



SECTION 11

Key Water Developments
in the World

11.1. Africa

The Grand Ethiopian Renaissance Dam on the Nile River. On August 12, Ethiopian Prime Minister Abiy Ahmed [announced](#) that his country has now completed the third filling of the reservoir behind the dam. This contributes to further tensions with downstream neighbours Egypt and Sudan. Egyptian authorities have filed a [complaint](#) with the UN's Security Council. The authorities in Cairo claim that Ethiopia refuses to share Dam plans, something which they view as essential in a project of great dimensions such as this one which will have an impact on the Nile's water

flow. Egypt accuses Ethiopia of filling the dam's reservoir without articulation with Egypt or Sudan, which would violate international law. It also urged the Council to intervene in order to bring Ethiopia to the negotiations table. The enormous \$4.2bn dam has been at the centre of a regional dispute ever since Ethiopia broke ground on the mega project in 2011. Ethiopia announced in mid-June that it had [completed](#) 88% of the construction work on the GERD, and is looking forward to the actual completion of its construction by the end of 2023.



This general view shows the site of the Grand Ethiopian Renaissance Dam in Guba, Ethiopia, Feb. 19, 2022. – Amanuel Sileshi/AFP via Getty Images

The **Horn of Africa**, a region in East Africa encompassing parts of Kenya, Somalia and Ethiopia, was enduring "the worst in 40 years" drought, which affected 36 million people in the region, caused crop failures and the death of more than 3 million livestock. The crisis in the region results from a combination of causes, including armed conflict, political instability and weather shocks. On the contrary, in West Africa heavy rainfall and floods caused the displacement of 1.3 million people and killed more than 600. In Nigeria, the floods affected 33 of the country's 36 states. Nearly 110,000 ha of farmland were destroyed by the floods. According to UNICEF, the floods left more than 2.5 million people in need of humanitarian assistance, more than 60% of them children.

Source: Counting the cost 2022: A year of climate breakdown, Christian Aid, December 2022

Senegal has kicked off work to build the country's first water [desalination plant](#) in Dakar's Mamelles district

aimed at easing the capital's chronic water shortage. The coastal facility will desalinate water from the Atlantic, with a peak capacity of 100,000 m³ per day. The project also entails renovation of more than 300 km of water pipes. However, the scheme is contested by critics as costly and an environmental peril.

The **Lesotho** Highlands Development Authority (LHDA) announced in November 2022 that the Polihali Dam and Polihali Transfer Tunnel construction contracts have been awarded and the work will start. These structures are a part of the Lesotho Highlands Water Project (LHWP), a multi-billion bi-national project which was established by the treaty of 1986 signed between the governments of the Kingdom of Lesotho and the Republic of South Africa. The LHWP is a multi-phased project to provide water to the Gauteng region of South Africa and to generate hydro-electricity for Lesotho. It is the largest [water transfer scheme](#) in Africa. The above contracts are a key

milestone in Phase II of the Project, which will increase the current water transfer rate of 780 Mm³ per annum incrementally to more than 1,270 Mm³ per annum.

Tanzanian authorities began [rationing water](#) in the commercial capital Dar es Salaam following a drought-induced drop in water levels from its main source, the Ruvu River. The 5.5 million inhabitants of the Indian Ocean city went without piped water for 24 hours on alternating days. Water supply from the Ruvu has dropped from 466 to about 300 million litres a day, whereas the city consumes an estimated 500 million litres a day.

The Africa's [biggest Sudd wetland is under threat](#) of being turned to desert by the revival of a half-completed engineering megaproject that would divert

the Nile River away from the wetland and shorten its route north to the Mediterranean Sea. Africa's largest freshwater wetland permanently occupies roughly 3,500 square miles in an otherwise dry region of South Sudan and floods up to 10 times more in the wet season. Egypt is set to fund the scheme, which would reduce evaporation from the swamp, and so deliver water downstream to its reservoirs. The **South Sudan** government hopes the canal will also reduce flooding around the swamp. However, there are increasing concerns that even a partial loss of the Sudd would be an ecological disaster, desiccating the world's second largest swamp and ending seasonal flooding of the surrounding grasslands. Hydrologically, cutting evaporation will reduce rainfall for farms and rainforests across South Sudan and neighboring countries.



Construction of the [Angololo multipurpose dam](#), a joint project between **Kenya and Uganda** is set to commence. The 430 square kilometer project is expected to offer water for irrigation and domestic use as well as generate 1.75 megawatts of electricity. The dam will supply 20 million people with water for domestic use and put 3,300 ha of land under irrigation.

Higher than usual rainfall was [filling up](#) Lake Chad as a result of significant flows into the Chari-Logone and the Komadougou Yobe tributaries of the Lake. The Lake Chad Basin Commission 2022 hydrological report disclosed that the rainfall helped farming in

several localities. However, the resulting overflow of major rivers caused flooding and significant material losses and internally displaced persons in the region. "The Lake is filling up rapidly, following higher than the average rainfalls of 1981-2010 recorded in the Lake Chad Basin in 2022," the report said. Its volume is comparable to that of an average lake with a surface area of about 24,000 km².

A new regional [transboundary aquifer map](#) for the African region has been released²⁷². Across Africa, there are now 106 transboundary aquifers, an increase from 72 in the 2015 inventory. They range in size from 10 km² to 2,500,000 km². Despite the progress

²⁷² it is based on the Transboundary Aquifers of the World Map (TBA Map) that was updated in 2021

made, there are still data and knowledge gaps for Africa's transboundary aquifers. Several aquifer boundaries are also unconfirmed by all riparian states. This could lead to a lack of ownership over their assessment, monitoring and management by riparian's.

Nigerian²⁷³ President has, for the third time, pushed for the approval of a [water bill](#) which has been highly criticized by coastal states of the Niger Delta. After two failed attempts the government is now sponsoring the same bill albeit under a different name. Critics say that this bill is an attempt at a power grab from the federal government as it tries to take control of all waterways which are currently under the control of the states.

According to the newly-released [National Infrastructure Plan 2050](#), all of **South Africa's** major metropolitan

areas will face water restrictions within the next five years. Irrigated water use may have to increase by a further 6% (up from the existing 60%), to maintain current crop yields. This, despite an overall water deficit. The plan also sets some priorities and implementation goals including establishment of a Water Resources Infrastructure Agency and single national water regulator; completion of a raw water pricing strategy; a plan for ensuring the viability of municipal wastewater plants; and, a policy for water use in agriculture.

The Democratic Republic of the **Congo** signed a [new law on the Promotion and Protection of the Rights of the Indigenous Pygmy Peoples](#) that legally recognizes Congo's traditional forest communities as a distinct people with rights, including the right to free, prior and informed consent before the government and companies can exploit their land.

11.2. Asia

Afghanistan

Socioeconomic and humanitarian crisis and climate change. In the aftermath of the Taliban takeover, Afghanistan faced acute socioeconomic and humanitarian crisis on an unprecedented scale. [According to UN](#), in 2022, 24.4 million people (59% of country's population) were in need of humanitarian assistance and more than 9 in 10 lived in poverty. More frequent and devastating natural disasters caused by climate change compounded the crisis. On 22 June, an earthquake in south-eastern Afghanistan resulted in an estimated 1,036 deaths and about 3,000 injuries and damage to at least 4,500 homes. Atypical floods during the summer season (June-August) affected 130,000 people, caused damage to some 3,400 houses and destroyed irrigation systems in at least nine provinces in the country.

Hydraulic structures. The construction of the Qosh-Tepa canal began in Kaldar district of Balkh province near the border with Tajikistan and Uzbekistan. The irrigation canal is to divert water from the left bank of the Amu Darya River (see 12.5 "[Construction of the Qosh-Tepa canal in northern Afghanistan](#)").

The [construction of the Tori Dam](#), which will cost 97 million Afghani to build, began in the southern province of Zabul in October. The dam will be constructed with a storage capacity of 2.9 million cubic meters, which will be used to irrigate 600 hectares of land and generate 100 kilowatts of electricity.

The [Kajaki power dam was inaugurated](#) on 27 July in Helmand province in the south of Afghanistan. The power dam will provide 100 MW of electricity to the provinces of Helmand and Kandahar. The Kajaki

dam was originally built by the US in 1953. In 1975, a 33-MW powerhouse was commissioned. In 2016, a Turkish company modernized the power dam to increase its capacity to 51 MW.

Humanitarian aid. The UN team in Afghanistan has launched its [One-UN Transitional Engagement Framework \(TEF\) to assist Afghans in 2022](#). The TEF is the overarching strategic planning document, ensuring the coordination of the UN team's work in saving lives, sustaining essential services and preserving essential community systems in Afghanistan. The \$8 billion required to implement this UN-wide framework include the \$4.44 billion previously requested through the Humanitarian Response Plan, launched on 11 January. The UN requires an additional \$3.6 billion in immediate funding. The European Union announced \$302 million to meet the basic human needs of the Afghans. [ADB](#) has approved \$405 million in grants to support food security and sustain delivery of essential health and education services. [WB](#) and the Afghanistan Reconstruction Trust Fund (ARTF) approved first transfer of \$280 million in support of delivery of essential services as part of the provision of over \$1 billion in the form of recipient-executed grants. The [U.S. support](#) for Afghanistan amounted to more than \$1.1 billion in humanitarian assistance since August 2021. Humanitarian aid was also provided by other governments, including [China](#), which donated \$37 million.

China

In January, China released the [first-ever 14FYP for Water Security](#)²⁷⁴. With an overall aim of significantly strengthening China's national water security capability by 2025, this comprehensive water plan res-

²⁷³ Nigeria is a federation of states, each with their own ethnic make-up and many with different perspectives on water management depending on whether they are part of the Niger Delta

²⁷⁴ Five-Year Plan for the period 2021-2025

ponds to China's significant national water challenges. During the current five-year period, China will promote reforms in key areas of water conservation, improve the innovative development of water conservation, and modernize the water management system by implementing a national water-saving initiative and smart water network, as well as undertaking the construction of major water projects. As part of this, there will be a strong emphasis on digitalizing and monitoring water resources. These include the full monitoring of its watersheds from mountains-to-oceans using new technologies from 5G, remote sensing to unmanned ships and underwater robots. China's aim is to accelerate the construction of 'digital watersheds' for all its major river basins/water sources. In the context of climate change, the plan sets key tasks that address core adaptation issues around water—from ensuring water supply to building resilience to water shocks, particularly by fortifying flood measures. Moreover, China's new **National Climate Adaptation Strategy** aims to develop the country as a 'climate resilient society' by 2035. The new policy document was jointly released on the 13th of June by 17 ministries, led by the Ministry of Ecology and Environment. Building on the already existing 2013 National Strategy for Climate Change Adaptation, the new strategy emphasizes the monitoring and assessment of climate risks as well as the protection of food security and climate sensitive economic sectors such as supply chains, financial sectors and energy supply.

State Councilor and Foreign Minister Wang Yi attended the third "China+Central Asia" Foreign Ministers' Meeting. Finally, the parties adopted the Joint Statement, which particularly focused on initiatives for cooperation in the field of environmental conservation, water and energy, and green growth (June 8, Nur-Sultan). China will also explore the possibility of participating in environmental and socio-economic projects in the Aral Sea region within the framework of the UN Multi-Partner Human Security Trust Fund.

China Belt and Road Initiative (BRI) investments in 2022: BRI finance and investments were steady in 2022 at \$67.8 billion. Total engagement in the energy sector reached \$24.1 billion – which is the lowest level of energy engagement since the launch of the BRI in 2013. Green energy engagement (solar, wind, hydro) in 2022 increased 50%. Coal saw renewed engagement through coal mining in Indonesia; engagements with Sub-Saharan Africa and West Asia dropped to lowest levels. Major beneficiary countries of Chinese investments were Hungary (\$7.6 billion), Saudi Arabia, and Singapore; the focus of China's overseas BRI engagement continued to be in infrastructure, particularly in energy (36%) and transport (18%). Metals and mining constitute the second largest investment sector for Chinese engagement in the countries of the BRI.

China announced its first national **drought emergency** on the 19th of August amid the hottest, driest summer since Chinese records began 61 years ago. Water in the drainage area of the Yangtze River had dropped to 60% below average levels for August. In Sichuan province, which is highly dependent (80%) on hydropower for its electricity supplies, factories

were ordered to shut down for six days in order to save power. The drought has also affected an estimated 2.2 Mha of agricultural land. China's State Council announced a \$1.45 billion package of subsidies for rice farmers to compensate for agricultural losses.

At the same time, during China's rainy season, many parts of the country experienced intense floods leading to large economic and human losses. In June, floods in the southern province of Guangdong affected almost half a million people, impacting the industrial city of Shaoguan, where factories had to halt production. In August, destructive rains were reported across the country, including the northwest province of Qinghai, the northern province of Shanxi, the southwest province of Sichuan and the northeast province of Heilongjiang. As the planet warms, a greater proportion of China's rain will fall as more concentrated downpours.

Source: Counting the cost 2022: A year of climate breakdown, Christian Aid, December 2022

Three major water projects commenced as part of the Chinese government's plan to invest an estimated \$120 billion in water infrastructure in 2022. One three-year project tackles floodgate reconstruction in the Yellow River. The project will ensure stable water supply in areas of the country with large-scale grain production. The largest of the projects, worth \$750 million, will impact the Hunan water reservoir and is expected to be able to guarantee a flow of 285,000 t of clean water a day into the Southeastern city of Jishou. Hunan is the second largest consumer of water in the Yangtze River Economic Belt (YREB) due to its agricultural activity. The third project is aimed to improve river management in Anhui province providing water security to 1.5 million people and nearly 200,000 hectares of farmland.

Other Asian Countries

In the midst of heavy monsoon rainfall and as **South Korea** deals with floods, **North Korea** (DPRK) has, for the second time this year, **opened** the floodgates of dam on the Imjin River without notice, causing an increased water flow downstream and a risk of flooding. In an agreement signed by both countries in October 2009 the DPRK committed to provided warning ahead of opening floodgates, however, and despite South Korea's appeals back in June, this has not been done. In 2009, opening of floodgates by the DPRK without notice caused the death of six people in South Korea's Yeoncheon County. According to North Korea official there is no reason for prior notification since South Korea is more modern and knows whether or not they've opened the gates.

India and **Pakistan** experienced extremely high temperatures in March and April. March was the hottest in India since records began 122 years ago. And in Pakistan, temperatures reached 47°C in some parts of the country. However, from mid-June to the end of August, **Pakistan** experienced very intense

rainfall, coincident with the monsoon season (see [Brahmaputra and Indus River Basins](#) below). Parts of **Malaysia** also suffered from floods in early 2022. The government has estimated that the total losses from the floods amount to \$1.46 billion, with most of the eco-

nomie damage located in Selangor, the country's richest state.

Source: Counting the cost 2022: A year of climate breakdown, Christian Aid, December 2022



Destruction due to stagnant rainwater causing of poor sewerage system creating problem for commuters and residents after flood flowed in area on July 26 2022 in Hyderabad.
Source: Counting the cost 2022: A year of climate breakdown, Christian Aid, December 2022

The 38th meeting of the **India-Bangladesh Joint Rivers Commission (JRC)** took place in New Delhi in August. This was the first meeting of the JRC after 12 years, the 37th edition having been held in 2010. JRC was established as an outcome of the 1972 Indo-Bangla Treaty of Friendship, Cooperation and Peace by the two countries. The issues under discussion included also [water sharing](#) of Teesta river which Bangladesh was quite keen to have. It is a major river after Ganga and Brahmaputra. A deal on sharing of Teesta water was about to be signed in 2011 during the visit of then Bangladesh Prime Minister Manmohan Singh. But this could not happen as West Bengal Chief Minister dropped out at the last minute from the visiting delegation. Presence of the latter would have helped in signing the deal as water is a state subject under the Indian constitution. Moreover, water from Teesta River helps irrigate farmlands in northern Bengal. Thus any deal on Teesta is going to materially affect the state of West Bengal. India and Bangladesh share 54 rivers between them. Now both countries are trying to reach an understanding over sharing of water of these rivers.

Cambodia shared its [plan](#) to secure UNESCO world heritage recognition for all the rich biodiversity to be found along the long stretch of the Mekong from the Lao border to the province of Kratie over 200 km downstream. Securing UNESCO recognition will also help protect 40 endangered species on ICUN's red-list. Cambodia is already home to three heritage sites, including the legendary Angkor Wat and one natural

heritage site, the successful U.N.-backed biosphere reserve and the bird sanctuary site on Tonle Sap, the biggest inland lake in the region.

Deforestation intensifies in northern **Malaysia's** most important water catchment. Between 2002 and 2021, the greater Ulu Muda landscape lost 82.8 square kilometers of humid primary forest and forest loss continued to intensify in 2022. The Ulu Muda rainforest is one of the last large, continuous tracts of forest in the Malay Peninsula, providing vital habitat for countless species as well as water for millions of people in northern Malaysia. Much of the recent clearing of Ulu Muda rainforest is occurring inside Ulu Muda Forest Reserve (UMRF). Conservationists worry that the loss of Ulu Muda rainforest will have detrimental impacts on the region's biodiversity and water security, as well as contribute to global climate change.

The **Indonesian government** has launched a program that will pay thousands of traditional fishers to [collect plastic trash from the sea](#). The four-week initiative is part of wider efforts to cut marine plastic waste by 70% by 2025. Indonesia is one of the largest contributors to marine plastic pollution in the world. The country produces about 6.8 million metric tons of plastic waste annually, according to a 2017 survey by the Indonesia National Plastic Action Partnership. Only 10% of that waste is processed, while nearly the same amount, about 620,000 metric tons, winds up in the ocean. Each of the 1,721 participating fishers will receive the equivalent of \$10 a week for collecting up to 4 kg of plastic waste from the sea daily.

Indonesia and Norway inked a deal that will see the Nordic country pay Indonesia to keep its forests standing. Under the agreement, measurable progress by Indonesia on reducing emissions from deforestation and forest degradation will be eligible for payment. The deal falls in line with Indonesia's ambitious bid to transform its forests into a major carbon sink by 2030, absorbing 140 million metric tons more CO₂ than they emit into the atmosphere. While Indonesia has in the past been a major carbon emitter due to land-use change, deforestation, forest fires and peatland destruction, the recent decline in deforestation is seen as a positive sign. The previous deal, signed in 2010, was terminated by Indonesia in 2021, citing lack of progress on promised payments. This time around, the deal will be based on "mutual respect and mutual understanding," including a mutually agreed-upon measurement, reporting and verification protocol.

Large River Basins in South Asia

Mekong River Basin

In October, the governing board of the **Mekong River Commission (MRC)** approved a milestone document that clarifies guidelines for how to design hydropower projects, to minimize impact on ecosystems and communities along Southeast Asia's largest waterway. Beyond this revised **Preliminary Design Guidance (PDG)**, the MRC Joint Committee also agreed on a Guideline on **Transboundary Environmental Impact Assessment (TbEIA)**. Given the transboundary nature of a river flowing through the four MRC Member Countries – Cambodia, Lao PDR, Thailand and Viet Nam – a TbEIA would measure how a project affects a neighbor. The agreement allows the TbEIA to be tested and applied by countries and developers, with MRC's technical support. Discussions of the TbEIA actually began 18 years ago, in 2004, when the term "Transboundary" was added to acknowledge that no river-related issue is limited to one country's borders. The PDG 2022 is the culmination of four years of discussion, which incorporates the MRC's lessons learned over the past decade, as well as international best practices in how to strike the right balance.

The Mekong delta's transboundary water problems.

The past few years have seen Mekong water flows recurrently decline and processes of saltwater intrusion accelerating in the Vietnamese Mekong delta. These **transformations** are attributed to climate change and large-scale hydropower dams operated in the upper stretches of the river. Some argue that China holds back a significant amount of water for the sake of its own development; downstream countries, notably Laos, also contribute to the problem by pursuing the construction of a wide array of dams, both in tributaries and the mainstream. Many express their doubts about the role that the Mekong River Commission plays in monitoring the hydrological regimes across the geographical span of the Mekong River, aside from the well-functioning knowledge hub it provides for the Mekong countries. There is much uncertainty about the longer-term changes to the Mekong's hydrological regime. But a significant out-

migration from the delta is already occurring, with the rural poor abandoning the delta in search of employment in urban areas. Transboundary hydrological transformations present unprecedented risks to the delta. At the local scale, a mix of control and adaptive measures have been undertaken to deal with externalities. But these local efforts are insufficient; meaningful cooperation towards improving Mekong hydrological conditions must also be facilitated, and benefits shared between upstream and downstream countries.

An underwater expedition has confirmed the presence of some of the world's largest and most threatened freshwater fish in a remote and barely studied stretch of the Mekong River in northeastern **Cambodia**. The findings included a 180-kilogram (400-pound) **giant freshwater stingray**. In addition to the endangered giant stingrays (*Urogymnus polylepis*), the area is thought to be home to Mekong giant catfish (*Pangasianodon gigas*) and giant barb (*Catlocarpio siamensis*), both of which are listed as critically endangered on the IUCN Red List.



The 4-meter-long giant freshwater stingray (*Urogymnus polylepis*) captured accidentally and subsequently released by fishermen in the deep-water pools in Cambodia's stretch of the Mekong River in May 2022. Image courtesy of Wonders of the Mekong

But just as researchers reveal the value of its biodiversity, food security and fisheries livelihoods, the area faces a new threat: earlier this year, feasibility surveys began for a 1,400-megawatt hydropower dam planned for directly upstream of the deep-pool habitats. Cambodia's 2020-2030 energy master plan doesn't include any hydropower dams on the mainstream Mekong. However, local media reports indicate that the dam has government approval "in principle." The dam would be the second major hydropower scheme in Stung Treng province, with the Lower Sesan 2 dam already operating on a tributary of the Mekong. According to the expedition team, construction of the dam would have "devastating ecological effects and could seriously threaten local food security in an

area of the world already impacted by changing climate."

The **Seventh Lancang-Mekong Cooperation (LMC)²⁷⁵ Foreign Ministers' Meeting** was held in Myanmar on 4th July 2022. The **meeting** set future directions for the LMC cooperation, namely, enhancing strategic guidance, deepening economic integration, expanding agricultural cooperation, upholding green development, promoting digital cooperation, and maintaining closer people-to-people and cultural exchanges. Next, the meeting announced six plans to be implemented in the next stage for the LMC cooperation, which include an action plan on Lancang-Mekong agricultural cooperation, a beneficial plan on Lancang-Mekong water resources, a cooperation plan on Lancang-Mekong digital economy, a Lancang-Mekong space cooperation plan, a Lancang-Mekong talent plan, and a Lancang-Mekong public health cooperation plan. Finally, the meeting endorsed the Five-Year Plan of Action on the Lancang-Mekong Cooperation (2023-2027) to be submitted to the upcoming 4th LMC Leader's Meeting for adoption.

Myanmar has launched the **Lancang-Mekong Project's Data Center** in the capital city of Nay Pyi Taw. The center will help improve the practices and understanding on analyzing, compiling and collecting of data on food production in Myanmar and will also help to promote cooperation among the countries.

Brahmaputra and Indus River Basins

India plans to construct the country's second-largest dam to counter China's ambitious water diversion scheme of the river that feeds downstream into the Brahmaputra. The **proposed dam** in the upper reaches of Arunachal is part of the proposed Upper Siang multi-purpose storage project that will also generate hydropower. Water in the lean season in the Brahmaputra comes from melting snow in the mountains on the Tibetan plateau. India's plan involves releasing water from the dam to maintain water security in case

China builds structures to divert water. Also, in the case of China releasing water from its upper reaches, such a dam will also help in storing water to prevent floods.

The 117th meeting of the Permanent Indus Commission (PIC) took place in Islamabad from 1-3 March. The commissioners of India and Pakistan **discussed** issues related to infrastructure development, the sharing of data and the release of (un)treated wastewater. India is constructing three infrastructure projects (a dam and two hydroelectric projects) located in Jammu and Kashmir. The government of Pakistan had raised objections to the projects. These issues were reviewed, but India maintained that its project designs were fully compliant with the terms of the Indus Waters Treaty and indicated to Pakistan that it was open to any technical suggestions. Differences of opinion also existed in regard to the Fazilka drain, which Pakistan had blocked to prevent untreated wastewater from some 18 urban areas in Punjab from flowing into its territory. However, this led to the accumulation of wastewater on the Indian side of the border and contaminated water in some 200 nearby villages. Pakistan has since acknowledged this issue and has promised to reopen the drain.

There was an **unprecedented flooding in the Indus River Basin** this June. **Pakistan** was a victim of compounding events: intense heat accelerated glacial melt in the northern mountainous regions which increased water flow into the basin. These resulted in floods that inundated more than a third of the country's districts. Around 33 million people were displaced and more than 1,500 were killed. The estimated economic impact was \$30-35 billion – or over 10% of Pakistan's GDP. The road to recovery will be long for Pakistan but perhaps this could be a trigger point for Pakistan to build back stronger – future-proofing villages/towns/cities along the river to climate threats ahead. This is especially important as the Indus River Basin is key to Pakistan – it houses 88% of Pakistan's population and 92% of its GDP.

11.3. America

The United States and Mexico have reached an agreement on emergency delivery of Colorado River waters. The US-Mexico International Boundary and Water Commission has signed Minute No.327 on emergency deliveries of Colorado River waters for use in the city of Tijuana, Baja California that renewed cooperation in light of a potential emergency that could affect the region's water supply. The Minute provides for emergency deliveries of Colorado River waters, for five years, to the city of Tijuana, through the Otay Mesa International Connection, of a portion of water allotted to Mexico under the 1944 Water Treaty. The requested water quantities cannot exceed the capacity of the connection at 1.5 million m³ and should

not affect the deliveries or releases of water of the Colorado River system to US users.

Water cuts for Colorado River States. In June, the Federal Bureau of Reclamation had issued an ultimatum to the seven states sharing the waters of the **drought-plagued Colorado River basin** to either jointly agree on a reduction in water demand or face externally imposed cutbacks by the Federal Government. Federal officials said more cuts were needed, both under terms already negotiated in the 100-year-old Colorado River compact and the 21st century reality of human-influenced climate change resulting in hotter temperatures and drier soils. Arizona, Nevada

²⁷⁵ founded in 2016, the LMC consists of six member countries: China, Thailand, Cambodia, Laos, Myanmar, and Vietnam

and Mexico will have supplies reduced for a second straight year: 21% for Arizona, 8% for Nevada and 7% for Mexico. They are the first to be subject to cutbacks under the Colorado River compact. Negotiations over further reductions are creating tension among the states, especially as California, the largest user, has so far avoided cuts triggered by low reservoir levels. Thus, the 23-year megadrought, the worst on record in at least 1,200 years, is testing the strength of the compact.

The Parana²⁷⁶ crossing Brazil, Paraguay and Argentina **is at its lowest level since 1944**. The impact is being felt in all three countries as Brazil continues to experience its worst drought in 91 years. The historic low water level has hindered grain transportation which used the waterway, has triggered a rise in wildfires, and has damaged entire ecosystems. There are fears that this is a trend that will only *intensify* as a result of climate change and global warming. There is also direct human intervention that is having a negative impact on the river's ability to self-regulate. This has a significant economic impact in the region's economy. The region is one of the world's largest producers of soybean and maize, but the ongoing drought has been having an impact on yields and also on the ability to transport the grains.

The **Honduran capital** of Tegucigalpa is facing a "humanitarian crisis" due to *water scarcity*. A damaged sewage system, closure of businesses and schools have also been cited as among the possibilities if water scarcity persists. Water is being rationed in Tegucigalpa, with people lining up to get water from trucks as tap water only runs once every 7 days. If the situation does not improve, residents may see water

rationing further increased to only having tap water twice a month.

As a record-breaking drought enters its 13th year, **Chile** has announced an unprecedented *plan to ration water* for the capital of Santiago, a city of nearly 6 million. The plan features a four-tier alert system that goes from green to red and starts with public service announcements, moves on to restricting water pressure and ends with rotating water cuts of up to 24 hours for about 1.7 million customers. The government estimates that the country's water availability has dropped 10% to 37% over the last 30 years and could drop another 50% in northern and central Chile by 2060.

One of the most important developments for tropical rainforests in 2022 was **Brazil's** presidential election of Luiz Inácio Lula da Silva. Lula, who presided over a sharp *drop in Amazon forest deforestation* during his terms in office between 2003 and 2010, made saving the Amazon a central part of his bid for the presidency, pledging to rehabilitate Brazil's international standing on climate and environmental issues. Brazil's National Space Research Institute released preliminary figures showing that deforestation in the Brazilian Amazon amounted to 11,568 square kilometers for the year ended July 31, 2022, a 11% drop from last year, when Amazon forest loss breached 13,000 square kilometers, the highest level in 15 years. Despite the apparent drop in deforestation, an *analysis by the Monitoring of the Andean Amazon Project* concluded that the eastern third of the Amazon may have already passed a critical threshold for forest loss. That region is especially important because of its role in driving moisture from the Atlantic to the central Amazon.



The Amazon rainforest. Photo: Rhett A. Butler

²⁷⁶ second in size only to the Amazon River

Lack of rain and high temperatures have caused large agricultural losses in Brazil in 2022. Brazil is one of the world's breadbaskets. It is a top-5 producer of 34 commodities and the world's largest net agricultural exporter. This is the third consecutive dry year in the country. Dry conditions in Brazil are linked to La Niña and partly to human-induced causes, particularly, deforestation in the Amazon forest.

Source: Counting the cost 2022: A year of climate breakdown, Christian Aid, December 2022

Congress in the last two years opened the public purse for **U.S. water systems**, providing federal funding at levels not witnessed in a half century. Cities, tribes, and states had the option of spending a portion of their \$350 billion in **pandemic relief funds** on water and sewer upgrades. The U.S. Environmental Protection Agency began distributing the \$50 billion for water systems that was a part of the Infrastructure Investment and Jobs Act. Newark, New Jersey, finished removing more than 23,000 lead service lines in the city, a process that took under three years. Another majority-Black city with high-profile lead contamination – Benton Harbor, Michigan – nearly completed its lead pipe removal. However, notable problems persisted. The water system in Jackson, Mississippi, failed during heavy rains in August. Some 160,000 people were without running water for a week. As per official, Jackson's water system is **troubled** by short staffing and "decades of deferred maintenance."

Mexico's historic summer 2022 drought. Dry conditions are not rare in northern Mexico. Much of the land consists of desert or is semiarid, typically receiving less than 30 inches of rain per year. Rainfall this year has been **lower than normal**, however. Water levels in the three dams that supply water to the city were very extremely dwindling. Groundwater is also near record lows. Mexican President Andrés Manuel

López Obrador acknowledged that growing industrial demand has strained water supplies and called on companies and farmers to give some of their water to the public during the drought.

50 years of protecting and restoring the Great Lakes. The Great Lakes cover nearly 250,000 square kilometers and hold over 20% of Earth's surface fresh water. More than 30 million people in the U.S. and Canada rely on them for drinking water. Despite their enormous importance, the lakes were degraded for well over a century as industry and development expanded around them. In 1972, the U.S. and Canada signed the **Great Lakes Water Quality Agreement**. Now, 50 years later, they have made progress, but there are new challenges and much unfinished business. The agreement set common targets for controlling a variety of pollutants in Lake Erie, Lake Ontario and the upper St. Lawrence River, which were the most polluted section of the Great Lakes system. Despite encouraging results in reduction of nutrient pollution, especially phosphates from detergents and sewage, toxic pollution in the Great Lakes remains a colossal problem that is largely unappreciated by the public. Numerous fish advisories are still in effect across the region because of chemical contamination. Industries constantly bring new chemicals to market, and regulations lag far behind. Another major challenge is the discharges that come from many diffuse sources, such as runoff from farm fields. Nitrogen levels in the lakes have risen significantly. As a result, algal blooms have returned to Lake Erie. To address this problem, measures, known as Total Maximum Daily Loads, have been applied. But this strategy relies on states, along with voluntary steps by farmers, to curb pollution releases. Climate change is now complicating Great Lakes cleanup efforts due to warming water that affects oxygen concentrations, nutrient cycling and food webs in the lakes, potentially intensifying problems and converting nuisances into major challenges.

11.4. Australia and Oceania

South-eastern Australia witnessed heavy rain and **flooding** during November 2022, following heavy rains during the month of October, which were the heaviest on record in the Murray Darling Basin. Heavy rainfall and flooding had already taken place in Queensland and Coastal New South Wales from February to April. On November 17th, for the first time, emergency services in New South Wales have requested international assistance to cope with flooding. The Australian flood insured losses over 2022 have reached AU\$ 6 billion. Despite the damage to property from the floods, the rainfall has restored water flows in the lower reaches of the Murray River and the Coorong lagoon system, which had been deprived of sufficient water for decades following the millennium drought which lasted from 1996 to 2010.

Australian mining and energy firm Mayur Resources announced that it would **scrap plans** to build a planned coal-fired power plant in **Papua New Guinea**,

instead focusing on projects in the country to offset its own emission. But PNG authorities issued later a public notice canceling Mayur's carbon credit project that involved approximately 800,000 hectares in PNG's Western province because of breaches of the country's forestry laws. It's unclear if the breach is particular to Mayur Resources or due to a blanket moratorium on carbon credit schemes announced by the environment minister on March 2. The moratorium was imposed with immediate effect on voluntary carbon standards (VCS) after multiple accounts of unaccredited and inexperienced companies sweeping into the nation to take advantage of the new market created by the U.N.'s Kyoto Protocol. Mayur is now threatening to sue the PNG government for canceling the carbon scheme.

Water Services Entities Bill passed in December. The **Water Services Entities Act** is the first of three pieces of legislation as part of a **public infrastructure restructu-**

ring programme launched to centralize the management of water supply and sanitation in New Zealand. The Act establishes four new Water Services Entities to manage, develop and deliver drinking water, wastewater and stormwater services across New Zealand from July 2024. The Act provides for community ownership and oversight of the new water services entities through local government's role as shareholders. Two further pieces of legislation which have been introduced to Parliament for consideration include the **Water Services Legislation Bill** that will make sure the new Water Services Entities have the necessary legal functions, responsibilities, and powers to get on with their work and the **Water Services Econo-**

mic Efficiency and Consumer Protection Bill that provides a detailed longer-term framework for ensuring the Entities provide affordable and well managed services.

The **eruption** of the **Hunga-Tonga-Hunga-Ha'apai**, a submarine volcano in the **Tongan archipelago in the southern Pacific Ocean**, on 15 January 2022 was the largest recorded since the eruption of Krakatoa in 1883. The eruption caused tsunamis in Tonga, Fiji, American Samoa, Vanuatu and along the Pacific rim. A lack of clean water was a priority because supplies in **Tonga** have been disrupted by layers of volcanic ash and salt water.

11.5. Europe

11.5.1. Western and Southern Europe

High temperatures and drought conditions affected large parts of Europe during the 2022 summer that was hottest on record in Europe.

Temperature records were set in weather stations across Europe, including Portugal (47.0°C), Spain (42.3°C) and Scotland (35.1°C). In the UK, temperatures passed the 40°C mark for the first time ever. Low water

levels in European rivers, including Germany's Rhine, France's Loire and Italy's Po, reduced agricultural production, affected the activity of energy plants and caused disruption in shipping. In parts of Spain, water reservoirs were at 30% of their 10-year mean levels.

Source: Counting the cost 2022: A year of climate breakdown, Christian Aid, December 2022



Mar Menor – the Europe's largest saltwater lagoon is effectively a person, says Spanish law. The lagoon now has legal guardians, including a scientific committee, and a legal right to exist, evolve naturally, and be restored. This way the authorities try to address

pollution in the **lagoon**. In recent years, the Mar Menor has suffered greatly from fertilizers washed off farm fields. Millions of dead fish were found on the shores. In this context, activists launched a petition to adopt a new and radical legal strategy: granting the

lagoon the rights of personhood²⁷⁷. Nearly 640,000 Spanish citizens signed it, and on 21 September, Spain's Senate approved a bill enshrining the lagoon's new rights.

The 17-metre high dam "La Roche qui boit" on the Sélune has been demolished. The hydroelectric dams of La Roche-qui-boit and Vezins were built on the Sélune River in France in early 20th century. Since the demolition of the 37 m high Vezins dam two years ago, the ecological continuity of the historic salmon river Sélune is now restored. In the main river alone, more than 60 km are free and allow access to former spawning sites. The campaign for a free Sélune led by associations including ERN, the French Fishing Federation, FNE and others have lasted 20 years.

The Po River under threat. The longest river in Italy starting from the Cottian Alps had the flow which was 6x lower than the seasonal levels in June. Rome declared a [state of emergency in Northern Italy](#); this was its worst drought in 70 years. The drought not only forced more than a hundred northern towns in Italy to ration its water, but also impacted food security as 40% of the nation's agricultural production relies on irrigation from the Po River. As low levels of river flow caused seawater intrusion, some farmlands have become highly saline as drying out aquifers in the river basin are now filled with seawater. Once seawater has seeped into aquifers, it can only be flushed out with lots of freshwater. Rain is the only hope as the other components of river flow, glacial & snowpack melt are likely not forthcoming as temperatures rise in the Alps and across Europe.

The **first Watch List** under the new Drinking Water Directive was [published](#) in January. Three representative endocrine-disrupting compounds: beta-estradiol, nonylphenol and bisphenol were included in the list. Water operators support the idea of the watch list in the DWD as a way to investigate contaminants of emerging concern in water resources/raw water and inform the Risk-Based Approach where they are likely to be present in water intended for human consumption and could pose a potential risk to human health.

The **European Commission** published [guidelines](#) to help Member States and stakeholders apply the rules on the safe reuse of treated urban waste water for agricultural irrigation. With several Member States increasingly suffering from droughts, reusing water from urban waste water treatment plants can become an essential tool to ensure a safe and predictable source of water, whilst lowering the pressure on water bodies and enhancing the EU's ability to adapt to climate change. The Water Reuse Regulation, applicable from June 2023, sets out minimum water quality, risk management and monitoring requirements to ensure safe water reuse.

Urban wastewater is one of the main sources of water pollution. The EU's **Urban Wastewater Treatment Directive** currently in force is more than 30 years old.

Since its adoption, the quality of European surface water has dramatically improved. Yet there is still pollution that needs to be addressed and is not covered by the current rules. To address this, the Commission has proposed an [update](#) to the Directive. Several improvements include obligations to recover nutrients from wastewater, new standards for micropollutants and new monitoring requirements for microplastics. Obligations to treat water will be extended to smaller municipalities with 1,000 inhabitants. As 92% toxic micro-pollutants found in EU wastewaters come from pharmaceuticals and cosmetics, a new Extended Producer Responsibility scheme will require producers to pay for the cost of removing them.

The 2022 summer was worst on record for **glaciers in the Alps**. Switzerland's glaciers have [lost](#) an average of 6.2% of their ice. Austrian glaciers have lost more glacial ice in 2022 than they have in 70 years of observations. Across the Alps, the preceding winter had very limited snowfall and therefore glaciers were not well insulated against the forthcoming summer melt season.

Spain and Portugal have agreed to strengthen the measures to be adopted to prevent and tackle water shortages in the river basins shared by the two countries in the framework of the Albufeira Convention. The decision was taken at the 24th plenary session of the Commission for the Implementation and Development of the Albufeira Convention (CADC) and following a year marked by the drought that has affected both countries ([December](#)). At the meeting, the operating conditions of the Permanent Technical Secretariat of the CADC were also established to facilitate ongoing cooperation between the two countries, especially in relation to the management of bodies of water and the hydrological planning of shared basins. However, earlier, in September in the context of acute drought Spain [announced](#) that it would no longer fully honor the Albufeira Convention by reducing the water flow of the Douro and Tagus rivers to Portugal.

Rhine River Basin

The states in the Rhine catchment have been cooperating in the International Commission for the Protection of the Rhine (ICPR) for 70 years. For the third time since 2009, the International Commission for the Protection of the Rhine (ICPR) has published a [river basin management plan](#). The report provides an overview of the state of the Rhine and its largest tributaries and the associated groundwater and summarizes which measures the states will take in the period 2022-2027 in order to achieve the good status of the water bodies²⁷⁸. For this purpose, the Rhine and its tributaries are divided into sections, the so-called surface water bodies and for these an assessment is made. The latest results show that in the International River Basin District Rhine, 10 % of the larger water bodies are currently in good ecological status. This is an improve-

²⁷⁷ success stories exist in indigenous communities, e.g. in Canada and New Zealand

²⁷⁸ according to the European WFD, the good status should be achieved for all water bodies by 2027 at the latest

ment of 7 percentage points compared to 2016. For 2027, it is predicted that one third of the surface water bodies shall achieve the good ecological status. 97% of groundwater bodies are already in good quantitative status. 75% are classified as good in terms of their quality; this is an increase of 8 percentage points compared to 2016. By 2027, the proportion of groundwater bodies in a good qualitative chemical status is expected to increase to just under 80%.

Danube River Basin

The International Commission for the Protection of the Danube River (ICPDR²⁷⁹) is an International Organization consisting of 14 cooperating states²⁸⁰ and the EU. The ICPDR deals with the whole Danube River Basin, which includes its tributaries and the groundwater resources.

The ICPDR held its 4th [Ministerial Meeting](#) on February 8, where the two Management Plans Updates and

the Danube Declaration were endorsed. The Danube River Basin Management Plan (DRBMP) includes concrete measures relating to the five Significant Water Management Issues identified by the ICPDR. The measures are to be taken within the next management cycle until 2027, including restoration of habitats and ecological corridors for migratory fish species – in particular sturgeons, implementing adequate wastewater treatment technologies and best management practices with a view to further tackling the issue of nutrient loads transported into the Black Sea via the Danube. The updated Danube Flood Risk Management Plan (DFRMP), besides the strategic basin-wide level measures to prevent and reduce damage caused by floods, gives special attention to measures employing areas which have the potential to retain flood water, such as natural floodplains as well as the other areas enabling controlled flooding. The Danube Declaration, which is updated and signed every six years, serves as a coordinating mechanism for transboundary water management within the basin.

11.5.2. Eastern Europe and Caucasus

Armenia

Water resources. The 70-Mm³ Azat reservoir²⁸¹ – largest in the Ararat Valley – on the Azat River²⁸² is to undergo renovation since 2 of 3 gates are out of operation and other units are malfunctioning.

The Armenian government plans to [restore](#)²⁸³ the former course of the Araks River in order to avoid further collapses in the corresponding section of the border with Turkey, approximately 6.5 km long, and eliminate one of the tributaries. It is also proposed to build a dam at the corresponding boundary marker on the current course of the Araks in order to route water to the former course and restore the earthen embankment 130 m long and 8 m deep (June 30, Cabinet of Ministers).

At year-end 2022, irrigation water discharge from Lake Sevan was lower than the established limit: 165 Mm³ against planned 170 Mm³. This is explained by a decrease in the lake water level, with the lowest mark reaching 1900.29 m in December. The lake lacked 300 Mm³ of water in May relative to the previous year. Short water was also observed in a number of other lakes. In particular, the Azat reservoir lacked 6-7 Mm³ of water. Similar situation was observed in Lake Arpi. In contrast, the positive trend was observed in the Akhuryan reservoir, which showed 100 Mm³ more water as compared to 2021. Water lowering was recorded in Yerevan Lake as well.

Agriculture. The government of Armenia [made changes](#) to a number of agricultural programs to encourage adoption of modern irrigation systems (January 27). In particular the cost compensation for the installation of modern irrigation systems is to be increased to 50% instead of the earlier 22% and 25%. Businesses and communities are also given the opportunity to expand existing reservoirs. The mandatory requirement to publish a list of bodies conducting laboratory studies of the agrochemical soil composition has been removed from the program, which allows enterprises to independently choose the appropriate service provider. At the same time, the acquisition of land for horticulture is permitted, as long as the maximum cost limits set by the program are not exceeded.

Energy. ADB and the Armenian government signed a memorandum "On technical assistance to assess the viability of [wind energy](#) projects" (November 28). The economically feasible wind energy potential of Armenia is estimated at 450 MW of total installed capacity, capable of generating 1.26 billion kWh of electricity. The main promising territories are the Zoc Pass, Bazum Mountains, Pushkin and Jajur passes, and Aparan and Meghri regions.

Environment. Draft amendments to the Law on environmental impact assessment and expertise have been disclosed for public consultation. According to the amendments, all hydropower projects at the construction stage shall be subject to environmental

²⁷⁹ established in 1998

²⁸⁰ Austria, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Germany, Hungary, Montenegro, Moldova, Romania, Serbia, Slovakia, Slovenia, and Ukraine

²⁸¹ operated since 1976. The reservoir lessens the load on Lake Sevan during the irrigation season

²⁸² takes its origin from Gegham mountains and drains into the Arax River

²⁸³ as part of the "Irrigation system improvement" program

expertise and environmental impact assessment irrespective of project capacity. Earlier, only over 1-MW hydropower projects have been subjected to environmental expertise.

Large-scale bloom of blue-green algae was recorded this summer in Lake Sevan. The main causes are an increase in mean water temperature and in biogenic substances and a decrease in self-purification capability. Climate change and pollution by phos-

phorus and nitrogen through discharge of domestic and agricultural wastewater contributed to this negative phenomenon. The self-purification capability was deteriorated also due to the reduction of lake inhabitants. Thus, experts believe it necessary to increase endemic fish species to restore the ecosystem, to improve hydro-biological and -chemical indicators of the lake, to regulate industrial fishing in the lake, to build modern treatment stations in catchment areas, and to clean coastal territories.



Algae blooming in Lake Sevan

Green growth. The Government of Armenia together with WB, EU and UNDP launched the platform "Growth and Recovery: for a stronger, modernized and prosperous Armenia" in support of Armenia's forward-looking sustainable development, green recovery and growth. The goal of the Green Armenia platform is to integrate and optimize policy and investment initiatives for transition to a green economy.

Azerbaijan

Water resources. The Ministry of Ecology and Natural Resources of Azerbaijan started working on the Zeyemchay reservoir. A feasibility study is developed now. A number of other reservoirs, such as Alijançay, Gudiyalçay, Velveleçay, Garachay, Gusarchay, Agsuchay, Turyançay, Yengijay and Vilashçay, are also at the study stage.

The Cabinet of Ministers has approved the Rules for charging water use (March 17). According to the Rules, legal and physical persons shall pay for the amount of water used if they divert water directly from sources, i.e. surface water and groundwater sources using technical facilities. Also, water use is

charged for water-management organizations. The charges will be based on tariffs that are differentiated depending on water quality, purpose, state of hydraulic structures, methods of water diversion and transportation and other factors. Physical persons may use ponds free of charge (beaches, boating, sport fishery, livestock watering, water diversion without application of technical facilities, etc.).

In 2022, like in previous years, farmers and peasants faced the irrigation water shortage problems in spring and summer. The lower farms had to spend additional money for the re-use of drainage water.

Agriculture. A rural business information system was developed within the framework of [agricultural digitalization](#) in the country²⁸⁴. This system would help farmers to connect to the electronic database and other digital services, as well as to improve transparency in interactions between business and public agencies.

Energy. ADB and Masdar Azerbaijan Energy Limited Liability Company (MAE) signed a \$21.4 million loan agreement to finance a 230-MW solar power plant

²⁸⁴ as part of a joint project with the EU aimed at the creation of electronic systems and a database for the agriculture market

near Alat settlement in Azerbaijan. It is the first significant private sector renewables investment in Azerbaijan. The new solar power plant will generate up to 558 gigawatt-hours of clean energy annually from the first year of operation, avoiding up to 265,000 tons of annual carbon emissions.

Environment. The Ministry of Ecology and Natural Resources of Azerbaijan organized environmental campaigns for the population to change some of their domestic wastes, such as plastics, glass, paper, batteries, for tree seedlings (November).

The Azerbaijani authorities started forming a bio-reservation on the base of the Zagatals state reserve. Upon completion, this bio-reservation can become the ecotourism destination, with the well-known Katech waterfall being one of its spots. The republic also plans to organize geoparks, also in places where mud volcanos are located.

Transboundary cooperation. The 51st meeting of the Azerbaijani-Iranian Permanent Joint Commission on use of water and energy resources of the Araz River was held in Tabriz, Iran. The parties agreed on the operating mode of the Araz reservoir, developed schedules of water distribution between the two countries, and signed a protocol on the joint use of water and energy resources on the Araz River.

Georgia

Water supply. The German state development bank KfW has allocated €55 million to support modern water infrastructure in Georgia's Black Sea city of Batumi. An old drinking water treatment plant will be rehabilitated and adapted to the modern standards and the wastewater treatment plant will be expanded and equipped with sludge treatment and nutrient elimination systems. €138 million had been spent over more than 16 years on modern water infrastructure in Batumi. More than 200,000 people who previously had access to drinking water only for a couple of hours a day, are now continuously supplied with hygienically safe drinking water.

According to the National Statistical Service of Georgia, half of the population living in the regions of Georgia does not have drinking water. 65% of the rural population produces drinking water on its own, mainly groundwater through wells and springs. However, the level of groundwater has dropped significantly, and non-professional drilling for personal purposes increases the risk of groundwater pollution.

Agriculture. The Georgian government has approved amendments to the Preferential Agricultural Loan Project. For procurement of agricultural drones and weather stations the government will finance a farmer through a 48-month loan at 11% per annum.

Within the framework of the state program "Support for agricultural land owners", small landowners have received support since May 10. This included issuan-

ce of special agro-cards, on which farmers who legally own registered land plots ranging from 0.25 to 1.25 ha were credited with agro-points. Farmers could use them to buy fertilizers and plant protection chemicals, seeds or seedlings, agricultural tools, etc.

The vertical farm High Gardens started operating in the industrial district of Tbilisi in April 2022. The vertical farm can produce monthly up to 1.5 t of rare greens and vegetables on an area of 280 m². The product line of the farm includes more than 10 plant types, the growing phase of which ranges from 20 to 45 days. The farm works on 2.9-m aeroponic towers. Each tower feeds 144 plants, with stems fixed by sponges in small containers and roots deepening down in the towers to get nutrients. Based on the results of the first commercial cycle, the farm's operating costs did not exceed \$2,500, of which 20% was for electricity and about 40% for plant nutrients.

Energy. In 2022, 14.8 billion kWh of electricity were consumed (3.8% more than in 2021) and 14.2 billion kWh were generated (12.7% more than in 2021). Hydro-power accounted for the largest share of generation – 10.8 billion kWh. Thermal power generated about 3.4 billion kWh and wind generated 87.49 billion kWh.

The Governments of Azerbaijan, Georgia, Romania and Hungary signed an "Agreement on strategic partnership in the field of green energy development and transmission" on 17 December. By this Agreement, the 1.2-km transmission line to be laid through the Black Sea will connect Georgia, Azerbaijan and Romania. The European Union will allocate €2.3 billion for this project. Electricity generated in Georgia and Azerbaijan will be traded to Europe.

Environment. Georgia's natural protected territories cover 13% of the total country area and are expanding further. In 2022, several new protected zones were established on 120,000 ha. The national fauna is comprised of more than 100 mammal species, 330 bird species and 160 fish species. The protected territories are home to 90 species of rare and endangered animals, accounting for 67% of animals on Georgia's Red List.

International cooperation. Mukhtar Babayev, the Minister of Ecology and Natural Resources of Azerbaijan met with Prime Minister Irakli Garibashvili and Otar Samugia, the Minister of Environmental Protection and Agriculture of Georgia. They discussed the areas of strategic cooperation, emphasized the functioning of regionally important infrastructural projects, and the importance of Georgia-Turkey-Azerbaijan cooperation. The two sides signed a memorandum of cooperation, which provides for management of protected areas in accordance with international practices, as well as protection and conservation of national heritage (November 28).

Belarus

Water resources. The 2030 National Water Strategy has been approved²⁸⁵ in Belarus. It is aimed at improving

²⁸⁵ Resolution of the Cabinet of Ministers 91 of 22.02.2022

the water use efficiency to ensure sustainable economic growth and creating conditions for preservation of aquatic ecosystems. The Strategy sets the following targets: (1) provision of the population with centralized water supply and sanitation systems – at least 95% and 85%, respectively; (2) surface water bodies of good and higher environmental status – at least 85%; (3) index of poorly treated wastewater discharge (relative to 2015) – 0%; (4) implementation of integrated water resources management – 100%; (5) the share of transboundary river basins with effective international cooperation agreements – 100%.

The task to improve the quality of water supply in Minsk was set in late 2018. In this context, it was decided to accelerate and facilitate implementation of an investment project for transferring Minsk to water supply from underground sources.

Agriculture. A new version of the Land Code was approved²⁸⁶. The document: has provisions for allotting land plots up to 1 ha to citizens for construction of houses in rural settlements; establishes the right to acquire, in the course of 5 years, land plots held by land users as of September 1, 2022, in private ownership or lease for 99 years, with preferential payment terms; strengthens the role of local authorities in regulation of land relations, restoration of order and resolution of disputes relative to land.

Decree of the President of Belarus No.443 "On insurance of crop yields, livestock and poultry" was adopted on 28 December. The Decree approves the list of crops, livestock and poultry and insurance tariffs for compulsory insurance for 2023.

As part of revision of the State Agrarian Business Program, financing of agriculture was increased by \$100 million. Such revision will help to settle the matters related to implementation of 13 new investment projects in crop production, poultry farming, dairy and beef cattle breeding.

Energy. The Law regulating relations in the sphere of renewables was adopted on 20 May. The document authorizes the use of RES installations for regulation of daily electricity load in the Belarusian energy system. Renewable energy prices are set at the level of tariffs for industrial consumers with connected capacity of up to 750 kW-A. Minimum incentive coefficients will be applied regardless of the period of RES operation.

Belarus has fifty two 96.2-MW HPPs. In 2022, more than 370 million kWh were generated. The largest hydropower plants – Vitebsk and Polotsk – generated 236 million kWh in total. This saved over 75 thousand tons of oil equivalent.

Environment. Belarus decided to withdraw from the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) due to "biased and discriminatory attitudes of the governing

bodies of the Convention and evidence of pressure". It is emphasized that withdrawal of Belarus from the Aarhus Convention will not entail subsequent termination of activities on the improvement of the Belarusian system of interaction between the authorities and the population in environmental matters.

Transboundary cooperation. The Joint Belarusian-Russian Commission for Transboundary Water Protection and Rational Use held its XIII meeting on June 7 in St. Petersburg. The members signed the joint program for monitoring transboundary water bodies in the Dnieper and Western Dvina river basins and approved the Resolution of the First Scientific and Practical Conference "On Further Development of Russian-Belarusian Cooperation on the Protection and Rational Use of Transboundary Waters." In the course of 20 years, the countries have developed and approved 15 major policy documents and undertaken multiple efforts for efficient water management and protection.

Moldova

Water resources. A number of laws on water use and ownership have been amended. According to amendments to the Law "On Fish Fund, Fishing and Fish Farming", the owners of hydraulic structures shall have a permit for special water uses and will be responsible for maintenance of the water body. Amendments to the Law "On Public Property Management and Denationalization" provide for granting administrative-territorial units the right to control sections of the rivers that cross their intra- or extra-settlement territory.

The Ministry of Environment has developed a plan for the rational use of water in the context of **severe drought** hitting the country. In summer, precipitation did not exceed 25-75 mm, which was observed for the first time in records in larger part of the territory, while soil moisture ranged from 2 to 60% of the norm. Water levels in artesian wells, the only source of drinking water for rural inhabitants or 65% of the country's population have dropped critically. During this period of time, the water level fell to 15-30% of the norm in the Prut River and to 30-40% in the Dniester River, and small rivers have gone low to 20% of the norm, with some of them drying up. In this context, it was recommended to save water as much as possible, use alternative methods of storing and recycling water in economic sectors, including in industry and agriculture.

The Rural Competitiveness and Resilience Project in Moldova (PCRR/USAID, \$84 thousand) announced the opening of a financing line for irrigation modernization through installation of the facilities using "green" (renewable) energy to deliver and distribute water to farmland. Water User Associations were invited to the project²⁸⁷. As estimated, the share of energy costs in WUAs' irrigation water tariffs reaches 60% in Moldova. In 2022, due to a rise in the cost of electricity and other energy resources, tariffs of WUA services increased by about 20-30%.

²⁸⁶ Law on amending the codes of 18.07.2022

²⁸⁷ in total, 35 WUAs are officially registered in Moldova. They administer 30 centralized irrigation systems capable of delivering water to more than 10 000 ha

Agriculture. The Concept of the Information System "Soil Register of the Republic of Moldova" was amended to include some changes in the data inputted into the system. Currently, the Concept provides geo-spatial and text information on soil profile, solvency, code and name. Farmers and businesses will be able to more quickly view and analyze data on land condition and quality to make sound agricultural investment or lending decisions. The information system can also be used by central and local authorities to identify degraded agricultural land for appropriate measures.

Energy. The Moldovan government disclosed the 2050 Energy Strategy. The Strategy is based on five goals: (1) improving energy security; (2) developing competitive energy markets and regional integration; (3) promoting energy efficiency; (4) developing sustainable RES; and (5) protecting consumers. According to the Strategy, new power plants should be built in the country territories under full control of the government; the energy budget will be revisited and RES and full technical, infrastructural and market integration into the European grid will be promoted.

Environment. A draft law on industrial emissions has been approved in the first reading. This document establishes rules designed not only to reduce and mitigate harmful industrial emissions to air, water and soil, but also to prevent waste generation. Industrial plants will be required to have permissions for operation. A comprehensive environmental permitting system for emissions to water, air and soil will be established for each source of pollution, rather than for economic agents as is currently the case.

The Agreement on the participation of the Republic of Moldova in the European Union Programme for the Environment and Climate Policies "LIFE" was signed²⁸⁸. By participating in the LIFE Programme, Moldova will be able to access financing for several projects, which refer to biodiversity, circular economy, transition to clean energy, as well as climate mitigation and adaptation.

Russia

Water resources. In 2022, as part of the Rosvodresursy's project "Reproduction and use of natural resources", for the construction and reconstruction of check dams the government allocates 6.2 billion rubles, of which 70% will be directed to the regions of the Far East. The action is to be completed by 2025. Reconstruction of the dam in Ulan-Ude on the Selenga and Uda rivers was started in Buryatia; the banks of the Vilyui River started to be strengthened in Yakutia; etc. The best results in 2022 were shown by the regions of the North Caucasus: two dams on the Khulkhulau River were built in Chechnya during the year, and bank reinforcement measures on the Urup River were completed ahead of schedule in Karachay-Cherkessia.

Water has dropped to a dangerous level in a number of rivers due to the abnormal heat wave. A state of emergency was announced in the Nenets Autonomous District. In Eastern Siberia, the Yenisei River began drying up rapidly. As a result, storage in the Krasnoyarsk

and Sayano-Shushensk reservoirs is below the levels recorded in the last 30 years. All hydroschemes are operated in conservation mode. A lot of dead fish was found on the banks of the Dvina River that can be related to the abnormal heat in expert opinion.

The Basin Council of the Nizhnevolzhsky Basin District discussed the development of the Lower Volga basin within the framework of the National Project "Ecology" (2022-2023). As a result of implementation, the water area of the Kuibyshev reservoir has become cleaner and bank enhancement activities are underway. The Council paid special attention to fulfillment of the work schedule on delineation of flooding and waterlogging zones, provision of reliable water supply to the population and economic sectors, and improvement of water monitoring.

Water supply. Amendments to Federal Law No.5-F3 of 28 January 2022 "On water supply and sanitation" vested the Ministry of Construction with authority to calculate norms of hot, potable and service water losses in centralized water supply systems during production and transportation of water. The law gives to the executive authorities of the RF constituent entities the right to set norms of water losses. Since March 1, 2023, it will be mandatory to take into account the norms of water losses during production and transportation of water. These data will be included in calculating water supply and sanitation tariffs.

Fees for the use of water bodies have been reduced for industrial enterprises: in 2022 and 2023, the payment for the use of water from large Russian rivers will increase by only 10%, instead of the previously planned 15%. By preliminary estimates, industrial companies using water from major Russian rivers, including the Amur, Volga, Yenisei, Don, Ob, and Lake Baikal, will save about 1.7 billion rubles.

Agriculture. The Law "On agricultural produce, raw materials and food with improved characteristics" was put in force (No.159-FZ of 11.06.2021). This law sets the basic requirements for production of improved agricultural produce, food, industrial and other products. One of them is to apply agro-industrial and other production technologies that meet environmental, sanitary-epidemiological, veterinary and other requirements and have a minimal negative impact on the environment; use recyclable and biodegradable packaging. The use of cloning and methods of genetic engineering and ionizing radiation is prohibited.

The Ministry of Agriculture has started to map agricultural land in the dimension of the constituent entities of the Russian Federation. The Kaliningrad, Moscow, Belgorod Regions and the Republic of Tatarstan are the pilot regions in this mapping exercise. This will provide complete and up-to-date data on the state of all agricultural land: producers will see information on land plots they can put into turnover and develop their production.

Energy. Europe's largest hydropower plant – Volzhskaya HPP – generated a record amount of electricity per

²⁸⁸ the total budget of the LIFE program for 2021-2027 is €5.4 billion

day – 65,370 thousand kWh. This is the maximum for more than 63 years of operation. Higher generation became possible through large-scale modernization of the plant. 22 hydro turbines and 17 hydro generators have been upgraded. The modernization is to be completed by 2026. The capacity of Volzhskaya HPP increased from 2,541 to 2,671 MW and will be brought to 2,744.5 MW.

By December 1, the total RES capacity in Russia reached 5.68 GW. Here wind and solar energy prevail with 2.2 GW and 2.1 GW, respectively. The total capacity of small hydro (up to 50 MW) is 1.2 GW. Renewable energy generation amounted to 6,940 million kWh for 11 months of 2022. The average installed capacity utilization factor was 14.7% for solar projects, 31.1% for wind projects, and 42.2% for small hydro.

Environment. The Government approved an innovative project "Unified National Monitoring System of Climate Active Substances" (2 stages). The monitoring system will produce independent climate forecasts and information on the causes of climate change. The scientific evidence data and environmental monitoring will support decisions on limiting greenhouse gas emissions and adapting the Russian economy to global climate change. At the first stage until the end of 2024, conditions for functioning of the new system will be created and a methodological basis for ecological transformation of economic sectors will be formed. At the second stage, the system is to become fully operational.

The Severstal's Yakovlevskiy Mining and Refining Plant is installing 800 artificial floating islands to grow over 10,000 plants that will create an innovative experimental phytoremediation system in the Plant's waste pond. It is planned to arrange four lines of artificial islands. Each line will have 200 islands and 2,600 plants.

International cooperation. A cooperation agreement was signed between Russia and Mongolia in the course of the conference on protection of Lake Khubsugul (Mongolian Baikal) adjacent to the Republic of Buryatia (RF). The parties decided to establish a specialized research center for protection of Lake Baikal and its coastal zone and include other water bodies in the north-west of Mongolia, neighboring and transboundary Ubsu-Nur, Ureg-Nur, Erzin lakes, and the Tes-Khem River in this project in the near future.

Ukraine

Water resources. The ongoing war in Ukraine is having multiple impacts on the country's water sector. This causes a wide range of damage, including flooding of large areas due to dam breaches, pollution from untreated waste water spills, dumped ammunition, an increase in mine water levels, and a significant decline in the quantity and quality of water for drinking and agricultural purposes. Approximately 16 million people in Ukraine needed water, sanitation and hygiene assistance in 2022. The energy crisis exacerbated the challenges, with power outages impacting water pumping stations and leading to cuts on water sup-

plies across Ukraine. UN WASH Cluster provided nearly 7.4 million people in Ukraine with water, sanitation and hygiene services and supplies, reaching almost 65 per cent of the targeted 11.2 million in 2022.

Irish Water provided two containerized water treatment plants (WTPs) to Ukraine. The self-contained units are capable of treating up to 40,000 litres per hour each, which will supply 6,200 people with the equivalent of 1.6 million one litre bottles of clean water per day.

The Ukrainian drinking water and waste water association Ukrvodokanal²⁸⁹ was welcomed as an associate EurEau member at the General Assembly meeting in Vienna (20 May).

The Project "Small River Ecosystem Restoration – Way to Promising Community Development and Local Welfare" was launched in Lviv oblast. The Project is aimed at increasing capacities of local communities for implementation of nature-based solutions for adaptation to climate change and helping these communities to start the complex process of river restoration. The project on restoration of the small Krasnoselka River in Chervonohradsky District, Lviv province will be implemented by the NGO Synergy Center for Democratic Youth Development.

Agriculture. By a FAO's survey, targeting 5,230 rural households across Ukraine, 25% of agricultural producers stopped or reduced production due to war. The crisis affected more than 40% households in the regions relying on agriculture. This trend was found in Sumska, Dnipropetrovska, Odeska, Chernihivska and Mykolaivska oblasts. Agricultural production costs have critically increased: 72% of the respondents involved in crop production and 64% of the respondents involved in livestock production reported increases. More than half of rural households have reported more than 50% decrease in levels of income compared with the same period during the previous year. Against this background, it is critical to monitor the dynamic situation in the agricultural sector to better inform short and long-term actions.

The EU-FAO project on conservation of plant genetic resources was launched: representatives of FAO, the Ukrainian National Academy of Agricultural Science and its research institutes discussed the terms and conditions of movement of perennial plant collection to a safe location. In general, the project also envisages improvement of the information system of plant genetic resources.

Energy. About 50% of the country's energy infrastructure has been destroyed: all TPPs and HPPs were damaged, as well about 40% of high-voltage grid facilities. By the Ministry of Energy, with about 10 GW of installed renewable capacity in Ukraine, 30% of solar and more than 90% of wind generation has been put out of operation. By February 2023, €144.36 million has been allocated to the Energy Support Fund of Ukraine.

Environment. By the State Ecological Inspection of Ukraine, due to the war over 280 thousand m² of soil

²⁸⁹ established 30 years ago and counts about 130 members

were contaminated with hazardous substances, more than 59 thousand ha of forests and other plantations, including the forests of Svyatogorye, were burned off by missiles and shells. The total amount of environmental damage due to pollution and contamination of land, air and water is estimated at approximately UAH1.9 trillion.

In Zakarpattia Oblast, the eco-campaign on cleaning of the Borzhava River from garbage was organized as part of celebrations of the Danube Day. Tisza Basin Council jointly with public authorities, local governments and other organizations collected 58 m³ of plastics, 5 m³ of glass, 10 m³ of wood, and 3 m³ of household waste.

International cooperation. Prospects and potential areas for increasing Ukrainian grain export, as well as the possibility of joint implementation of irrigation

projects in the south of the country were the key topics addressed during the meeting between the Minister of Agrarian Policy and Food of Ukraine N. Solskiy and his Turkish counterpart V. Kirishji in Turkey (July).

8th meeting of the [Polish-Ukrainian Intergovernmental Commission for Economic Cooperation](#) took place on September 22. The parties noted the increasing value of trade with agri-food products and expressed hope for further development of mutual cooperation in this sector²⁹⁰.

Ukraine broke off diplomatic relations with the Russian Federation in the sphere of water (December 30). In fact, since 2014, the Ukrainian side has not carried out any joint actions and information exchange with Russia on transboundary water.

11.6. Middle East

Israel and Jordan signed an agreement on the rehabilitation and protection of the River Jordan (November). The agreement follows an inter-ministerial decision taken in July in Israel to restore a stretch of the southern Jordan basin from the Sea of Galilee to the Bezek stream, after which the river becomes the border between Israel and Jordan. The decision includes the improved treatment of sewage before being released into the river, as well as the release of substantially more water from the Sea of Galilee from the current 30 million m³ to a maximum of 70 million m³. The agreement builds on the 1994 peace treaty which includes clauses on the protection of the river. The water quality and flow of the river has declined steeply as the result of a number of damming and diversion projects conducted by Israel, Syria and Jordan over the last few decades. This resulted in a flow reduction of 98% and increased concentration of pollutants in the lower section of the river.

Jordan, classified as the world's second-most water-scarce country, secured more than \$2.2 billion to finance its [water carrier project](#), the largest infrastructure venture in the kingdom's history. The project will depend on the Red Sea as a sustainable source and it includes a desalination plant based on the southern shore of Aqaba, in addition to pumping stations and tanks, and a 450-kilometre pipeline. The National Water Carrier Project to be ready by 2027 will provide about 300 million m³ of desalinated water annually.

Thousands of war-displaced Yemenis were hit by floods. Rainstorms, floods and landslides have [impacted](#) the province of Marib in **Yemen** which just this year resulted in an estimated 10,000 displaced individuals. Overall, it is calculated that the war has displaced 90,000 people who sought refuge in Marib. Thousands of shelters have been destroyed in the aftermath of torrential rains. These floods were exacerbating an already very precarious humanitarian situation after 8 years of war in Yemen.

The **Iraqi government** is intensifying its efforts to complete work on the Makhoul Dam. The construction of the dam on the Tigris River is expected to create a reservoir to hold a storage capacity of 3 billion m³. Water storage will be used for generating electricity, irrigation purposes, as well as for preventing flooding. However, the project will put underwater the Ashur Historic heritage site upstream and cause major damage to Mesopotamia Marshes nature heritage site downstream. River-protection NGOs prepared a [report](#), which says if the government continues with the construction of the Makhoul Dam, it will put the ecosystems and environment around the Makhoul Dam out of balance. By flooding upstream areas and decreasing the water flow downstream, it will negatively affect the water quality. The report also points to risks and suggests alternatives.

Egypt faces an acute water crisis. In May, the Minister of Local Development announced that the country had entered a stage of "water poverty". In July, Egypt's submission to the UN Framework on Climate Change revealed that its water resources only amount to about 60 billion m³ annually, nearly all of which comes from the Nile. But with the population increasing by one person every 19 seconds, Egypt needs an estimated 114 billion m³ of water per year, forcing the country to bridge the gap with groundwater, rainfall and treated wastewater. Despite warning of water scarcity, [the government continues building a "Green River" in the desert](#). The artificial body of water is meant to mimic the Nile and become a key centerpiece of the New Capital project (designed for a population of 6.5 million). The giant system of lakes, canals and gardens connecting the New Capital's different neighborhoods is designed to be 35 km long. But it is not clear how the government plans to source the vast amounts of water for the project.

²⁹⁰ Ukraine is the most important recipient of Polish agri-food products among the non-EU countries. In the seven months of 2022, there was an increase in mutual trade, with exports amounting to around €536 mln, while imports from Ukraine amounted to €1.1 bln