.2 Early childhood development
- 4.3 TVET & tertiary education
- 4.a Education facilities
- 4.5 Equal access to education
- 4.c Qualified teachers
- 4.7 Sustainable development education
- 4.b Scholarships

**5 GENDER EQUALITY**

- 5.5 Women in leadership
- 5.1 Discrimination against women & girls
- 5.2 Violence against women & girls
- 5.3 Early marriage
- 5.4 Unpaid care and domestic work
- 5.6 Reproductive health access & rights
- 5.a Equal economic rights
- 5.b Technology for women empowerment
- 5.c Gender equality policies

**6 CLEAN WATER AND SANITATION**

- 6.1 Safe drinking water
- 6.2 Access to sanitation & hygiene
- 6.4 Water-use efficiency
- 6.5 Trans-boundary water cooperation
- 6.b Participatory water & sanitation management
- 6.6 Water-related ecosystems
- 6.3 Water quality
- 6.a International cooperation on water & sanitation

**7 AFFORDABLE AND CLEAN ENERGY**

- 7.3 Energy efficiency
- 7.1 Access to energy services
- 7.b Investing in energy infrastructure
- 7.2 Share of renewable energy
- 7.a International cooperation on energy

**8 DECENT WORK AND ECONOMIC GROWTH**

- 8.2 Economic productivity & innovation
- 8.3 Formalization of SMEs
- 8.6 Youth NEET
- 8.1 Per capita economic growth
- 8.5 Full employment & decent work
- 8.8 Labour rights & safe working env.
- 8.10 Access to financial services
- 8.b Strategy for youth employment
- 8.4 Material resource efficiency
- 8.7 Child & forced labour
- 8.9 Sustainable tourism
- 8.a Aid for Trade

**9 INDUSTRY, INNOVATION AND INFRASTRUCTURE**

- 9.1 Infrastructure development
- 9.c Access to ICT & the Internet
- 9.2 Sustainable/inclusive industrialization
- 9.4 Sustainable & clean industries
- 9.5 Research and development
- 9.b Domestic technology development
- 9.3 Small-scale industries access to finance
- 9.a Resilient infrastructure

**10 REDUCED INEQUALITIES**

- 10.2 Inclusion (social, economic & political)
- 10.4 Fiscal & social protection policies
- 10.7 Safe migration & mobility
- 10.1 Income growth (bottom 40%)
- 10.3 Eliminate discrimination
- 10.5 Regulation of financial markets
- 10.6 Inclusive global governance
- 10.a Special & differential treatment (WTO)
- 10.b Resource flows for development
- 10.c Remittance costs

**11 SUSTAINABLE CITIES AND COMMUNITIES**

- 11.2 Public transport systems
- 11.6 Urban air quality & waste management
- 11.b Disaster risk management policies
- 11.5 Resilience to disasters
- 11.1 Housing & basic services
- 11.3 Sustainable urbanization
- 11.4 Cultural & natural heritage
- 11.7 Urban green & public spaces
- 11.a Urban planning
- 11.c Sustainable & resilient buildings

**12 RESPONSIBLE CONSUMPTION AND PRODUCTION**

- 12.4 Managing chemicals & wastes
- 12.a Support for R&D capacity for SD
- 12.b Sustainable tourism monitoring
- 12.2 Sustainable use of natural resources
- 12.c Fossil-fuel subsidies
- 12.1 Programmes on SCP
- 12.3 Food waste & losses
- 12.5 Reduction in waste generation
- 12.6 Corporate sustainable practices
- 12.7 Public procurement practices
- 12.8 Sustainable development awareness

**13 CLIMATE ACTION**

- 13.1 Resilience & adaptive capacity
- 13.2 Climate change policies
- 13.3 Climate change awareness
- 13.a UNFCCC commitments
- 13.b Climate change planning & management

**14 LIFE BELOW WATER**

- 14.1 Marine pollution
- 14.2 Marine & coastal ecosystems
- 14.3 Ocean acidification
- 14.4 Sustainable fishing
- 14.5 Conservation of coastal areas
- 14.6 Fisheries subsidies
- 14.7 Marine resources for SIDS & LDC
- 14.a Research capacity & marine technology
- 14.b Small-scale artisanal fishing
- 14.c Implementing UNCLOS

**15 LIFE ON LAND**

- 15.1 Terrestrial & freshwater ecosystems
- 15.2 Sustainable forests management
- 15.4 Conservation of mountain ecosystems
- 15.5 Loss of biodiversity
- 15.8 Invasive alien species
- 15.3 Desertification and land degradation
- 15.6 Utilization of genetic resource
- 15.7 Protected species trafficking
- 15.9 Biodiversity in national & local planning
- 15.a Resources for biodiversity & ecosystems
- 15.b Resources for forest management
- 15.c Protected species trafficking (global)

**16 PEACE, JUSTICE AND STRONG INSTITUTIONS**

- 16.1 Reduction of violence & related deaths
- 16.6 Effective institutions
- 16.2 Human trafficking
- 16.3 Justice for all
- 16.4 Illicit financial and arms flows
- 16.5 Corruption and bribery
- 16.7 Inclusive decision-making
- 16.8 Inclusive global governance
- 16.9 Legal identity
- 16.10 Public access to information
- 16.a Capacity to prevent violence
- 16.b Non-discriminatory laws

**17 PARTNERSHIP FOR THE GOALS**

- 17.1 Tax & other revenue collection
- 17.4 Debt sustainability
- 17.6 Science and tech international cooperation
- 17.8 Capacity building for ICT
- 17.9 Capacity building for SDGs
- 17.10 Multilateral trading system (WTO)
- 17.18 National statistics availability
- 17.19 Statistical capacity
- 17.17 Partnerships (public, private, CSO)
- 17.2 ODA commitment by dev. countries
- 17.3 Additional financial resources
- 17.5 Investment promotion for LDCs
- 17.7 Transfer of technologies
- 17.11 Exports of developing countries
- 17.12 Duty-free market access for LDCs
- 17.13 Global macroeconomic stability
- 17.14 Policy coherence for SD
- 17.15 Respect country's policy space
- 17.16 Global partnership for SD

- MAINTAIN progress to achieve target
- ACCELERATE progress to achieve target
- REVERSE trend to achieve target
- Cannot be measured



## 12.3. Earth Overshoot Day 2021

**Earth Overshoot Day 2021** fell on **July 29**. This is the point when human consumption outstrips the resources nature can regenerate in that year. Earth Overshoot Days is computed annually by the Global Footprint Network (GFN). Although the computation methodology is not quite reliable, it anyway serves as a

reminder that we need to take care of nature. According to GFN, humanity consumes 1.6 Earths every year. If the ecological footprint remains the same, by 2030, humanity will be on pace to consume 2 planet's worth of resources and the Earth Overshoot Day will fall on late June.

## 12.4. COVID-19, Water and the Environment: Risks and Opportunities

### Introduction

The COVID-19 pandemic has underscored the value of water and its connections to human health and the environment, but it has also highlighted longstanding water management and environmental governance deficiencies. For example, while hand washing is one of the most effective ways for preventing the spread of COVID-19 and other communicable diseases, 40% of the global population – three billion people – live without soap and water available at home. In the face of COVID-19, they are among the most vulnerable and most at risk of being left behind.

While this global health crisis has raised new water and environment related challenges for national go-

vernments, local communities and the private sector, it could also be an important turning point for addressing longstanding challenges, including the failure to provide safe and affordable water and sanitation for all. The surge in interest, along with potentially massive investments by the business community and government to mitigate risks and help ailing economies, could provide a rare opportunity for more effective and equitable water and environmental policies and management.

This review gathers insights from across the globe to highlight some of the most pressing questions for decision makers, practitioners and citizens alike.

### Water, sanitation and hygiene: World Leaders' Call to Action on COVID-19<sup>109</sup>

Heads of State, Government, and leaders from United Nations agencies, International Financial Institutions, civil society, private sector and research and

learning are mobilizing around a call for the prioritization of water, sanitation and hygiene in the response to COVID-19. Their joint statement:

*Until there is a vaccine or treatment for COVID-19, there is no better cure than prevention.*

*Water, sanitation and hand hygiene, together with physical distancing, are central to preventing the spread of COVID-19, and a first line of defence against this serious threat to lives and health systems. Handwashing with water and soap kills the virus but requires access to running water in sufficient quantities.*

*Our response plans – at national, regional and global levels – must therefore prioritize water, sanitation and hygiene services.*

*Leaders that recognize the role of water, sanitation and hygiene in preventing the spread of COVID-19, will save lives. Leaders that prioritize international collaboration and support, will save lives. We are only as healthy as the most vulnerable members of society, no matter in which country they are.*

<sup>109</sup> [www.sanitationandwaterforall.org/world-leaders-call-action-COVID-19](http://www.sanitationandwaterforall.org/world-leaders-call-action-COVID-19)

Hence, we call on all national, regional and global leaders to join us in:

**Making water, sanitation and hygiene available to everyone, eliminating inequalities and leaving no one behind,** taking care of those who are most vulnerable to COVID-19. This includes the elderly, people with disabilities, women and girls, and those living in precarious situations, such as in informal settlements, refugee camps, detention centres, homeless people, as well as those people whose livelihoods are limited or destroyed by measures put in place to stop the spread of the virus, and women who shoulder the vast majority of unpaid care work in crisis. These measures are critical, not just to protect these vulnerable populations from COVID-19, but also to prevent other infectious diseases that can spread when water, sanitation and hygiene services are disrupted.

**Working collaboratively with all stakeholders in a coordinated manner** to improve water and sanitation services, as each actor, whether public, private, donor or civil society has something to offer to protect populations from COVID-19. Coordinated action is more effective, including urgent immediate action to establish handwashing facilities within health care facilities and at entrance points to public or private commercial buildings and public transport facilities. Partnerships such as Sanitation and Water for All are key platforms for national, regional and international cooperation and exchange of experiences.

**Ensuring that water and sanitation systems are resilient and sustainable** in order to protect people's health and support national health systems. Service providers for water, sanitation and hygiene including utilities and informal providers will have difficulties to maintain or expand services at a time of reduced financial flows restricted movement. This is both a short-term and a long-term requirement to save lives. Undisrupted global supply chains, including movement of goods and production capacity, for water, sanitation and hygiene commodities and services must be maintained at all costs. Water, sanitation and hygiene workers must also be granted sufficient protection to be able to provide us with such services without disruption.

**Prioritizing the mobilization of finance to support countries in their response to this crisis.** Any financing directed at supporting emergency interventions must have long-term solutions already in mind. Access to water, sanitation and hygiene must be affordable to all, and this may require additional funding to support service providers and help those who cannot afford it. Funding envelopes need to be maintained with no diversion away from the commitments and priorities set for the water, sanitation and hygiene sector. This includes avoiding any shifts in domestic funding allocations that support WASH services and sustained support by international donors for on-going water, sanitation and hygiene humanitarian responses, and broader Grand Bargain commitments.

**Delivering accurate information in a transparent manner.** Consistent and rational messaging based on scientific advice that is accessible to everyone will help people to understand the threat and enable everyone to act accordingly.

COVID-19 is not the first and will not be the last epidemic that countries will face. Resilience to future crises depends on actions taken now, as well as on policies, institutions and capacity put in place during normal times. Let us ensure this threat is not a missed opportunity to achieve our vision of universal access to water, sanitation and hygiene.

As leaders, this is our chance to save lives.

## COVID-19: the role of the Water Convention and the Protocol on Water and Health<sup>110</sup>

The [Water Convention](#) and the [Protocol on Water and Health](#) jointly serviced by WHO-Europe and UNECE help countries by promoting the availability of safe water for all within countries and across borders and sectors.

### Water Convention: Supporting recovery and preparedness

The timely and sufficient availability of water of adequate quality is a prerequisite for the provision of safe water, sanitation and adequate hygiene and for tackling possible impacts of the COVID-19 crisis, including poverty, economic downturn, food and energy insecurity and political instability. 60 percent of global freshwater flow comes from transboundary basins. The Water Convention provides a unique global legal and intergovernmental framework for peaceful and cooperative management of transboundary water resources and allows preventing potential tensions between countries and avoiding adverse transboundary impacts such as pollution. For example, it includes provisions for early warning across borders, joint monitoring and assessment, mutual assistance etc. The following activities and tools under the Water Convention support recovery and prevention:

- The Water Convention supports countries to **develop or strengthen transboundary water agreements and joint institutions** as key instruments to negotiate transboundary water management, including water quantity, water quality and health aspects. Transboundary cooperation, including in particular river basin organizations can play an important role in coordinating and supporting actions by riparian countries for COVID-19 recovery and prevention of future crisis; some of them already have health and mutual assistance in their mandate and already support countries in tackling the COVID-19 pandemic.

- The Water Convention helps transboundary basins to **adapt to climate change** through capacity building activities organized at the global level and support provided to specific basins in development and implementation of transboundary adaptation strategies and plans. These activities also promote better resilience of countries, basins and people to prevent future emergencies, as they address the projected variety in water resources quantity and quality and increase linkages between transboundary water cooperation, climate change adaptation and disaster risk reduction.

- **Performant monitoring and effective information exchange** help to address emerging health concerns linked to water quality. The activities on data and information exchange and several guidance documents on monitoring and assessment developed under the Water Convention help to improve harmonized monitoring of waters (measuring, sampling, etc.) to ensure adequate and consistent information to inform decision-making in transboundary basins.

- **Financing access to water and sanitation and transboundary water cooperation** are increasingly important to prevent future crisis. The Water Convention guides the countries on funding and financing to support transboundary water cooperation processes.

- In countries of Eastern Europe, Caucasus and Central Asia, the EU Water Initiative **National Policy Dialogues on Integrated Water Resources Management and on Water Supply and Sanitation**, implemented under the programmes of work of the Water Convention and the Protocol on Water and Health, provide platforms for regular dialogue on water management, water and sanitation issues, hygiene and water-related diseases. In 2020-2021, the *National Policy Dialogue steering committees*, bringing together national water, health, environment, finance and other ministries, discuss measures needed in the water sector and beyond for COVID-19 recovery, as well as prevention of and preparedness to similar outbreaks in the future.

- The [Task Force on the Water-Food-Energy-Ecosystems Nexus](#) under the Water Convention provides a global platform to share experience on **intersectoral cooperation** in transboundary contexts, which is of particular relevance in the phase of recovery, when more than ever, Governments will be prioritizing securing supply and affordability of these resources to all citizens, including those who are vulnerable.

### The Protocol on Water and Health: Supporting prevention, preparedness and recovery

The provision of safe and sufficient water and adequate sanitation and hygiene is key to protecting human health during the infectious disease outbreaks, such as also COVID-19. Frequent handwashing according to appropriate hygiene standards require a continuous supply of safe water, and sanitation systems that are operational, including under challenging conditions, such as due to a changing climate.

In order to achieve the Protocol's objective of protecting human health and well-being through improving water management and preventing, controlling and reducing water-related disease (Article 1), countries should pursue the aim of ensuring access to drinking-water and provision of sanitation for everyone (Article 6). The fundamental requirements stemming from the above provisions are important pillars in responding to the COVID-19 pandemic and in guiding recovery efforts, while promoting the progressive realization of human rights.

Through its governance and accountability framework, the Protocol can play a vital role in "building forward better and fairer" from the pandemic by promoting safe, resilient and equitable WASH services for all in all places, including in communities, health care facilities and schools, and organizing the

<sup>110</sup> <https://unece.org/environment-policy/water/COVID-19-role-water-convention-and-protocol-water-and-health>

exchange of good practices and mutual support across pan-European countries.

The Protocol requires Parties to set national targets on water, sanitation and health, regularly review them and report upon their implementation (Articles 6 and 7). As targets shall be periodically revised, countries can use such opportunity to review and amend them to respond to the priorities and needs arisen from the COVID-19 pandemic.

In accordance with Article 8, countries should establish, improve and maintain comprehensive national and/or local surveillance and early-warning systems, and prepare national and local contingency plans for responses to outbreaks of water-related disease, water quality incidents and risks. Although there is no evidence of waterborne transmission of SARS-CoV-2,

surveillance of viral RNA in wastewater emerges as an important tool for timely and effective public health decision-making during the pandemic and can therefore be considered in further improving routine surveillance and early warning systems as defined in Article 8.

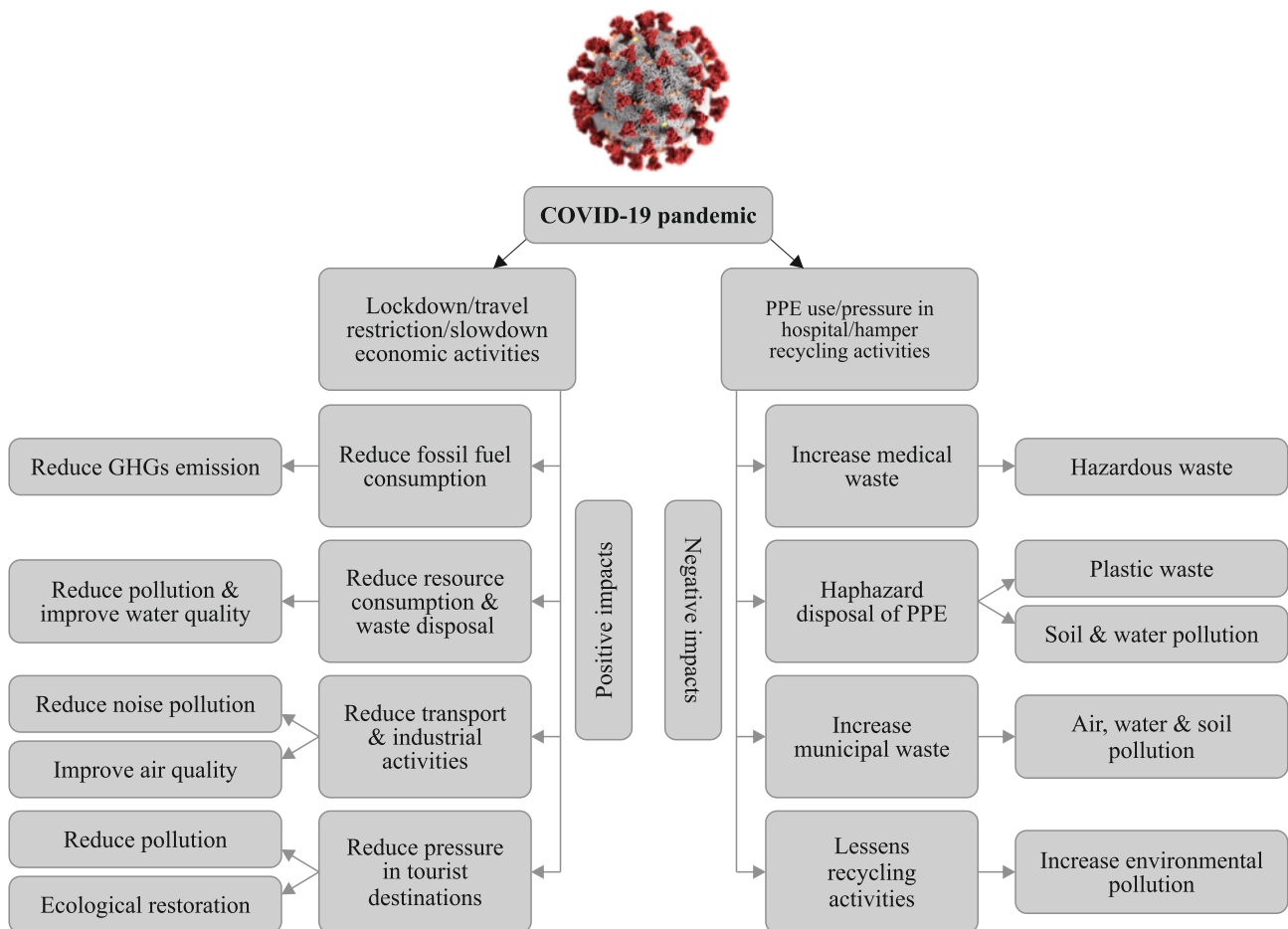
The more detailed requirements set by the Protocol and possible actions to support public health preparedness, response to and recovery from COVID-19 can be found [here](#). These provide a conceptual framework that may support planning, financing, implementing and monitoring WASH interventions to prevent and control COVID-19 outbreaks, as well as other infectious diseases. Countries and partners may choose from the proposed action list and integrate them into national, local and setting-specific response and recovery plans.

## Environmental effects of COVID-19 pandemic and potential strategies of sustainability<sup>111</sup>

The global outbreak of COVID-19 is affecting every part of human lives, including the physical world. A [recent study](#) on environmental effects of COVID indicates that the pandemic situation significantly

improves air quality in different cities across the world, reduces GHGs emission, lessens water pollution and noise, and reduces the pressure on the tourist destinations, which may assist with the restoration of the

### Positive and negative environmental effects of COVID-19 pandemic



<sup>111</sup> Rume, T., & Islam, S. (2020). Environmental effects of COVID-19 pandemic and potential strategies of sustainability. *Heliyon*, 6(9), e04965. <https://doi.org/10.1016/j.heliyon.2020.e04965>



ecological system. In addition, there are also some *negative consequences* of COVID-19, such as increase of medical waste, haphazard use and disposal of disinfectants, mask, and gloves; and burden of untreated wastes continuously endangering the environment. It seems that economic activities will return soon after the pandemic, and the situation might change. Hence, this study also outlines possible ways to achieve long-term environmental benefits. It is expected that the proper implementation of the proposed strategies might be helpful for the global environmental sustainability. Below a summary of this study is presented.

### Environmental effects of COVID-19

The global disruption caused by the COVID-19 has brought about several effects on the environment and climate. Both positive and negative environmental impacts of COVID-19 are present in the Figure above.

#### Positive environmental effects

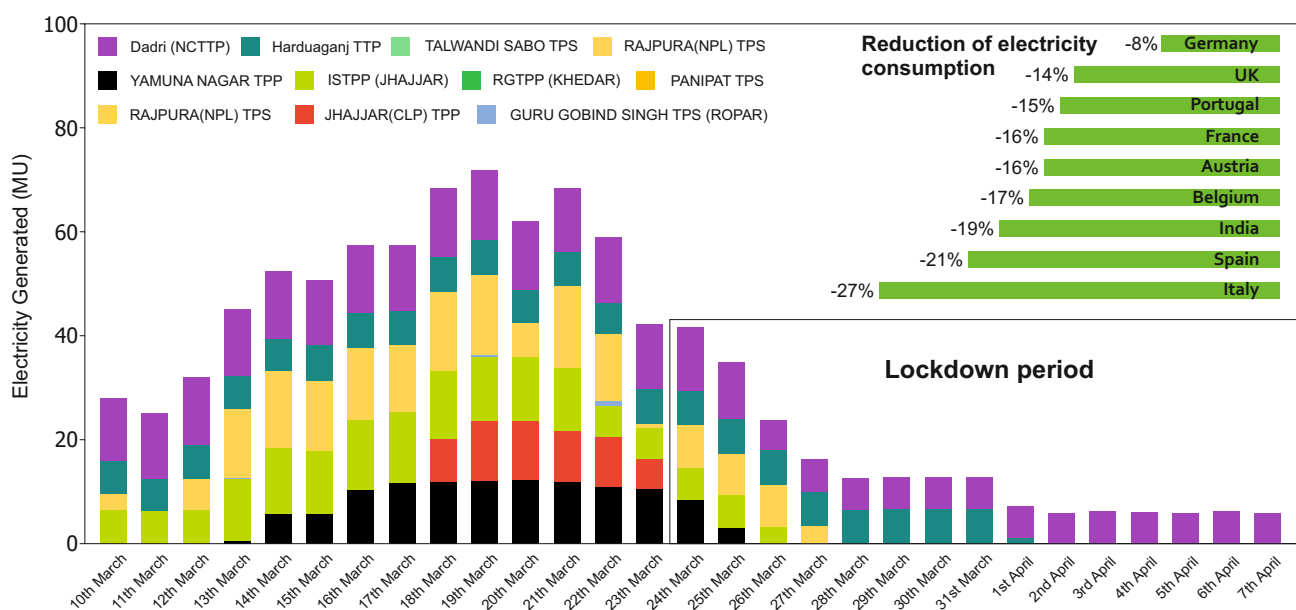
**Reduction of air pollution and GHGs emission.** As industries, transportation and companies have closed down, it has brought a sudden drop of greenhouse gases (GHGs) emissions. Compared with this time of last year, levels of air pollution in New York has reduced by nearly 50% because of measures taken to control the virus (Henriques, 2020). It was estimated that nearly 50% reduction of N<sub>2</sub>O and CO occurred due to the shutdown of heavy industries in China (Caine, 2020). Also, emission of NO<sub>2</sub> is one of the key

indicators of global economic activities, which indicates a sign of reduction in many countries (e.g., US, Canada, China, India, Italy, Brazil etc.) due to the recent shutdown (Biswal et al., 2020; Ghosh, 2020; Saadat et al., 2020; Somani et al., 2020). [...]

It is assumed that vehicles and aviation are key contributors of emissions and contribute almost 72% and 11% of the transport sector's GHGs emission respectively (Henriques, 2020). The measures taken globally for the containment of the virus are also having a dramatic impact on the aviation sector. Many countries restricted international travelers from entry and departure. Due to the decreased passengers and restrictions, worldwide flights are being cancelled by commercial aircraft companies. For instance, China reduces almost 50-90% capacity of departing and 70% domestic flights due to the pandemic, compared to January 20, 2020, which ultimately deducted nearly 17% of national CO<sub>2</sub> emissions (Zogopoulos, 2020). Furthermore, it is reported that 96% of air travel dropped from a similar time last year globally due to the COVID-19 pandemic (Wallace, 2020), which has ultimate effects on the environment.

Overall, much less consumption of fossil fuels lessens the GHGs emission, which helps to combat against global climate change. According to the International Energy Agency (IEA), oil demand has dropped 435,000 barrels globally in the first three months of 2020, compared to the same period of last year (IEA, 2020). Besides, global coal consumption is also reduced because of less energy demand during the lockdown period (Figure below). [...]

### Coal based electricity generation scenario before and after lockdown in the periphery of Delhi, India, along with total electricity consumption reduction in some selected countries



Data sources: Armstrong, 2020; CREA, 2020

**Reduction of water pollution.** Water pollution is a common phenomenon of a developing country like India, and Bangladesh, where domestic and industrial wastes are dumped into rivers without treatment (Islam and Azam, 2015; Islam and Huda,

2016; Bodrud-Doza et al., 2020; Yunus et al., 2020). During the lockdown period, the major industrial sources of pollution have shrunk or completely stopped, which helped to reduce the pollution load (Yunus et al., 2020). For instance, the river Ganga and Yamuna

have reached a significant level of purity due to the absence of industrial pollution on the days of lockdown in India. It is found that, among the 36 real-time monitoring stations of river Ganga, water from 27 stations met the permissible limit (Singhal and Matto, 2020). This improvement of water quality at Haridwar and Rishikesh was ascribed to the sudden drop of the number of visitors and 500% reduction of sewage and industrial effluents (Singhal and Matto, 2020; Somani et al., 2020). [...] It is reported that, due to the lockdown of COVID-19, the Grand Canal of Italy turned clear, and many aquatic species reappeared (Clifford, 2020). Water pollution is also reduced in the beach areas of Bangladesh, Malaysia, Thailand, Maldives, and Indonesia (Kundu, 2020; Rahman, 2020). Jribi et al. (2020) reported that, due to the COVID-19 lockdown, the amount of food waste is reduced in Tunisia, which ultimately reduces soil and water pollution. However, the amount of industrial water consumption is also reduced, especially from the textile sector around the globe (Cooper, 2020). Usually, huge amount of solid trashes is generated from construction and manufacturing process responsible for water and soil pollution, and it also reduced. Moreover, owing to the reduction of export-import business, the movement of merchant ship and other vessels is reduced globally, which also decreased emission as well as marine pollution.

**Reduction of noise pollution.** Noise pollution is the elevated levels of sound, generated from different human activities (e.g., machines, vehicles, construction work), which may lead to adverse effects on human and other living organisms (Goines and Hagler, 2007; Zambrano-Monserrate et al., 2020). Usually, noise negatively affects physiological health, along with cardiovascular disorders, hypertension, and sleep shortness of human (Kerns et al., 2018). It is reported that globally around 360 million people are prone to hearing loss due to noise pollution (Sims, 2020). World Health Organization predicted that in Europe alone, over 100 million people are exposed to high noise levels, above the recommended limit (WHO, 2012). Moreover, anthropogenic noise pollution has adverse impacts on wildlife through the changing balance in predator and prey detection and avoidance. Unwanted noise also negatively affects the invertebrates that help to control environmental processes which are vital for the balance of the ecosystem (Solan et al., 2016). However, the quarantine and lockdown measures mandate that people stay at home and reduce economic activities and communication worldwide, which ultimately reduced noise level in most cities (Zambrano-Monserrate et al., 2020). For instance, noise level of Delhi, the capital of India, is reduced drastically around 40-50% in the recent lockdown period (Somani et al., 2020). [...] Moreover, due to travel restrictions, the number of flights and vehicular movements have drastically decreased around the world, which have ultimately reduced the level of noise pollution. For example, in Germany passenger air travel has been slashed by over 90%, car traffic has dropped by >50% and trains are running <25% than the usual rates (Sims, 2020). Overall, COVID-19 lockdown, and lessened economic activities reduced the noise pollution around the globe.

### **Ecological restoration and assimilation of tourist spots.**

Over the past few years, the tourism sector has witnessed a remarkable growth because of technological advancements and transport networks; which contribute significantly to global gross domestic product (GDP) (Lenzen et al., 2018). It is estimated that the tourism industry is responsible for 8% of global GHGs emission (Lenzen et al., 2018). However, the places of natural beauty (e.g., beaches, islands, national parks, mountains, desert and mangroves) usually attract the tourists, and make a huge harsh. To facilitate and accommodate them, lots of hotels, motel, restaurant, bar and market are built, which consume lots of energy and other natural resources (Pereira et al., 2017). For instance, Puig et al. (2017) calculated the carbon footprint of coastland hotel services of Spain and reported electricity and fuels consumption take a key role, and 2-star hotels have the highest carbon emissions. Moreover, visitors dump various wastes which impair natural beauty and create ecological imbalance (Islam and Bhuiyan, 2018). Due to the outbreak of COVID-19 and local restrictions, the number of tourists has dropped in the tourist spots around the world (Zambrano-Monserrate et al., 2020). For instance, Phuket, Thailand's most popular tourist's destination, with 5,452 visitors per day on average, goes into lockdown on April 9, 2020, due to the surge of COVID-19 (Cripps, 2020). Similarly, local administration imposed a ban on public gathering and tourist arrivals at Cox's Bazar sea beach, known as the longest unbroken natural sand sea beach in the world. As a result of restriction, the color of sea water is changed, which usually remain turbid because of swimming, bathing, playing and riding motorized boats (Rahman, 2020). Nature gets a time to assimilate human annoyance, and due to pollution reduction recently returning of dolphins was reported in the coast of Bay of Bengal (Bangladesh) and canals, waterways, and ports of Venice (Italy) after a long decade (Rahman, 2020; Kundu, 2020).

### **Negative environmental effects**

**Increase of biomedical waste generation.** Since the outbreak of COVID-19, medical waste generation is increased globally, which is a major threat to public health and environment. For sample collection of the suspected COVID-19 patients, diagnosis, treatment of huge number of patients, and disinfection purpose lots of infectious and biomedical wastes are generated from hospitals (Somani et al., 2020; Zambrano-Monserrate et al., 2020). For instance, Wuhan in China produced more than 240 metric tons of medical wastes every day during the time of the outbreak (Saadat et al., 2020), which is almost 190 m tonnes higher than the normal time (Zambrano-Monserrate et al., 2020). Again, in the city of Ahmedabad of India, the amount of medical waste generation increased from 550-600 kg/day to around 1000 kg/day at the time of the first phase of lockdown (Somani et al., 2020). Around 206 m tonnes of medical waste are generated per day in Dhaka, the capital of Bangladesh because of COVID-19 (Rahman et al., 2020). Also other cities like Manila, Kuala Lumpur, Hanoi, and Bangkok experienced similar increases, producing 154-280 m tonnes more medical waste per day than before the pandemic (ADB, 2020). Such a sudden rise of hazardous wastes and their proper

management have become a significant challenge to the local waste management authorities. According to the recent published literature, it is reported that the SARS-CoV-2 virus can exist a day on cardboard, and up to 3 days on plastics and stainless steel (Van-Doremalen et al., 2020). So, waste generated from the hospitals (e.g., needles, syringes, bandage, mask, gloves, used tissue, and discarded medicines etc.) should be managed properly, to reduce further infection and environmental pollution, which is now a matter of concern globally.

**Safety equipment use and haphazard disposal.** To protect from the viral infection, presently peoples are using face mask, hand gloves and other safety equipment, which increase the amount of healthcare waste. It is reported that, in USA, trash amount has been increasing due to increased PPE use at the domestic level (Calma, 2020). Since the outbreak of COVID-19, the production and use of plastic based PPE is increased worldwide (Singh et al., 2020). For instance, China increased the daily production of medical masks to 14.8 million since February 2020, which is much higher than before (Fadare and Okoffo, 2020). However, due to lack of knowledge about infectious waste management, most people dump these (e.g., face mask, hand gloves etc.) in open places and in some cases with household wastes (Rahman et al., 2020). Such haphazard dumping of these trashes creates clogging in waterways and worsens environmental pollution (Singh et al., 2020; Zambrano-Monserrate et al., 2020). It is reported that face mask and other plastic based protective equipment are the potential source of microplastic fibers in the environment (Fadare and Okoffo, 2020). Usually, Polypropylene is used to make N-95 masks, and Tyvek for protective suits, gloves, and medical face shields, which can persist for a long time and release dioxin and toxic elements into the environment (Singh et al., 2020). Though, experts and responsible authorities suggest for the proper disposal and segregation of household organic waste and plastic based protective equipment (hazardous medical waste), but mixing up these wastes increases the risk of disease transmission, and exposure to the virus of waste workers (Ma et al., 2020; Somani et al., 2020; Singh et al., 2020).

**Municipal solid waste generation, and reduction of recycling.** Increase of municipal (both organic and inorganic) waste generation has direct and indirect effects on environment like air, water and soil pollution (Islam et al., 2016). Due to the pandemic, quarantine policies established in many countries have led to an increase in the demand of online shopping for home delivery, which ultimately increase the amount of household wastes from shipped package materials (Somani et al., 2020; Zambrano-Monserrate et al., 2020). However, waste recycling is an effective way to prevent pollution, save energy, and conserve natural resources (Ma et al., 2019). But, due to the pandemic many countries postponed the waste recycling activities to reduce the transmission of viral infection. For instance, USA restricted recycling programs in many cities (nearly 46%), as government worried about the risk of COVID-19 spreading in recycling

facilities (Somani et al., 2020). United Kingdom, Italy, and other European countries also prohibited infected residents from sorting their waste (Zambrano-Monserrate et al., 2020). Overall, due to disruption of routine municipal waste management, waste recovery and recycling activities, the landfilling and environmental pollutants increased worldwide.

**Other effects on the environment.** Recently, huge amount of disinfectants has been applied onto roads, in commercial, and residential areas to exterminate SARS-CoV-2 virus. Such extensive use of disinfectants may kill non-targeted beneficial species, which may create ecological imbalance (Islam and Bhuiyan, 2016). Moreover, SARS-CoV-2 virus was detected in the COVID-19 patient's faeces and also from municipal wastewater in many countries including Australia, India, Sweden, Netherlands and USA (Ahmed et al., 2020; Nghiem et al., 2020; Mallapaty, 2020). So, additional measures in wastewater treatment are essential, which is challenging for developing countries like Bangladesh, where municipal wastewater is drained into nearby aquatic bodies and rivers without treatment (Islam and Azam, 2015; Rahman and Islam, 2016). China has already strengthened the disinfection process (increased use of chlorine) to prevent SARS-CoV-2 virus spreading through the wastewater. But, the excessive use of chlorine in water could generate harmful by-product (Zambrano-Monserrate et al., 2020).

### Potential strategies of environmental sustainability

It is assumed that all of these environmental consequences are short-term. So, it is high time to make a proper strategy for long-term benefit, as well as sustainable environmental management. The COVID-19 pandemic has elicited a global response and made us united to win against the virus. Similarly, to protect the globe, the home of human beings, united efforts of the countries are imperative (Somani et al., 2020). Therefore, some strategies are proposed for global environmental sustainability.

**1. Sustainable industrialization:** Industrialization is crucial for economic growth; however, it's time to think about sustainability. For sustainable industrialization, it is essential to shift to less energy-intensive industries, use of cleaner fuels and technologies, and strong energy efficient policies (Pan, 2016). Moreover, industries should be built in some specific zones, keeping in mind that wastes from one industry can be used as raw materials of the other (Hysa et al., 2020). After a certain period of time, industrial zones should have been shut down in a circular way to reduce emission without hampering the national economy. Again, in industries, especially readymade garments (RMG) and others, where a huge number of people work, proper distance and hygienic environment should be maintained to reduce the spread of any infectious communicable disease.

**2. Use of green and public transport:** To reduce emissions, it is necessary to encourage people to use public transport, rather than private vehicles. Besides, people should be encouraged to use bicycle in a short distance, and public bike sharing (PBS) system

(like China) should be available for mass usage, which is not only environmentally friendly but also beneficial for health.

**3. Use of renewable energy:** Use of renewable energy can lower the demand for fossil fuels like coal, oil, and natural gas, which can play an important role in reducing the GHGs emissions (Ellabban et al., 2014; CCAC, 2019). Due to the COVID-19 pandemic, global energy demand drops down, which results in the reduction of emission and increased ambient air quality in many areas (Somani et al., 2020; Zambrano-Monserrate et al., 2020). But, to maintain the daily needs and global economic growth, it is not possible to cut-off energy demand like a pandemic situation. Hence, the use of renewable energy sources like solar, wind, hydropower, geothermal heat and biomass can meet the energy demand and reduce the GHGs emission (Ellabban et al., 2014).

**4. Wastewater treatment and reuse:** To face the challenges of water pollution, both industrial and municipal wastewater should be properly treated before discharge. Besides, reuse of treated wastewater in non-production processes like toilet flushing and road cleaning can reduce the burden of excess water withdrawal.

**5. Waste recycling and reuse:** To reduce the burden of wastes and environmental pollution, both industrial and municipal wastes should be recycled and reused. Hence, circular economy or circularity systems should be implemented in the production processes to minimize the use of raw material and waste generation (Hysa et al., 2020). Moreover, hazardous and infectious medical wastes should be properly managed by following the guidelines (WHO, 2020c). It is now clear that majority of people (especially in developing countries) lack the knowledge about waste segregation and disposal (Rahman et al., 2020). So, governments should implement extensive awareness

campaigns through different mass media, regarding proper waste segregation, handling and disposal.

**6. Ecological restoration and ecotourism:** For ecological restoration, tourist spots should be periodically shut down. Moreover, ecotourism practices should be strengthened to promote sustainable livelihoods, cultural preservation, and biodiversity conservation (Islam and Bhuiyan, 2018).

**7. Behavioral change in daily life:** To reduce the carbon footprint and global carbon emission, it is necessary to change our daily behavior and optimize consumption; avoid processed and take locally grown food, make compost from food waste, switch off or unplug electronic devices when not used, and use a bicycle instead of a car for short(er) distances.

**8. International cooperation:** To meet the sustainable environmental goals and protect global environmental resources, such as global climate and biological diversity, combined international effort is essential (ICIMOD, 2020). Hence, the responsible international authority like the United Nations Environment Programme (UN Environment) should take effective role to prepare time-oriented policies, arrange international conventions, and ensure coordination of global leaders for appropriate implementation.

Directly or indirectly, the pandemic affects human life and the global economy, which ultimately has effects on the environment and climate. It reminds us on how we have neglected the environmental elements and enforced human induced climate change. Moreover, the global response to COVID-19 also teaches us to work together to combat threats the mankind faces. Though the impacts of COVID-19 on the environment are short-term, united and time-oriented efforts can strengthen environmental sustainability and save the Earth from the effects of global climate change.

## COVID-19: lessons for sustainability?<sup>112</sup>

This briefing from the 'Narratives for Change' series reflects on the lessons learned from the COVID-19 pandemic and asks how these lessons can be applied to our quest for sustainability and how we can govern our societies in a way that respects planetary health as a precondition for human and economic health.

### Key messages include:

- COVID-19 can be seen as a 'late lesson' from an early warning. Environmental degradation increases the risk of pandemics. COVID-19 emerged and escalated through the complex interplay between drivers of change, such as ecosystem disturbance, urbanisation, international travel and climate change.

- The pandemic has shown that our societies have immense potential for collective action and change when faced with a perceived emergency.

- Thus far, the unprecedented agency shown by governments in responding to COVID-19 does not seem to have greatly served the cause of sustainability.

- Human health and environmental integrity are intertwined. A transition to a sustainable society and economy is necessary to protect human health.

- To 'build back better', society and governments must reflect on what to do differently and what to stop doing altogether.

<sup>112</sup> [www.eea.europa.eu/publications/covid-19-lessons-for-sustainability](http://www.eea.europa.eu/publications/covid-19-lessons-for-sustainability)



## Human Rights, the Environment and COVID-19<sup>113</sup>

The COVID-19 crisis reveals a clear truth about catastrophic risk in an increasingly globalized world: an effective response requires immediate, ambitious and evidence-based preventive action at the international level. To avert future global threats, including pandemics, we must protect rights to a safe, clean, healthy and sustainable environment upon which we all depend for our health and wellbeing. A human rights-based approach to the COVID-19 crisis is also needed to address its unequal impacts on the poor, vulnerable and marginalized and its underlying drivers, including environmental degradation. The following key messages summarized by UNEP, COVID-19 Response and UN Human Rights Office of the High Commissioner on human rights, the environment and COVID-19 highlight essential human rights obligations and responsibilities of States and others, including businesses, in addressing and responding to the COVID-19 crisis.

### 1. Fulfil the Right to a Healthy Environment

Environmental degradation and biodiversity loss create the conditions for an increase in the type of animal-to-human zoonosis that can result in viral epidemics. They also contribute to pre-existing medical conditions, such as asthma, that make persons more vulnerable to viral infections. More than 150 countries recognize the right to a safe, clean and healthy environment in some form. The substantive elements of this right include a safe climate, water and sanitation, clean air, healthy and sustainably produced food, non-toxic environments, healthy ecosystems and biodiversity. These elements are prerequisites for human health and resilience in the face of illness and for reducing the risk of zoonosis and expansion of existing disease vectors. According to the Human Rights Committee, environmental degradation is one of “the most pressing and serious threats to the ability of present and future generations to enjoy the right to life” and protecting the human right to life “depends on measures taken by States parties to protect the environment”. The COVID-19 response should respect, protect and fulfil rights to a healthy environment.

### 2. Re-Think Our Interactions with Nature

The COVID-19 pandemic should push us all to rethink our interactions with nature and wildlife. Around 60 percent of all infectious diseases and 75 percent of all emerging infectious diseases in humans, including COVID-19, are zoonotic. On average, one new infectious disease emerges in humans every four months. Ecosystem integrity is the foundation of human health and development. Human-induced environmental changes modify wildlife population structure and reduce biodiversity, resulting in new conditions that favour particular hosts, vectors, and/or pathogens. Integrating the human right to a healthy environment in key environmental agreements and processes, such as the post-2020 Global Biodiversity Framework, is critical to a holistic response to COVID-19 that inclu-

des reconceptualization of the relationship between people and nature that will reduce risks and prevent future harms from environmental degradation.

### 3. Protect Those Living in Poverty or Subject to Discrimination

The poor and marginalized are among those worst impacted by both COVID-19 and environmental harms such as climate change, biodiversity loss and pollution that threaten full and effective enjoyment of all human rights. Environmental harms disproportionately impact individuals, groups and peoples already living in vulnerable situations – including women, children, the poor, minorities, migrants, indigenous peoples, and persons with disabilities. Crises such as COVID-19 amplify those impacts, including through adverse effects on access to food and land, water and sanitation, housing, livelihoods, decent work, healthcare and other basic necessities. Fulfilling human rights, including the human right to a healthy environment, not only reduces disproportionate impacts, it also fosters more resilient societies. The COVID-19 pandemic demonstrates that society can only be as healthy as its most vulnerable members. The COVID-19 response should address inequalities and focus on protection of persons in vulnerable situations in order to leave no one behind.

### 4. Strengthen Environmental Rule of Law and Protect Environmental Human Rights Defenders

The COVID-19 crisis requires us to reconsider the policies and practices that have contributed to our current situation. Rather than rolling back environmental laws and policies, it is time to step up environmental protection and enforcement in order to create resilience and reduce future pandemic risks, bearing in mind that short-term economic gains from deregulation often come at long-term costs.

States should recognize the right to a safe, clean, healthy and sustainable environment in their constitutional and legislative frameworks, with effective remedies for violations of this right. At practical level, States can, for example, strengthen efforts to combat illegal trade in wildlife – reducing potential avenues for zoonosis and promoting the rule of law while ensuring alternative and sustainable livelihoods.

Tourism fees often fund parks and conservation efforts. The COVID-19 crisis jeopardizes this revenue stream and funding against poaching, illegal wildlife trade and other forms of prohibited exploitation of natural resources, placing increased pressure on natural systems. Effective and inclusive conservation efforts are essential to protect healthy ecosystems and the communities that depend on them. Environmental human rights defenders are essential allies in efforts to protect the environment and, by extension, human health during the COVID-19 crisis. Action is needed to protect both the environment and its defenders including, in many cases, Indigenous Peoples, whose worldviews and traditional

<sup>113</sup> [www.unep.org/resources/report/human-rights-environment-and-COVID-19-key-messages](http://www.unep.org/resources/report/human-rights-environment-and-COVID-19-key-messages)



knowledge can bring critical perspectives for sustainable and rights-based development. Limitations on civic space undermine the crucial advocacy of environmental human rights defenders, which in turn can pave the way for short-sighted and dangerous actions. Defenders should be empowered and protected from threats, reprisals, and harassment, including as relating to emergency decrees and legislation.

### 5. Guarantee Meaningful and Informed Participation

The International Covenant on Civil and Political Rights and other international human rights instruments establish that participation and access to information are human rights. The importance of participation and access to information in environmental matters has been frequently reaffirmed, including by Rio Principle 10, the Paris Agreement, the Aarhus Convention and the Escazù Agreement.

Governments and businesses should be transparent in sharing relevant information related to their efforts to address environmental and health crises and ensuring the informed participation of all persons in decision-making processes that affect them. During this crisis, Governments and the international community should find new ways and modalities of working.

Environmental governance should be modernized, including through inclusive and rights-based tools for digital participation and access to information, ensuring that essential environmental decision-making continues in an inclusive and effective manner regardless of the exigencies posed by COVID-19. Meaningful, informed and effective participation of all people is not just their human right, it also leads to more effective, equitable and inclusive environmental action.

Drawing on the diverse interests, needs and expertise of all people, including women and girls, local communities and indigenous peoples, offers important insights for inclusive and sustainable environmental action. The COVID-19 crisis should be a catalyst for further democratization of environmental decision-making at all levels through improved use of digital space and inclusive consultative processes.

### 6. Minimize the Harmful Impacts of Medical Waste

The COVID-19 response has led to increased use of medical supplies, including testing kits and protective equipment, as well as packaging/delivery supplies such as single use plastics. Effective and comprehensive waste management, including medical, household and other hazardous waste, is critical to minimize possible secondary impacts on health and the environment caused by the COVID-19 response.

The poorest, most vulnerable and marginalized communities without access to waste management or sanitation infrastructure have been, and will continue to be, hit the hardest by secondary effects on health, livelihood and rights. Preventing environmental harm and ensuring the full and effective implementation of basic human rights such as those to health, a healthy environment, and water and sanitation, is critical to prevent and minimize the risk of infectious diseases.

States and other duty-bearers should ensure the safe handling and disposal of waste as a vital component of an effective and comprehensive emergency response and treat waste management, including of medical, household and other hazardous waste, as an urgent and essential public service. Effective and equitable management of biomedical and health-care waste should be guaranteed through appropriate identification, collection, separation, storage, transportation, treatment, protection, training and disposal.

### 7. Build Back Better

A rights-based approach to the COVID-19 recovery and response requires that we build back better and more sustainably. Economic stimulus packages should protect and benefit the most vulnerable while advancing efforts to fulfil human rights, achieve the 2030 Agenda and the SDGs, and limit global heating to the greatest extent possible.

The response to the crisis presents an opportunity to support improved social protection measures, and a just transition to a sustainable, no-carbon economy founded on renewable energy, environmentally sound technology, sustainable resource use, community empowerment and livelihoods of dignity.

States should work jointly and individually to mobilize the maximum available resources toward building back better. Country-level socioeconomic impact analysis of COVID-19, the Common Country Analysis, UN Sustainable Development Cooperation Frameworks and the UN Secretary-General's Call to Action for Human Rights are important entry points for building back better and for operationalizing the human right to a healthy environment.

The rights of all people to benefit from science and its applications must also be safeguarded ensuring that solutions to global problems, like a vaccine for COVID-19 or environmentally sound technologies, are equitably shared by all. Over the long run, inclusive, sustainable and equitable economies are more robust.

All States have an obligation to pursue development that benefits both people and the planet and equitably distribute the benefits thereof. Businesses have a responsibility to respect human rights and it is also in their best interest to pursue sustainable development.

### 8. Learn from the COVID-19 Crisis

In the face of global risks, rapid, evidence-based, participatory and collective action not only produces the best results, it is also fulfilling human rights obligations. Effective responses to COVID-19 and environmental crises should be global responses grounded in solidarity, compassion, respect for human dignity and ecological integrity.

The required actions and international cooperation must build on obligations of States and other duty-bearers in international legal frameworks and instruments such as the Universal Declaration on Human Rights, the Declaration on the Right to Development, and the Rio Declaration.

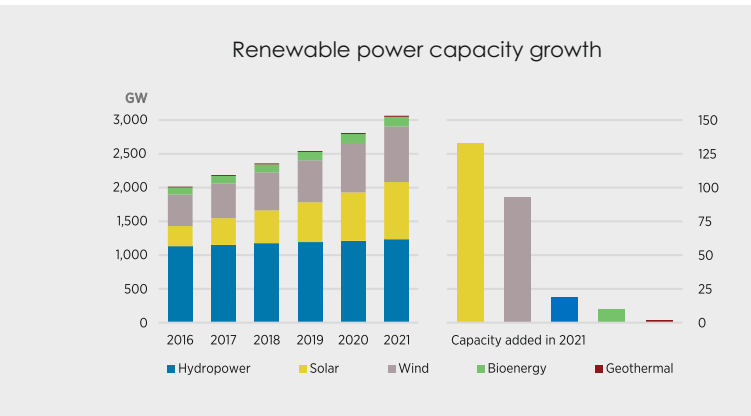
Collaboration between governments, international partners, civil society, activists, the private sector, and all individuals and peoples are needed to fulfil human

rights, including rights to a safe, clean, healthy and sustainable environment, and to achieve sustainable

development that equitably meets the needs of present and future generations.

## 12.5. Review of Hydropower Capacity Additions in 2021

Prepared by Eugene Simonov, the Rivers without Boundaries Coalition



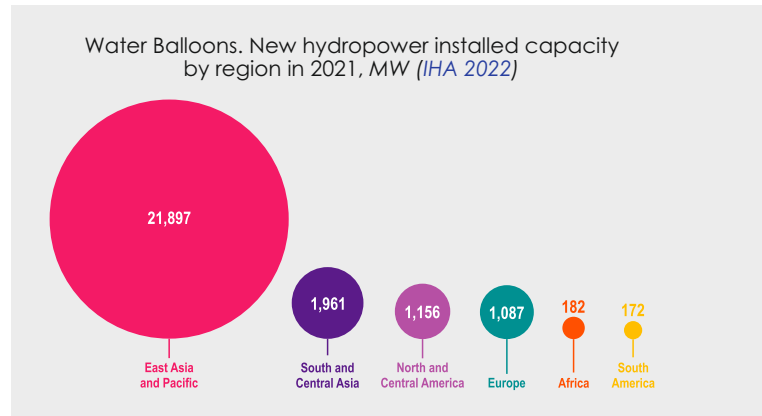
Source: <https://www.irena.org/publications/2022/Apr/Renewable-Capacity-Statistics-2022>

Hydropower built in 2021: Its role in energy revolution continues to decline, but damage to river ecosystems persists

### Hydro – no longer the engine for energy transition

In April IRENA issued new [Renewable Capacity Statistics](#): Hydropower net additions (without pumped storage) are preliminarily assessed in 2021 as 18.9 GW, which is only 7% of global growth in renewables estimated as 257 GW (roughly the same additions as in 2022). Hydropower has shown the slowest growth (2%) among all types of renewables (9% on average).

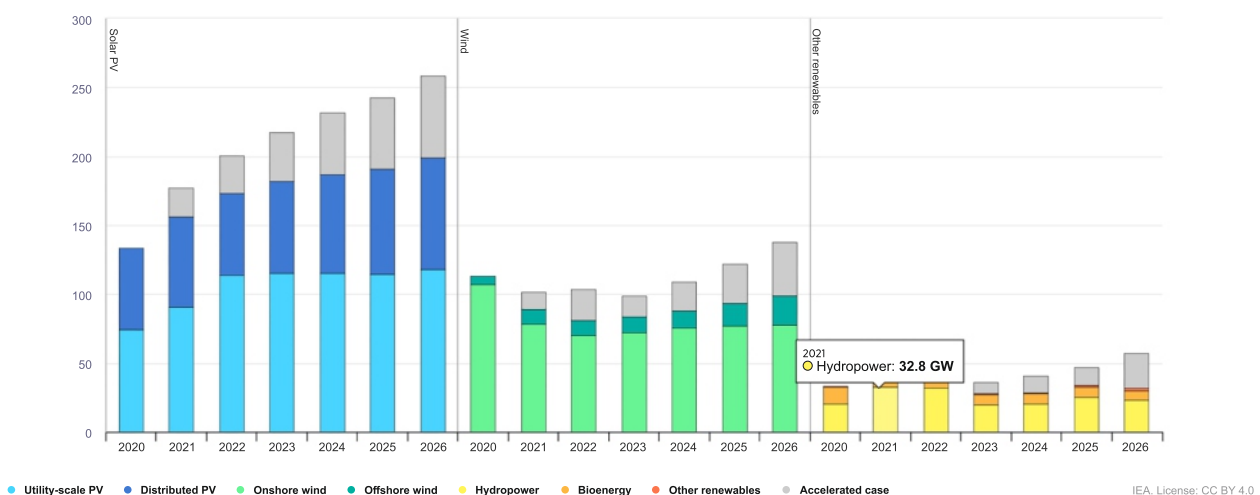
In June the IHA followed with the [State of Hydropower Report for 2021](#) which reveals that 26,445 MW were added in 2021, from which 4,700MW in pumped storage.



Finally, Ren21 thinktank also issued its [regular report](#): “Renewables 2022 Global Status Report”, which has the most informative chapter on hydropower. It estimates expansion of hydropower in 2021 at 26GW and expansion of Pumped storage at 3GW.

The International Energy Agency recently predicted that in the “main case” (without policy-driven acceleration) hydropower capacity addition will be highest in 2021-2022 (during the period before 2026) and will constitute 33 GW. If we add to 19 GW of conventional hydro the 4.7GW of pumped-storage hydro (PSH) installed in 2021 then overall addition will be still only 24 GW – one quarter or 9 GW short of the IEA forecast. If we opt to use 26.4 GW reported by the IHA or Ren21, this gap will be 6.6 GW.

### Chart on RE capacity additions from the IEA Report Renewables 2021 published in December 21



Source: <https://www.iea.org/data-and-statistics/charts/annual-capacity-additions-of-solar-pv-wind-and-other-renewables-main-and-accelerated-cases-2020-2026>

Data from all agencies again vividly show that significance of hydropower for energy transition continues to decline, despite hectic efforts of industrial lobby to promote its “decisive role in fighting climate change”. This is fully in line with IPCC report on mitigation issued in April 2022, which listed hydropower as having the least potential to reduce GHG emissions among all measures in energy industry in the period before 2030, when urgent action is needed. See chart: <https://www.ipcc.ch/report/ar6/wg3/figures/summary-for-policymakers/figure-spm-7>

**Bad climate for hydro**

According to Ren21 Report, despite growth in capacity, “global generation from hydropower fell an estimated 3.5% in 2021 to around 4,218 terawatt-hours (TWh). This reflected changes in hydrological conditions, specifically the significant and sustained droughts that have affected major hydropower producers in the Americas and in many parts of Asia. Loss of glacial icecaps, such as in the Himalayas, is causing long-term change in output in affected areas. The large producers experiencing the greatest decline in generation in 2021 were Turkey (-28.7%), Brazil (-9.1%) and the United States (-8.8%). Other major markets with more modest contractions (although in some cases larger multi-year declines) included India (-2.2%), Canada (-1.5%) and China (-1.1%). The IHA Report also referred to similar trend in several regions”. In 2021-2022, Norway undergoes the climate-related crisis in generation and is forced to reduce power supplies to EU.

Increase of river flow may be as dangerous as decrease. Ren21 reminds that “India’s hydroelectricity

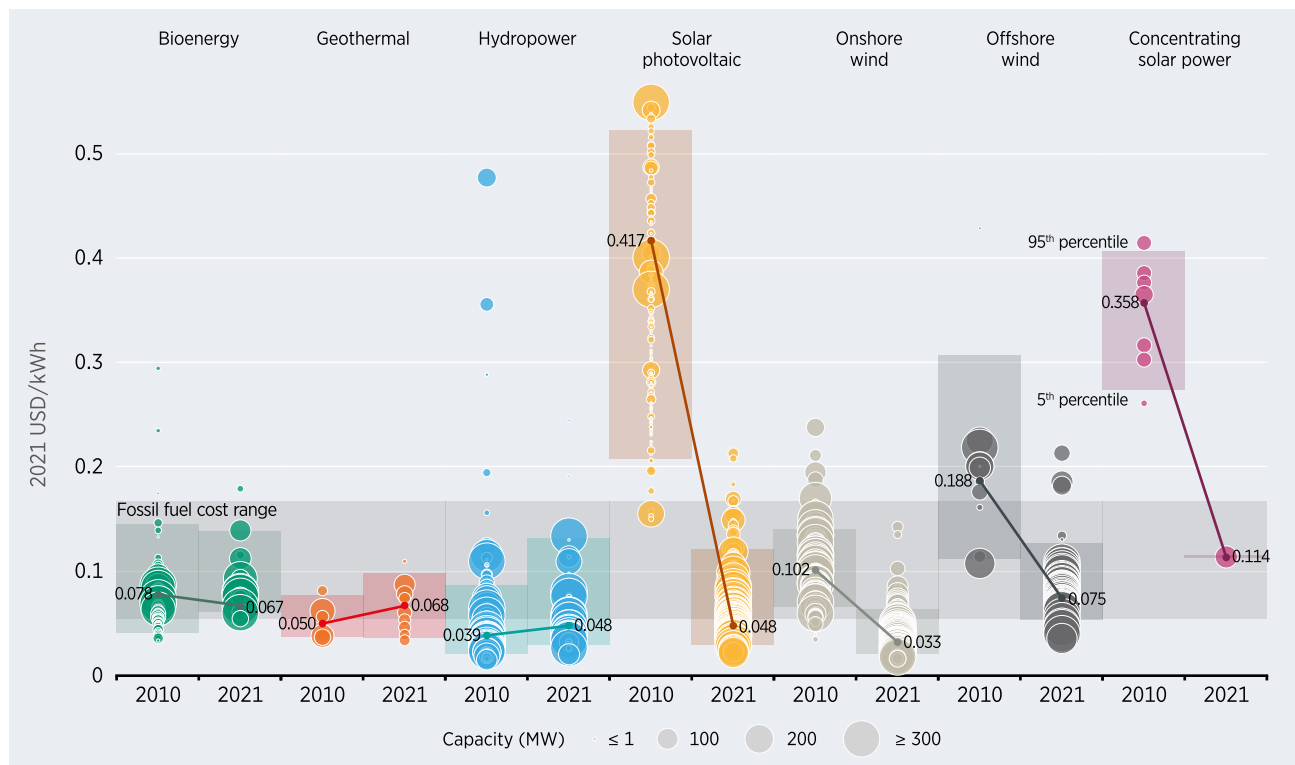
generation fell slightly during 2021 (-2.2%) to 168.4 TWh, the overall trend in recent years has been a large increase in output, driven mainly by the melting of glacial icecaps. In the five years since 2016, hydropower generation rose 31% while installed capacity increased only 9.2%. Glacial melting in the Himalayas contributes to increased river flow, as the mountain range has lost an estimated half meter of ice (8 billion tons of water) on average per year over the last two decades. In early 2021, the Rishi Ganga River in Uttarakhand swelled more than 15 metres in an avalanche-induced flash flood of glacial meltwater. In additions to the many lives lost, the torrent destroyed the 13.2 MW Rishi Ganga plant and damaged the 520 MW Tapovan-Vishnugad plant under construction.”

**Despite prices of all renewables continue to decline, except for hydropower**

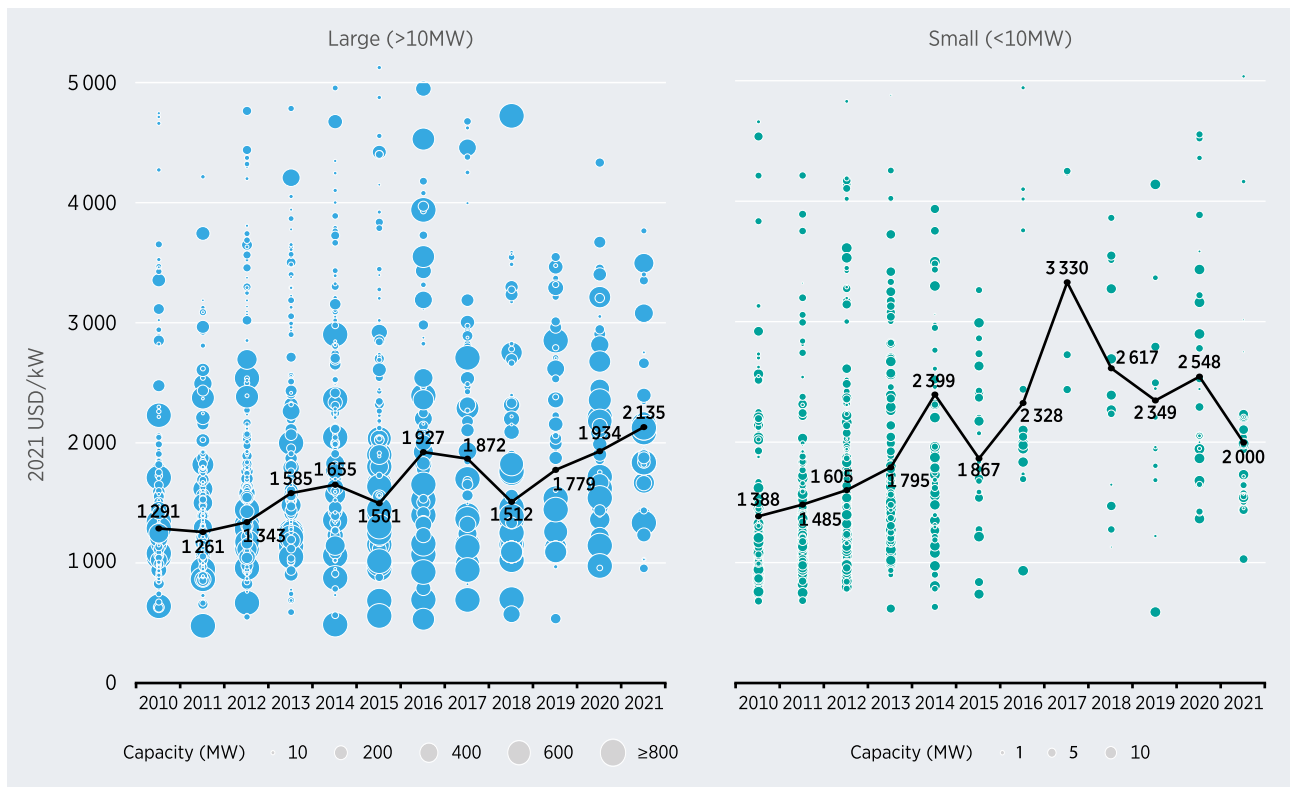
Another IRENA Report “Renewable Power Generation Costs in 2021” shows that the newly commissioned hydropower projects have lost their major competitive advantage, that is the cost of generated hydropower virtually all over the world.

The below Figure shows that in the last decade the cost of solar and wind generation (one kilowatt hour) fell by 60-80%. The cost of one kilowatt hour of energy produced by newly commissioned hydropower projects increased by 24% and became equal for solar. Certainly, this is the case for new hydropower projects as the earlier commissioned ones, with already repaid construction, have lower cost of generation but growing cost of modernization.

Global weighted average LCOEs from newly commissioned, utility-scale renewable power generation technologies, 2010-2021



Total installed costs for small and large hydropower projects and the global weighted average, 2010-2021



Source: IRENA Renewable Cost Database

Economically, this means that hydropower projects do not offer anymore the cost-efficient production of energy demanded. In other words, it is advisable to use maneuvering capacities of existing hydropower projects to balance variable daily generation of newly commissioned solar and wind project instead of building new hydropower.

Construction of new hydropower projects becomes challenging for a number of reasons: long lead and construction time, frequent and significant cost overrun, high cost of individual projects, and continually rising cost for adding unit hydropower capacity to new projects.

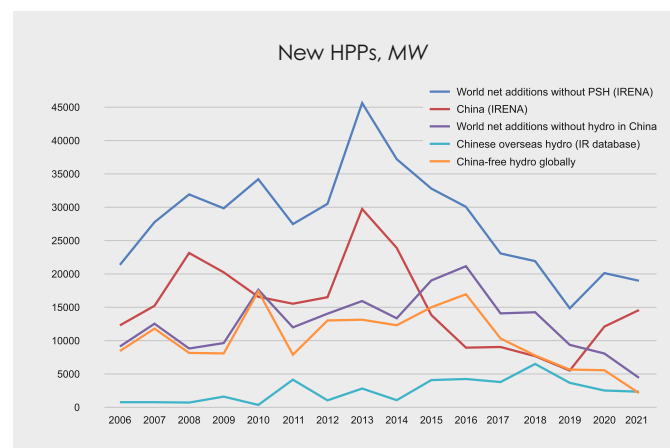
In a decade, the installed costs for hydropower rose by 64%, whereas for solar and power generation those decline rapidly. The cost of one kilowatt of energy produced is on average \$2,135 for hydropower, \$1,327 for onshore wind, and \$857 for solar PV.

Interestingly, lower costs in the past years were determined by lower-than-average installed costs in China, which added, at least, the half of capacities in the world. The higher was the share in China, the cheaper the cost of one kilowatt of energy seemed. In 2021, for the first time China acknowledged that hydropower is very expensive to build.

**Actual picture more worrying than it seems**

According to IRENA, 46 countries added some hydropower capacity in 2021, while in 9 countries capacity decreased (similar numbers observed in 2020). The IHA believes that only 38 countries added some capacity.

Closer look at IRENA's statistics shows that actual newly installed conventional hydropower (at country level) accounted for 23 GW (very close to IHA figures), while reported decline in capacity have been almost 4.5 GW, most of it in USA and EU. This mysterious decline is 10 times more than country-level reductions in capacity reported in 2020. This means that despite declining "net additions", in 2021 we see at least 1.6-3 GW more of new conventional hydro put online than in 2020. Of course, we do not know what part of new capacity comes from modernization of old existing dams, but it normally under 10% and list of countries with new additions makes us think that share is even lower. This, likely, there was year to year increase in new rivers destroyed for hydropower.



Source: <https://www.irena.org/publications/2022/Apr/Renewable-Capacity-Statistics-2022>. Graph by Rwb



### Pumped storage hydropower (PSH)

PSH is considered a promising way to store energy and regulate energy systems, but its development recently experienced serious setbacks. China has upgraded its policies to incentivize PSH. According to IRENA, in 2021 China commissioned 6 GW of pumped storage, which brings overall pumped storage capacity in China to 36GW. According to the IHA, China added 4.5 GW, but any project-level evidence is presented only for 1,300MW (600 MW at Fengning pumped storage 600 and 700 MW at Jilin Dunhua PSH). Ren 21 documented 2850MW of new PSH in nine different projects.

Ukraine, who comes next, installed 324 MW of pumped storage. The United States expanded one PSH by 70 MW

Globally net PSH addition in 2021 was 5,992 MW according to IRENA and 4,700 MW according to the IHA and we cannot find proof to either of these figures at project level.

An average PSH is less destructive for river ecosystems and sometimes can be built without damming any natural streams (closed-loop design). However, built at wrong place (like Kanev PSH in Ukraine or Snowy-II in Australia) a pumped storage facility may incur as much negative impact as two conventional hydropower plants. All in all, slowing down of convention hydro development partly depends on incentives created for acquiring costly but reliable PSH technology, which is better suited for regulating energy systems.

### The role of China

According to IRENA, China alone installed domestically 14.5 GW, mostly by completing several megadams in Yangtze Basin, which makes up 80% of net additions in 2021. This includes completion of the first high-altitude dam in Tibetan Plateau – Lianghekou, where it flooded Jinsha river valley – essential refugia both for biodiversity and indigenous people.

According to IHA, “China continues to lead the way on new development, contributing 16,300 MW of the new capacity that came online in 2021 (besides, Pumped

storage hydropower totaled 4.5 GW of the new additions in capacity, up on the 1.5 GW added in 2020).”

According to Ren21, “While China’s net hydropower capacity grew around 5.6%, generation fell 1.1% to 1,340 TWh in 2021. Hydropower’s relative contribution to the country’s energy mix has declined in recent years as other generating technologies have gained market share and as capacity utilization has decreased (due likely to changing weather patterns). During the (13<sup>th</sup> five-year plan) period 2016-2021, China’s overall electricity generation rose more than 36%, while hydropower output grew only around 12% (with capacity growth of 16%), causing hydropower’s share of supply to drop from 19.4% to 16%.”

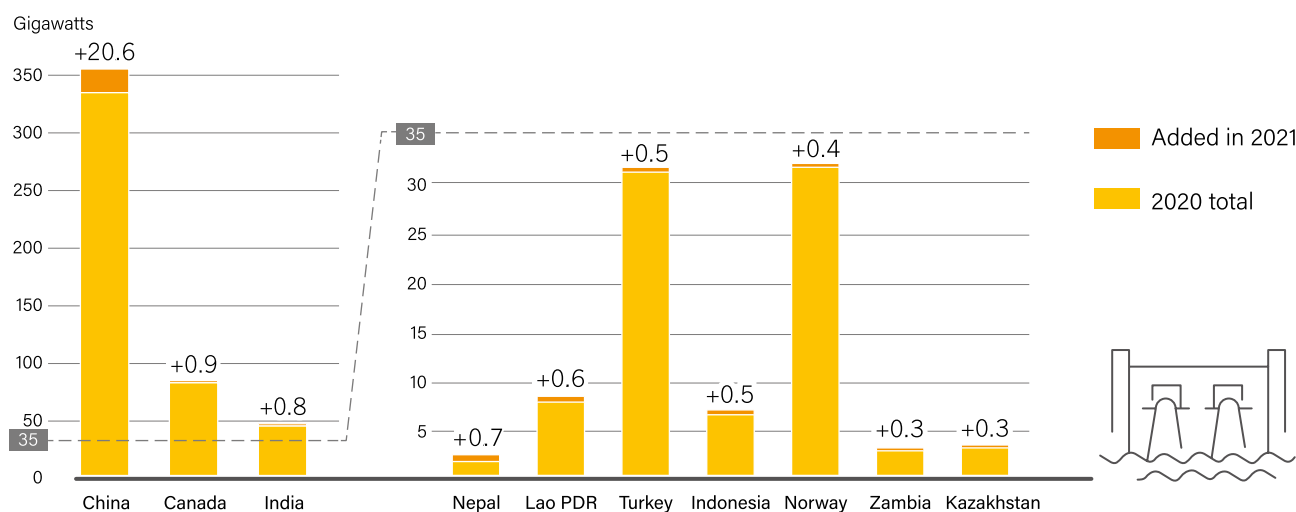
In the rest of the world approximately 6 GW of hydropower was installed in 2021 and no country besides China installed more than 1 GW. Much of those additions came with China’s financing and/or hydroengineering contracts.

In our preliminary estimate Chinese companies in 2021 participated in installing at least 2,200 MW in other countries of the world. This brings participation of Chinese companies up to 90% of net hydropower capacity installed globally in 2021.

### What other countries installed hydropower in 2021?

According to the IHA and Ren21 reports, globally installed hydropower in 2021 included at least 11 pumped storage units, completion of units in approximately 25 conventional dam-based large greenfield hydropower projects, more than 80 small hydropower stations (<10MW). Reports named only 6 projects of expansion through modernization of existing facilities, but this is due to less attention paid to this crucial activity by industry and governments. Accuracy of national reporting to IRENA differs from country to country and we rely on IHA/Ren21 data in case of discrepancy. We also found no explanation for exceptionally high figures of decrease in capacity in the United States (3.8 GW) reported by IRENA. Table below covers only capacity additions > 10 MW.

### Hydropower Global Capacity and Additions, Shares of Top 10 Countries, 2021



Source: Ren21 “Renewables 2022 Global Status Report”.

Canada, Nepal, Lao PDR, Norway, Zambia, are countries with most of their generation coming from hydro, thus new hydropower does not improve or diversify their energy systems. Nearly half of countries which added more than 10 MW are those with more than 50% of their electricity already supplied by hydro, which makes them potentially vulnerable to climate change.



Country	All (MW)	Without PSH	PSH	Project-level data, mostly from IHA, Ren21 and RwB
	IHA and (Ren21)	IRENA	Ren21	Projects associated with documented serious environmental problems <b>highlighted</b>
China	20,840	14,500	2,850	Conventional HPP: 6 units 6,000 MW of Baihetan, 3,400 MW of Wudonghe, 2,500 MW at high altitude <b>Lianhekou</b> and 1,500 MW at Yangfanggou. Pumped storage: 600 MW of 3,600 MW Fengning pumped storage, 700 MW of the 1,400 MW Jilin Dunhua, and 7 other PSH units according to Ren21
Canada	924	1,333		Ren21: the 824 MW <b>Muskat Falls</b> facility in Labrador brought into service the second half of its generating units during the year. The project suffered significant delays and budget overruns. Difficulties also remain with the transmission interlink with Newfoundland, cutting off intended customers. In Manitoba, the first five of the seven generating units making up the 695 MW Keeyask plant were placed into service in 2021
India	803	800		Last two 150 MW turbines at the 600 MW <b>Kameng project</b> in Arunachal Pradesh, two 50 MW units at Sorang, 113 MW at Rongnichu and three 60 MW units ready for service by year's end at the Bajjali Holi HPP
Nepal	684	690		450 MW <b>Upper Tamakoshi</b> finally commissioned after many years of delay and serious overspending
Laos	600	767		Part of <b>Nam Ou Cascade</b> project is operational. Power China has 29-year BOT rights to entire Ou River basin. Project is impacting local communities and Luang Prabang World Heritage property
Turkey	513	509		The remaining two 155 MW turbines were installed at the 500 MW <b>Lower Kaleköy on the Murat River</b> (Upper Euphrates). Also on the Murat River, Turkey's 280 MW Alpaslan II plant was completed by its Czech developer. Its reservoir is among the ten largest in Turkey. The 58 MW Gürsögüt scheme completed, and over 30 smaller-scale hydropower plants
Indonesia	481	461		Last 200 MW at 515 MW <b>Poso River project</b> on Sulawesi, 90 MW Malea plant on the Saddang River in South Sulawesi both by Kalla Group with support from Power China consultants. 18 small hydropower units totalling 111 MW in Sulawesi
Norway	396	1,081		Most of the 50+ new projects commissioned were small-scale hydro below 10 MW in size, in addition to the 62 MW Jølstra, 42 MW Tolga and 22 MW Herand, and 70 MW came from upgrades
Viet Nam	222	765		Bach Dang (5.3 MW) and <b>Thuong Kon Tum</b> (220 MW) on Se San River tributary of the Mekong River recognized for its rich aquatic and terrestrial ecosystems
Brazil	175	108		<b>Ren21: Brazil</b> added 13 generating units totalling 119 MW in 2021 (each less than 10 MW). Hydropower generation dropped sharply from the previous year (down 9.1%) to 378 TWh, comprising 63% of supply. In terms of both energy generated and the share of Brazil's electricity mix, hydropower has been in long-term decline since its peak in 2011 (when it reached 453 TWh and a 91% share)
USA	172	0	70	Ren21: Nine small hydropower units were added with 103 MW in 2021. Bad Creek PSH enlarged by 70MW
Russia	167	74		Continuation of <b>Ust-Srednekanskaya HPP</b> , modernization of Nizhegorodskaya, <b>Irkutsk</b> , Barsuchkovskaya, and Votkinskaya
Austria*	150	0		17.5 MW Traunleiten hydropower plant
Zambia*	150	150		Part of 750 MW Kafue Gorge Lower HPP built by Sinohydro
Kazakhstan	129	248		Only 25 MW at <b>Turgusun Hydro</b> is known to Rwb (IHA mistakenly placed Uzbek Zarchob Hydro here)
Argentina	115	1		Small hydro
Peru	(84)			Ren 21: completed 84 MW La Virgen hydropower plant, after years of delays
Philippines	85	6		?? not supported by project-level data
Uzbekistan	76	38		Likely correct IHA figure
Tajikistan*	49	1		?? not supported by project-level data
Costa Rica*	48	48		?? not supported by project-level data
Chile	(39)			Ren21: brought into service two units, the 24 MW Digua and the 14.9 MW Hidromochu. Hydropower generation fell sharply in 2021 (down 20%) to represent 20% of the country's electricity supply, well below the 30% average
South Korea	35	35		?? not supported by project-level data
Sri Lanka	35	0		?? not supported by project-level data
Ecuador*	31	1		Ren21: the first of three 16.3 MW units of the 49 MW Sarapullo plant, on the Pilatón River
Uganda*	24	0		?? not supported by project-level data
Spain	16	0		?? not supported by project-level data
Honduras	12	12		?? not supported by project-level data
Switzerland	12	0		?? not supported by project-level data
Georgia*	10	116		IHA figure is more accurate
Ukraine	0	0	324	Part of 1200 MW <b>Dniester River PSH</b>

Note:\* Marking countries with more than 50% hydroelectricity in their energy systems based on 2015 statistics.

Sources: [https://data.worldbank.org/indicator/EG.ELC.HYRO.ZS?most\\_recent\\_value\\_desc=true&view=map&year=2015](https://data.worldbank.org/indicator/EG.ELC.HYRO.ZS?most_recent_value_desc=true&view=map&year=2015), <https://www.transrivers.org/2022/3663/>, <https://www.transrivers.org/2022/3695/>

