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MRC

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INSIDE

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Cover: New dam and fishway on the Pursat River in Cambodia (see page 24).

PHOTO: CHHUT CHHEANA / USAID WONDERS OF MEKONG

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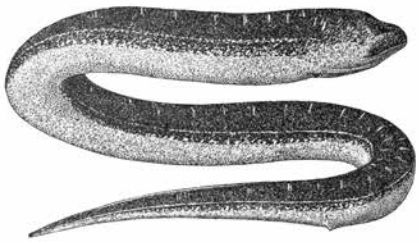
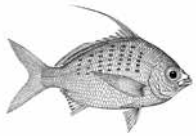


From the Editor's Desk

With both cross-border and domestic travel restrictions under Covid, producing the past five issues of *Catch and Culture – Environment* has been challenging. But with all crises come opportunities, and we've sought to leverage these as much as possible over the past 18 months. For example, we've expanded our fisheries and environment coverage to the broader East Asian region, notably China – a dialogue partner of the Mekong River Commission. At the same time, we've tried to cover more global issues of particular relevance to the Lower Mekong Basin such as the rapidly expanding market for green finance, notably the Paris-based network for Greening the Financial System which includes the Bank of Thailand and the National Bank of Cambodia. The Bank of Lao PDR and the State Bank of Vietnam are members of a similar network established by the International Finance Corporation (IFC) known as the Sustainable Banking and Finance Network. We highly value comments from readers, especially our more than 650 subscribers worldwide. Please send any feedback or suggestions for future articles to peterstarr@mac.com. In the meantime, as we approach the Year of the Tiger and our 28th year as the only regular publication of the MRC since its establishment in 1995, we wish all of our readers a healthy and prosperous 2022.



Tonle Sap Lake fishers target **small-sized** Borneo **river sprats**

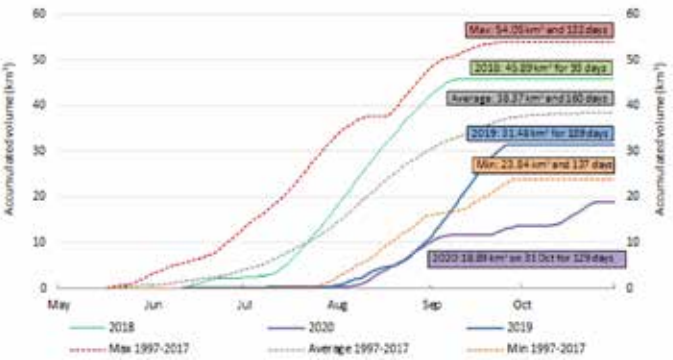
As this year's season kicks off, Cambodian fishers say catches are better than the last two seasons – especially last year when a critical hydrological situation took place.
That was a significant delay in the reverse flow of the Tonle Sap River, which usually accounts for about half the lake's water. Only about a third comes from tributaries with the rest derived from rainfall over the lake.

The Tonle Sap Lake, the largest lake in Southeast Asia, is connected to the Mekong River by the Tonle Sap River. In terms of fish abundance, the lake is among the most productive in the world. For about eight months of each year, especially during the dry season, the river flows "down" from the lake, joining the Mekong in Phnom Penh. During the wet season, however, the vast quantities of water flowing down the Mekong push the Tonle Sap river "up" towards the lake, inundating floodplains and providing access to many fish species for breeding, rearing, and feeding. Such "reverse flows" generate enormous fish production, essential for Cambodian food security where fish is the main staple after rice. Between 1996 and 2005, the reverse flows averaged about 43 km^3 in volume and last about 120 days until the water starts flowing backs down the river into the Mekong.

In 2020, the reverse flows were significantly delayed – about two weeks later than 2019 and 40 days later than the average between 1997 and 2017 (see below). The first started on 7 July and ended on 15 July, with a volume of just 0.21 km^3. A second occurred in late July with the major reversal not taking place until August. Reverse flows also occurred in late September and the third week of October, finally stopping in the last week of October.

At 18.89 km^3, the volume for 2020 was only about 44 percent of the average and the lowest since 1997. As a result, the Tonle Sap Lake was suffering from extremely dry conditions by the end of October. This is when the annual fishing season usually starts with fish migrating down the Tonle Sap River, which has the largest commercial fishery in the Lower Mekong Basin. Catches from the fishery — located on the river in northern Phnom Penh and neighbouring Kandal province— usually peak in December or January.

Based on Article 6 of the Mekong Agreement between Cambodia, Lao PDR, Thailand and Viet Nam in 1995, the Mekong River Commission considered the reverse as "unstable" in 2020. Except in cases of historically severe floods or droughts, the article provides for cooperating in to maintain Mekong flows from diversions, storage releases or other actions of a permanent nature "to enable the acceptable natural reverse flow of the Tonle Sap River to take place during the wet season." In the case of 2020, the MRC concluded that the reverse flow volume appeared to be low due to the low rainfall between May and July as well as the late arrival of the annual monsoon rains, which lasted

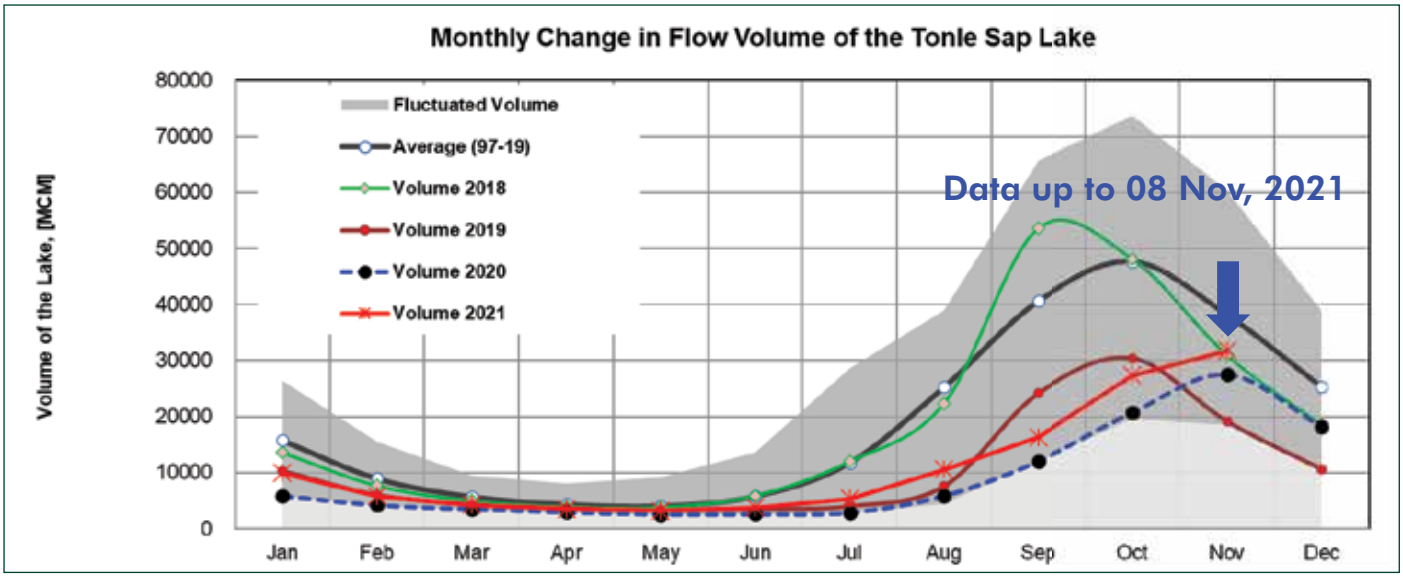


Accumulated reverse flows for 2018, 2019 and 2020, compared to the minimum, maximum and average values of 1997–2005

Source: MRC (2020)

Observed water levels at Kampong Luong (KPL) on the Tonle Sap Lake as well as Prek Dam (PKD) and Phnom Penh (PPP) on the Tonle Sap River in 2020. During May and the first week of September, the water level at Kampong Luong in Pursat province was 0.1–0.5 m lower than in 2019. By the end of September, the level was 2.5 m lower than the previous year. But by the end of October, it was around the same level as 2019 and then somewhat higher from November onwards.

Source: MRC (2020)



Source: MRC (2021a)

from August to October. This rainfall pattern was well captured by characteristics of the reverse flows into the Tonle Sap Lake.

Compared to long-term average volumes, low flows persisted in the Tonle Sap Lake in 2021. But the situation was nowhere near as critical as 2020. The reverse flow started in mid-June – about three weeks earlier than the previous year. By October, the flow volume had exceeded the 2019 volume and later rose to around the same as 2018. As of early November this year, in only one month (September) were volumes considered to be "critical". That compared with five critical months in 2020 and two in 2019. But in all three years, volumes have been either low or critical – and not a single month has experienced "normal" conditions based on average volumes between 1997 and 2019.

With bigger water volumes in the Tonle Sap Lake in 2021, fisherman Path Tol said fishing was the best he'd seen in three years. "Catches are much bigger," he told *Catch and Culture - Environment* in early November as Cambodia's main fishing season was getting underway. Path Thol is village chief in Kampong Koh in Kampong Luong commune in Krakor district in Pursat province. Kampong Luong is located near two fish conservation areas and has many fishing grounds. The main fish habitats are the lake and flooded forest, which provide rich feeding grounds when the Tonle Sap flood plain is inundated every year.

Path Thol said his floating village had 97 fishing households. "Some fishers have only one career, which is fishing by net," village chief said, adding that most tend to be older. "All the young people have left to work at garment factories or construction sites." He said fishers in his village fish only in the open lake, about 5-6 km away, using drift gillnets, known as *mong bandet* in Khmer. "We cannot fish in the flooded forest," Path Thol said, explaining that the nets get snagged in the trees. He said fishers typically head out to the lake mid-afternoon to set the drift nets before returning home. They return in the early evening to collect their catch,

Kampong Prak Village Chief Phat Thol

Photo: Chhut Chheana

Borneo river sprats from the Tonle Sap system

Photo: Chhut Chheana / USAID Wonders of the Mekong

Fish trader Dy Ith removing the heads of mud carps with her son before she and her husband transport the fish to land by boat

Photo: Chhut Chheana

taking the fish back to the village. They go back to the lake the next morning before dawn to bring in a second catch. The catches are dominated by Borneo river sprats (*Clupeiodes borneensis*), a tiny species used to make a Vietnamese-style fermented fish paste. The motorised boats used have at least three men to haul in the catches from the drift nets, which can be up to 2 km in length. "These fishers can catch 100-150 kg a day," the village chief said.

Known as *trey bondol ampeou* ("sugarcane stalk fish") in Khmer, the Borneo river sprat is native to Cambodia, Lao PDR, Thailand and Viet Nam in addition to Borneo. It grows to about 7 cm – compared with common sizes of about 10-12 cm for small species of mud carp known as *trey riel* in Khmer (*Gymnostumus siamensis* and *Gymnostumus lobatus*). Such short-lived carp species are among those that drive fish catches across the Lower Mekong Basin (carps account for more than 45 percent of the basin's fish abundance and biomass).

Phat Thol said the river sprat catches are either exported to Thailand on ice where such small species can fetch wholesale prices of almost $5 per kg. They are also used locally for processing into fish cakes or Vietnamese-style fermented fish paste known as *mam*. Others uses are as feed for local farms raising snakeheads and walking catfish in cages and ponds.

"We had a lot of fish in 2017 but catches started to collapse in 2018," said Dy Ith. Four years ago, she said "women could easily catch 10-20 kg an hour" from motorised boats with three gill nets about 60 m in length. The target species were mud carps used to make prahok, the fermented fish paste that serves as a staple food in Cambodia. From 2018 onwards, however, she said catches dwindled to only 2-3 kg an hour even though the women used longer nets of up to 1,200 m.

Unable to earn an income from fishing, Dy Ith said she turned to rearing snakeheads (*Channa* spp) in cages instead. But receding floodwaters flowing into the village were polluted and she had to frequently move the cages. "It was too difficult so I stopped ... Now I'm raising walking catfish," she said, referring to fish from the *Clarias* genus of air-breathing catfishes known as *trey andeng* in Khmer. "They can adapt more easily to bad water." Dy Ith said she had also started trading catches of other species unloaded in the floating village, taking them to sell on land.

Notwithstanding the improved catches this year compared with recent years when water levels were exceptionally low, Dy Ith said mud carps were nowhere near abundant as two decades ago. "I used to be able to row around the canals in the village as the floodwaters receded and I could easily catch mud carps by slapping the oars on the surface. The fish would jump out of the water and I'd have enough food to eat for three days," she said.

"In those days, the village could catch tonnes of fish every day from arrow traps," Dy Ith said, referring the large-scale commercial fishing gear operated by groups of fishers. "There were times when we'd have three or four tonnes a day and have to throw a tonne back into the lake because the buyers said they didn't want so much."

A fisherman from Kampong Prak setting his net

Photo: Chhut Chheana

Fishers from Kampong Prak setting their drift nets on the Tonle Sap Lake in the late afternoon. This fishing ground is located about 5 km from the village. The fishers return to the village with their catches in the early evening. They head back to the lake before dawn to haul in their second catches.

Photo: Chhut Chheana

Kouk Sokonn – a young fisherman who settled in the village a few years ago with his wife – said the peak fishing period between November and January was the fifth to eighth day of the waxing moon. "I'm now catching 80-100 kg a day," he said. "But we have to spend more time and set longer gill nets than before." Kou Sokonn said he offloaded his daily catches to traders based in the floating village who then sold the fish to land-based traders based in Kampong Luong.

MRC monitoring of fish abundance and diversity at five stations around the Tonle Sap Lake showed increasing catch trends at four stations including one located in Kampong Luong between 2007 and 2018. Part of a broader study at 25 stations in all four countries of the Lower Mekong Basin, the monitoring found that fish species composition was "quite stable" around the Tonle Sap (the study – the first of its type – found 617 species across the basin).

Published earlier this year, the MRC study recommended that fish abundance and diversity be protected to sustain food supplies for millions of people living across the basin. "Fisheries are under stressed conditions due to overfishing and habitat degradation induced by human population growth and economic development, and environmental changes (e.g. flow change) including climate change," it said. The study also recommended setting up more fish monitoring stations closed to hydropower dam projects on the Mekong mainstream. "This will enable hydropower projects in the Mekong mainstream to be assessed in terms of their impacts." Among other recommendations were fish protected areas or conservation zones in transboundary areas and a study to assess the impact of sand mining on fish populations.

Further reading

Mekong River Commission. (2021a). Weekly dry season situation report in the Lower Mekong River Basin for 2–8 November 2021. Vientiane: MRC Secretariat.

Mekong River Commission. (2021b). Status and trends of fish abundance and diversity in the Lower Mekong Basin during 2007–2018 (MRC Technical Paper No. 66). Vientiane: MRC Secretariat. https:// doi.org/10.52107/mrc.qx5yo0

Mekong River Commission. (2021c). Weekly wet season situation report in the Lower Mekong River Basin for 22–28 June 2021. Vientiane: MRC Secretariat.

Mekong River Commission. (2020). Situation report on hydrological conditions in the Lower Mekong River Basin in July–December 2020. Vientiane: MRC Secretariat.

Review finds **61 fishes** migrating between Mekong **freshwater** and **marine** habitats

Number of suspected diadromous species identified in study is higher than previously assumed

Fishes that migrate between fresh and marine waters are known as diadromous species. They are among the most vulnerable species to river infrastructure development. These fishes need to move between fresh water and the sea to complete their lifecycles, so barriers to migration can block access to critical habitats. The Lower Mekong River Basin is undergoing an unprecedented boom in river development, with many dams and irrigation schemes being installed. General patterns of fish migration are known in the basin. But there's been relatively little information on diadromous fish migration so the impacts of river development on their populations probably underestimated.

This has now changed, thanks to a study led by Vietnamese biologist Vu Vi An of the Fisheries, Ecology and Aquatic Resources Division of the Research Institute for Aquaculture No 2 (RIA2) in Ho Chi Minh City, part of the Ministry of Agriculture and Rural Development (MARD). An and his colleagues reviewed information for over one thousand Mekong fish species including from the MRC fish database. They found that diadromy is likely to be a more common life history trait in the Lower Mekong than previously suspected.

Sixty-one of the Mekong fish species assessed showed diadromous traits. Of these, it seemed that 9 were anadromous (growing at sea and breeding in freshwater), 8 were catadromous (growing in freshwater and breeding at sea) and 44 were amphidromous (migrating between freshwater and the sea or vice versa at some stage of their life cycle but not for breeding).

Among Mekong fishes, Krempf's catfish (*Pangasius krempfi*) is the only species scientifically confirmed as anadromous (growing at sea and breeding in freshwater). This catfish can reach around 80 cm and is highly prized by consumers. It inhabits the Mekong estuary and adjacent sea and swims some 700 km upstream to spawn in the Khone Falls area in Lao PDR. The species has been found in fish catches in northern Lao PDR, some 1,500 km from the sea. Viet Nam's National Breeding Centre for Southern Freshwater Aquaculture in Cai Be in Tien Giang province in the Mekong Delta successfully domesticated this species in 2005 under the Mekong River Commission's Aquaculture of Indigenous Mekong Species project. Fingerlings of the catfish have since been distributed to farmers in the delta. But only limited numbers of hatchery-produced fingerlings are available so many farmers stock their ponds with juveniles caught in the wild instead.The breeding centre is part of the Research Institute for Aquaculture No 2 in Ho Chi Minh City.

Photo: Trinh Quoc Trong

The giant mottled eel *(Anguilla marmorata)*, a catadromous species (growing in freshwater and breeding at sea). The species is of considerable economic value. This specimen was on display at a market in Pakse, southern Lao PDR. It was later sold to a local Vietnamese restaurant.

Photo: Somphone Phommanivong

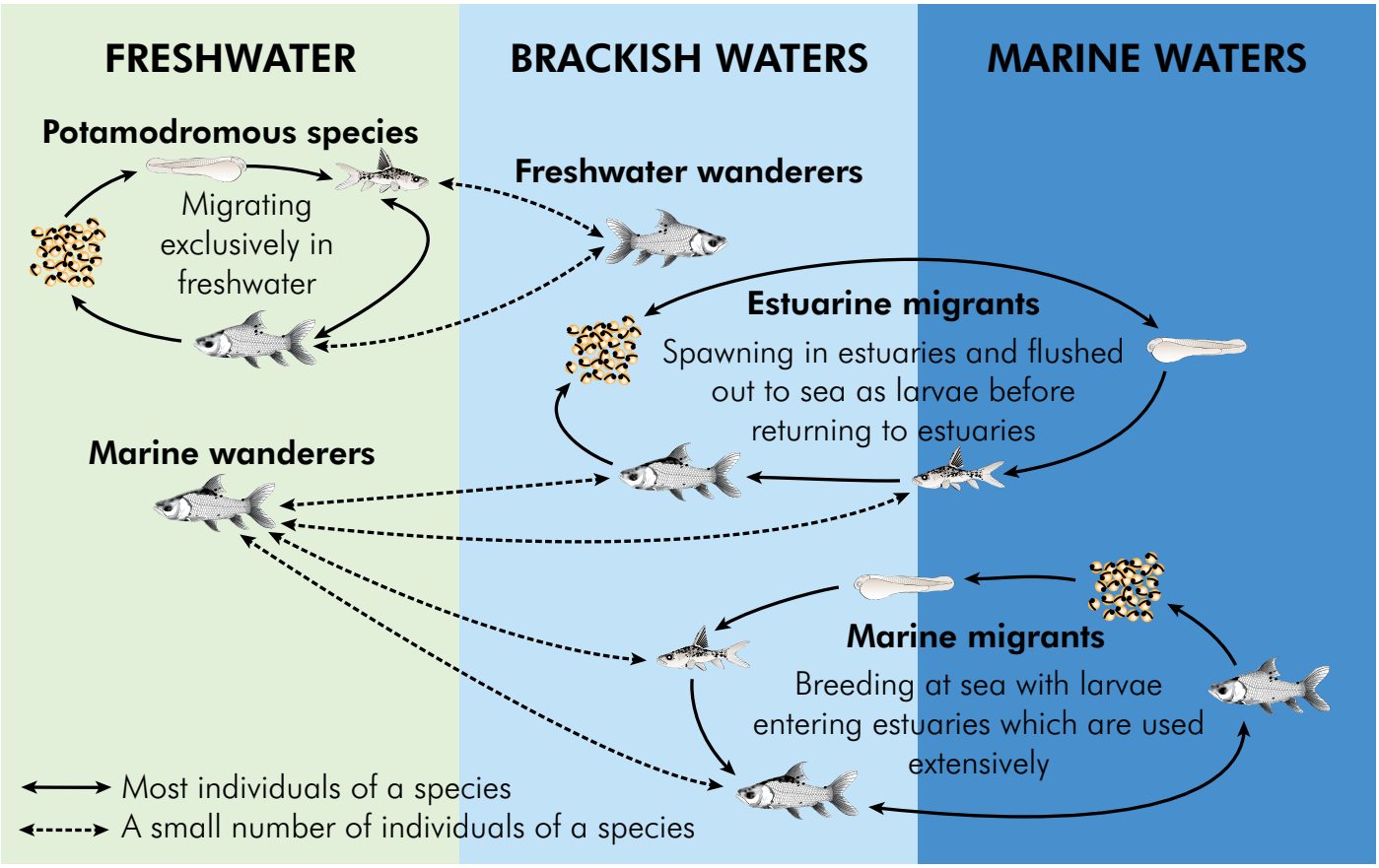
Eight families

Gobies (Gobiidae) accounted for 20 of the species. Seven other families each accounted for 1 to 6 species. These were bully sleepers (Eleotridae), anchovies (Engraulidae), sea catfishes (Ariidae), herrings (Clupeidae), mullets (Mugilidae), shark catfishes (Pangasiidae) and lates perches (Latidae). Most of the 61 species were found in the Mekong Delta in Viet Nam and Cambodia (within 700 km of the sea). But 8 were found in Lao PDR and 6 in Thailand. The 61 fishes were mainly recorded in the Mekong mainstream but also found in tributaries.

Only one species – Krempf's catfish (*Pangasius krempfi*) – has been confirmed as anadromous in the Mekong (by microchemistry). Other anadromous species were "implied" – based on local knowledge or confirmed in other rivers. Freshwater and marine amphidromy could not be distinguished so these were all grouped together. Freshwater amphidromous adult fishes grow and spawn in freshwater with juveniles growing at sea. Marine amphidromous fishes do the opposite – the adults grow and spawn at sea with juveniles growing in freshwater.

In addition to the 61 diadromous fishes, the study found 119 euryhaline species that can tolerate a wide range of salinity. These non-diadromous "wanderers" move occasionally between freshwater and brackish or marine environments, probably for feeding. But migrations by freshwater or marine wanderers are not regular. Nor do they mainly involve most of their populations. Other fishes in the Mekong are classified as potamodromous – migrating exclusively in freshwater.

The study noted that the Mekong River Commission's Regional Fish Abundance and Diversity Monitoring Programme had recorded 25 of the 61 species between 2007 and 2012. These accounted for about 3 percent of the catch of 11 tonnes during the five-year period, of which 2.8 percent was from the Mekong Delta in Viet Nam. In the delta, catches of anadromous



Euryhaline species can tolerate a wide range of salinity but they are not diadromous. These "wanderers" move only occasionally between freshwater and marine environments. The study identified 119 freshwater and marine wanderers in the Mekong.

Illustration: Redrawn from Vu *et al.* (2020) by Chhut Chheana

species were higher in the dry season. But in countries upstream, catches were bigger in the wet season. In all countries, catadromous and amphidromous catches were likely to be higher in the dry season.

'Krempf's catfish inhabits the Mekong estuary and adjacent sea in Viet Nam and swims upstream at least 720 km to spawn in the Khone Falls area in Lao PDR'

Some diadromous fishes are of extremely high value. The giant mottled eel (*Anguilla marmorata*), a catadromous species that can reach 70 cm, can fetch as much as $32 per kg. The eel spawns in the ocean and has also been found in the Khone Falls area. The anadromous Krempf's catfish has a first-sale price of $10 to $17 per kg. This catfish can reach around 80 cm. Krempf's catfish inhabits the Mekong estuary and adjacent sea in Viet Nam and swims upstream at least 720 km to spawn in the Khone Falls area in Lao PDR. But they have also been reported in catches during the early wet season as far upstream as upper Lao PDR, some 1,500 km from the sea.

These two species are particularly preferred for consumption even at much higher prices. Local fishers often sell high-value fishes to traders who deliver the fish directly to consumers and restaurants to earn more income. So diadromous species make significant contributions to livelihoods and income generation across the Lower Mekong.

The study notes that river infrastructure like dams, weirs and pumps and floodplain developments for agriculture have had significant impacts on the abundance of diadromous fishes in sub-tropical or tropical rivers. These include the hilsa shad (*Tenualosa ilisha*), a highly prized anadromous species across the Indian sub-continent. In the Pearl River in China, the anadromous Chinese sturgeon (*Acipenser sinensis*) is now critically endangered. In Australia, several diadromous fish species have declined and are now likely extinct above river barriers.

'First step'

Findings of the study are considered the "first step" to investigate the diadromous status of many fish species in the Mekong. But considerable work remains, especially for species tentatively assigned as diadromous that require scientific tools like microchemistry, tagging and telemetry to validate their diadromy.

"We found diadromy appears to be more common than previously assumed in the Mekong River," the authors conclude. "Some of the diadromous fish are economically important and are distributed among all Mekong countries. Many of these species are known to migrate relatively long distances, connecting with the Mekong estuary and the sea to complete their life cycles. River development will impact them. They need to be considered in holistic ecosystem planning to prevent declines, whilst also meeting food and energy demands in the region."

Further reading

An V. Vu, L.J. Baumgartner, M. Mallen-Cooper, J.A. Howitt, W.A. Robinson, N. So and I.G.Cowx. 2020. Diadromy in a large tropical river, the Mekong: more common than assumed, with greater implications for management. Journal of Ecohydraulics. https://doi.org/10.1080/24705357.2020.1818642

Second anadromous species confirmed

A yellow-fin catfish caught in Phnom Penh. The fish migrated up from Viet Nam together with Krempf's catfish, another species from the shark catfish family. This fish weighed 16 kg and was a female ready to breed. It was caught in June at the start of the wet season.

PHOTO: FIELD GUIDE TO FISHES OF THE CAMBODIAN FRESHWATER BODIES

Vu Vi An told *Catch and Culture - Environment* in November that microchemical analysis had confirmed a second anadromous species in the Mekong — the yellow-finned catfish (*Pangasius mekongensis*). This finding is the subject of a new study expected to be published in 2022. This species is comparatively new to science (it was first described in 2003). According to MRC Technical Paper No 10, it occurs throughout the Lower Mekong but is relatively rare.

Further reading

Poulsen, A.F., K.G. Hortle, J. Valbo-Jorgensen, S. Chan, C.K.Chhuon, S. Viravong, K. Bouakhamvongsa, U. Suntornratana, N. Yoorong, T.T. Nguyen and B.Q. Tran. 2004. Distribution and Ecology of Some Important Riverine Fish Species of the Mekong River Basin. MRC Technical Paper No. 10. ISSN: 1683-1489

Wind and **sun** increasingly **powering** Viet Nam's voracious **appetite** for **energy**

By Nguyen Tuong Thuy *

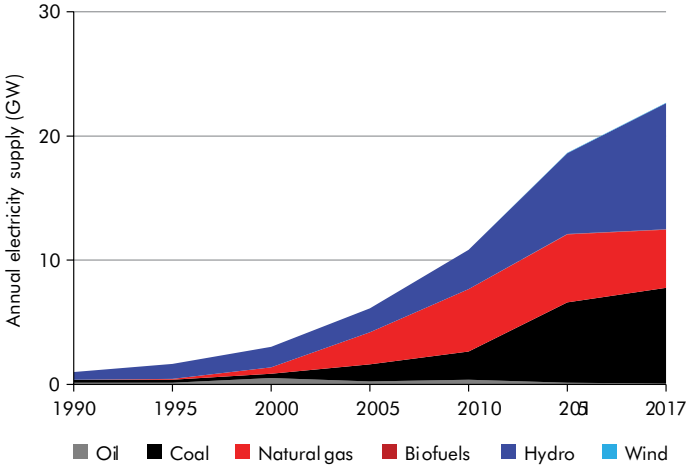
Viet Nam is ramping up its investment in wind power as the country reduces its reliance on fossil fuels under a 10-year master plan for power development. At the same time, exploding investment in Vietnamese solar projects has propelled the nation to third place worldwide in terms of newly installed solar capacity.

With vast coastal areas suitable for offshore wind, a strong national commitment to renewables and soaring power demand in a country of almost 100 million people, Viet Nam is fertile ground for renewable energy development. According to a World Bank report in June this year, Viet Nam consumes more energy per unit of economic output than the Philippines, Malaysia, Indonesia or India. With high and consistent wind speeds along more than 3,200 km of coastline, the bank estimates the country's offshore wind potential at up to 500 gigawatts (GW). And in a report released in September last year, Fitch Ratings – one of the "Big Three" credit rating agencies in the United States – forecast that Viet Nam's electricity demand would increase at an average annual rate of up to nine percent over the next decade. In its Eighth National Power Development Master Plan for 2021-2030, the Vietnamese government says it

A solar and wind power farm in Ninh Thuan province in southern central Viet Nam. With plentiful sunshine and high wind speeds, Ninh Thuan and the neighbouring province of Binh Thuan are Viet Nam's most suitable areas for renewable energy.

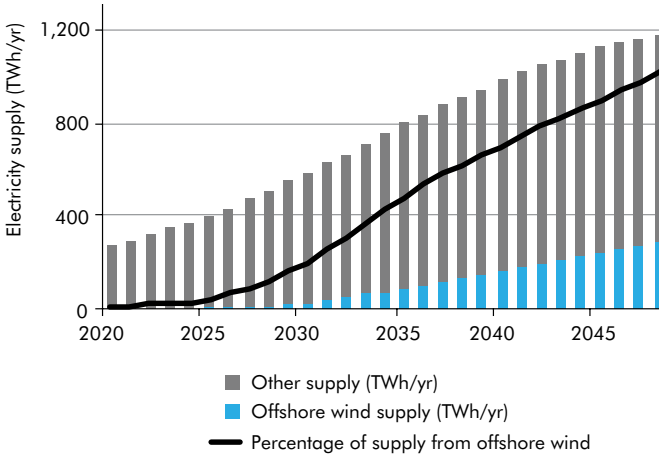
Photo: Nguyen Tuong Thuy

Coal, hydro and gas …



SOURCE: WORLD BANK (2021)

… give way to offshore wind



SOURCE: WORLD BANK (2021)

plans to attract up to $128 billion in energy investments including $32 billion for grid infrastructure. Wind is expected to generate 12G GW by 2025, six times an earlier forecast of 2 GW, and 19 GW by 2030, more than three times the previous projection of only 6 GW.

Benefits, challenges

"Offshore wind could play a significant role in sustainably meeting Viet Nam's rapidly growing electricity demand and has the potential to supply 12 percent of its electricity by 2035," the World Bank says."By replacing coal-fired generation, this could help to avoid over 200 million metric tons of carbon dioxide emissions and add at least $50 billion to Viet Nam's economy by stimulating the growth of a strong, local supply chain, creating thousands of skilled jobs, and exporting to other offshore wind markets globally."

The World Bank sees two scenarios for offshore wind – a low-growth one supplying 5 percent of the country's energy by 2035 and a high-growth scenario reaching 12 percent by the same year. The latter is expected provide faster cost reductions, four times more jobs and value added to the economy – and less than half the net energy costs to consumers. It would also involve greater supply chain investment and optimisation, leading to exports of electricity to regional and global markets. In addition, the high-growth scenario is expected to increase local content in projects, thereby reducing imports, boosting economic development, increasing competition and lowering energy costs. Under this scenario, the cost of offshore wind could reach parity with fossil fuel costs sooner, with cumulative net costs to consumers 60 percent lower through to 2035 and net benefits from 2036 – three years before the low-growth scenario.

"Experience in developed offshore wind markets suggest that ambitious, long-term targets can serve as cornerstones for industry development," the report says. "The results of this roadmap suggest that a target of 10 GW by 2030 and 25 GW by 2035 would likely accomplish this objective." At the same time, a consequence of higher growth is a greater risk of adverse environmental and social impacts – highlighting the need to develop a marine spatial plan and a framework for environmental legislation before offshore development leases are issued. The report also says that existing regulations, laws, processes and infrastructure will need to be improved.

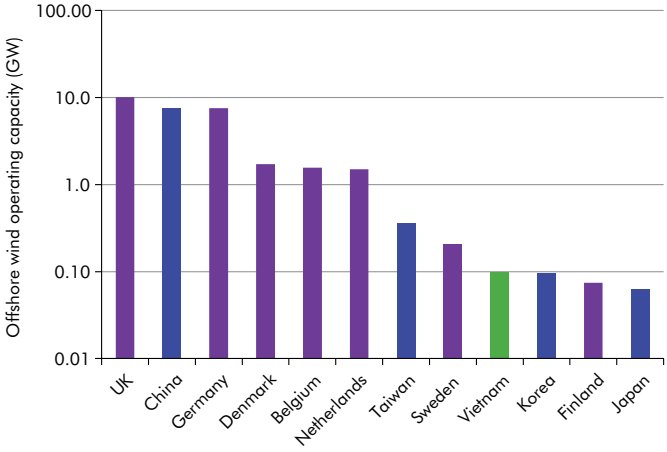
Corporate moves

Among companies seeking to capitalise on the promising new industry are Denmark-based Ørsted A/S, a global leader in offshore wind, and Viet Nam's diversified T&T Group based in Hanoi. In September this year, the two companies signed a memorandum of understanding to launch a wind energy partnership over 20 years. Ørsted says it has so far developed 27 offshore wind farms worldwide with gross installed capacity of more than 7.6 GW and a further 2.3 GW under construction. The Danish company says capacity is targeted to reach 30 GW by 2030. The partnership with T&T expects to generate almost 10 GW from wind projects off the coast of central Viet Nam – Binh Thuan and Ninh Thuan provinces, the country's most suitable areas for offshore wind development. Investments of up to $30 billion are envisaged. "To support

Dam Nai Wind Farm in Ninh Thuan province, which has the greatest potential for wind power in Viet Nam with sunny days for more than 90 percent of the year. The 40 MW farm is a joint venture between TSC Invest and Development Joint Stock Company in Ho Chi Minh City and Singapore-based Blue Circle Pte Ltd. Elsewhere in Viet Nam, Blue Circle has another two 40 MW projects with potential capacity of more than 200 MW in neighboring Binh Thuan province in partnership with AC Energy Corp of the Philippines, part of the Ayala Group. The partnership aims to develop, construct, own and operate a renewable energy project pipeline of about 3,000 MW across Asia. In addition to Singapore and Viet Nam, Blue Circle has offices in Cambodia and Thailand as well as a presence in Indonesia, Lao PDR and Myanmar.

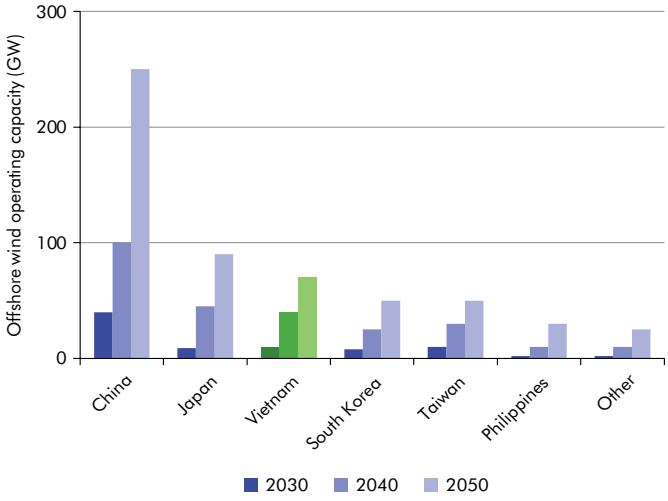
Photo: Nguyen Tuong Thuy

Global offshore wind market (2019)



Source: BVG Associates/World Bank (2021)

East Asia offshore wind forecasts



Source: BVG Associates/World Bank (2021)

this ambitious build-out, we need to work closely with partners like T&T, which has an impressive track record of developing large energy projects in Viet Nam and brings a deep understanding of the market," said Martin Neubert, Ørsted's chief commercial officer who is also the company's deputy chief executive.

'The start of this collaboration is happening at an ideal time for both parties'

T&T has since joined forces with UPC Renewables, a Colorado-based wind and solar farm developer, with another memorandum of understanding to develop onshore and nearshore wind farms and solar projects in Viet Nam, although nearshore projects pose environmental risks (see box opposite). The partnership, expected to invest an estimated $2.5 billion, envisages a combined capacity of nearly 1.5 GW from projects in Ninh Thuan and the Mekong Basin province of Dak Nong in the Central Highlands and Soc Trang, Ben Tre and Bac Lieu in the Mekong Delta.

"The start of this collaboration is happening at an ideal time for both parties," said Logan Knox, chief executive of the US company's Vietnamese unit. "With UPC Renewables long experience in developing wind power projects globally, T&T's large ambitions in Viet Nam, and each of the partners already successfully implementing projects in-country we expect to propel Viet Nam's energy transition forward rapidly," Knox said.
UPC has more than 4.5 GW of wind and solar projects operating under its global umbrella with an investment value of more than $8.4 billion. These include two 30 MW wind projects in the Mekong Delta province of

Nearshore wind projects near Mekong Delta seen adversely affecting environment

In addition to fixed offshore wind projects at water depths of up to 50 m and floating projects at greater depths, the World Bank report looks at nearshore projects, considered as a hybrid between onshore and offshore wind, located about 5.5 km from the shore.

"Vietnam has established an early pipeline of such projects, particularly around the Mekong Delta," the report says. "Wind development in these nearshore areas, however, has a high risk of significant adverse environmental and social effects." These include the presence of threatened species in coastal areas and being close to protected or sensitive habitats as well as potential impacts on coastal sediment dynamics and communities, especially fishers.

Such nearshore projects "may be unlikely to meet the requirements of international lenders who typically adopt World Bank Group environmental and social (E&S) standards," the banks says. As such, the report includes recommendations that "seek to address risks associated with widespread development of nearshore projects". After the initial pipeline of nearshore projects is completed, the report reckons most offshore wind projects in Viet Nam will be conventional fixed projects.

EDF unit makes 'significant investment' in Vietnamese rooftop solar developer

Vietnamese investment management company VinaCapital announced on October 13 that Électricité de France unit EDF Renewables had invested an undisclosed sum in the holding company of its rooftop solar power subsidiary. In a statement, Ho Chi Minh City-based VinaCapital said the French company had made a "significant investment" in SkyX Solar, which had about 30 MW of solar projects already operating.

The statement said SkyX Solar, also based in Ho Chi Minh City, planned to invest more than $100 million to develop a further 200 MW of rooftop solar and distribute energy solar projects for commercial and industrial customers over the next two to three years. "In just a few years, Viet Nam's rooftop solar energy sector has grown from virtually nothing into Southeast Asia's leading solar market, with cumulative rooftop solar capacity totaling 9.3 gigawatts at the end of 2020," the statement said, citing data from BloombergNEF.

"The potential for renewables in Viet Nam is enormous," said Yalim Ozilhan, the EDF Renewables director or Southeast Asia. "We are keen to expand our footprint in the country drawing on our global knowhow in rooftop solar solutions," Ozilhan said. He added that SkyX Solar had "quickly scaled up providing world class rooftop solar solutions to meet the high demand for low carbon sources of energy from commercial and industrial customers, something that is set to increase in the years ahead."

Mr Kumar

Photo: SkyXSolar

Samresh Kumar, chief executive and founder of SkyX Solar, said the company had around 100 MW of rooftop solar projects that were either already operating or being developed. "We intend to partner with more industrial companies in Viet Nam to build many hundred MWs of solar capacity with them," Kumar said.

VinaCapital chief executive and co-founder Don Lam described SkyX Solar as a leading company in the sector. "A few years ago, we recognized the critical role that clean energy would play in powering Viet Nam's continued growth and development," he said. "The launch of SkyX Solar in 2019 is just one of our initiatives in the sector, and in a very short span of time, it has grown to become a leading player in the commercial and industrial rooftop solar market in the country." Lam, who also serves a board member at SkyXSolar, said VinaCapital looked forward to exploring "other projects where there are synergies" with EDF Renewables.

Earlier this year, EDF Renewables secured a deal worth more than VND2,210 billion ($98 million) to develop two wind power plants in the Central Highlands province of Dak Lak with a total capacity of 70 MW. Worldwide, the French company aims to be producing 50 GW of renewable energy by 2030 and considers Viet Nam as one of its strategic markets in Asia.

In 2020, Viet Nam experienced a boom in rooftop solar installations coinciding with a connection deadline for subsidies. More than 9 GW was installed, including 6 GW in December alone. The government is now drafting a new price mechanism for rooftop solar to replace the existing feed-in-tariff table. The new mechanism, according to the Ministry of Industry and Trade, will use a self-consumption rate based on the ratio between electricity consumed on site and the total installed production capacity. Under this model, the electricity seller would be able to sell most of the electricity generated to consumers and the rest back to the national grid via the state utility Vietnam Electricity (EVN). This means commercial and industrial energy users would be allowed to self-generate and, where possible, sell their surplus to the grid.

Further reading

BloombergNEF. 2021. Vietnam Was Likely the Third-Largest Solar Market in 2020, 7 January, 2021. Bloomberg Finance LP, New York.

Bloomberg. 2021. In 2020 Vietnam Put Solar Panels on Everything. Podcast. 23 January, 2021. Bloomberg Finance LP, New York.

Shani, N. and B. Suryadi. 2021. Vietnam Smashes 2020 Solar Capacity Records. 10 April, 2021. The ASEAN Post, Kuala Lumpur.

VinaCapital. 2021. EDF Renewables Partners with VinaCapital to Invest in SkyX. VinaCapital Group, Ho Chi Minh City.

Soc Trang. Elsewhere in the Asia Pacific region, wind and solar assets operating or under construction are located in Australia, China, India, Indonesia and the Philippines. Its development portfolio of more than 10 GW spans the same countries along with Mongolia, South Korea and Taiwan.

In 2020, T&T switched on four solar power plants with a combined installed capacity of 245 MW. By the end of this year, the Vietnamese company is on track to commission 530 MW of onshore wind projects. Over the next 10 years, it plans to develop energy projects with an estimated total capacity of 10 GW to 11 GW. In addition to renewables, this includes a $2.3 billion liquefied natural gas (LNG) project in Quang Tri province with 60 percent of the investment coming from three Korean companies – Hanwha Corp, Korea Gas Corp (Kogas) and Korea Southern Power (Kospo).

Sunny skies for Chinese solar giant

Elsewhere in the solar sector, China's JinkoSolar Holding Co Ltd – one of the world's top makers of solar modules – started building a $366 million silicon wafer plant in the northern province of Quang Ninh in late September. The wafers will supply the Chinese company's new $500 million solar photovoltaic (PV) cell facility, also located in Quang Ninh, and other plants in Malaysia and the United States (JinkoSolar has 10 production facilities worldwide). The two Vietnamese plants are both located in Song Khoai Industrial Park, developed by Thailand's Amata Corp PCL.

'Viet Nam ranks third in the world for newly installed solar power capacity after China and the United States'

JinkoSolar began work on the solar PV cell facility on 32 ha of land in April this year. On September 19, the company received an investment registration certificate for the second project covering 20 ha. Production at the 7 GW wafer facility – which is also carrying out research and development – is scheduled to start in December, with annual output of 1.43 million silicon ingots and wafers. The facility is expected to have about 2,200 employees. The separate PV cell plant began operating in October with about 2,250 employees and is forecast to generate annual sales of $1.3 billion.

In southern Viet Nam, JinkoSolar and distributor Solar Z has installed 2 MW of 535-watt rooftop solar panels at a plant operated by Saigon Alcohol, Beer and Beverage Joint Stock Co (Sabeco) in August. Known for its "Bia Saigon" and "33" brands of beer, Sabeco is Viet Nam's largest brewer. Controlled by Thai Beverage PCL, which acquired a stake of 53.6 percent in Sabeco for almost $5 billion in 2017, the company is carrying out an environmental program to reduce electricity costs.

According to JinkoSolar, Viet Nam ranks third in the world for newly installed solar power capacity after China and the United States. "The demand for PV modules in Viet Nam has also been gradually ramped up towards monocrystalline and large silicon wafers," the Shanghai-based company said in May. At the end of last year, the company's integrated annual capacity was 22 GW for monocrystalline wafers, 11 GW for solar cells, and 31 GW for solar modules.

'The State Bank of Vietnam has been spearheading the greening of the Vietnamese financial system'

Vietnamese banks have meanwhile been attracting considerable green finance from abroad. In September, Proparco – the private sector arm of Agence Française de Développement (AFD) – provided a $50 million loan to Ho Chi Minh City Development Joint Stock Commercial Bank (HDBank) to finance green projects for sustainable growth. In July, the International Finance Corp (IFC), the World Bank's private sector affiliate, extended a long-term green loan of $100 million to Orient Commercial Joint Stock Bank (OCB). And in May, AFD provided the Bank for Investment and Development of Viet Nam (BIDV) with a $100 million loan and $366,000 in technical assistance to finance businesses investing in environmental protection, climate change responses and green growth. Others to

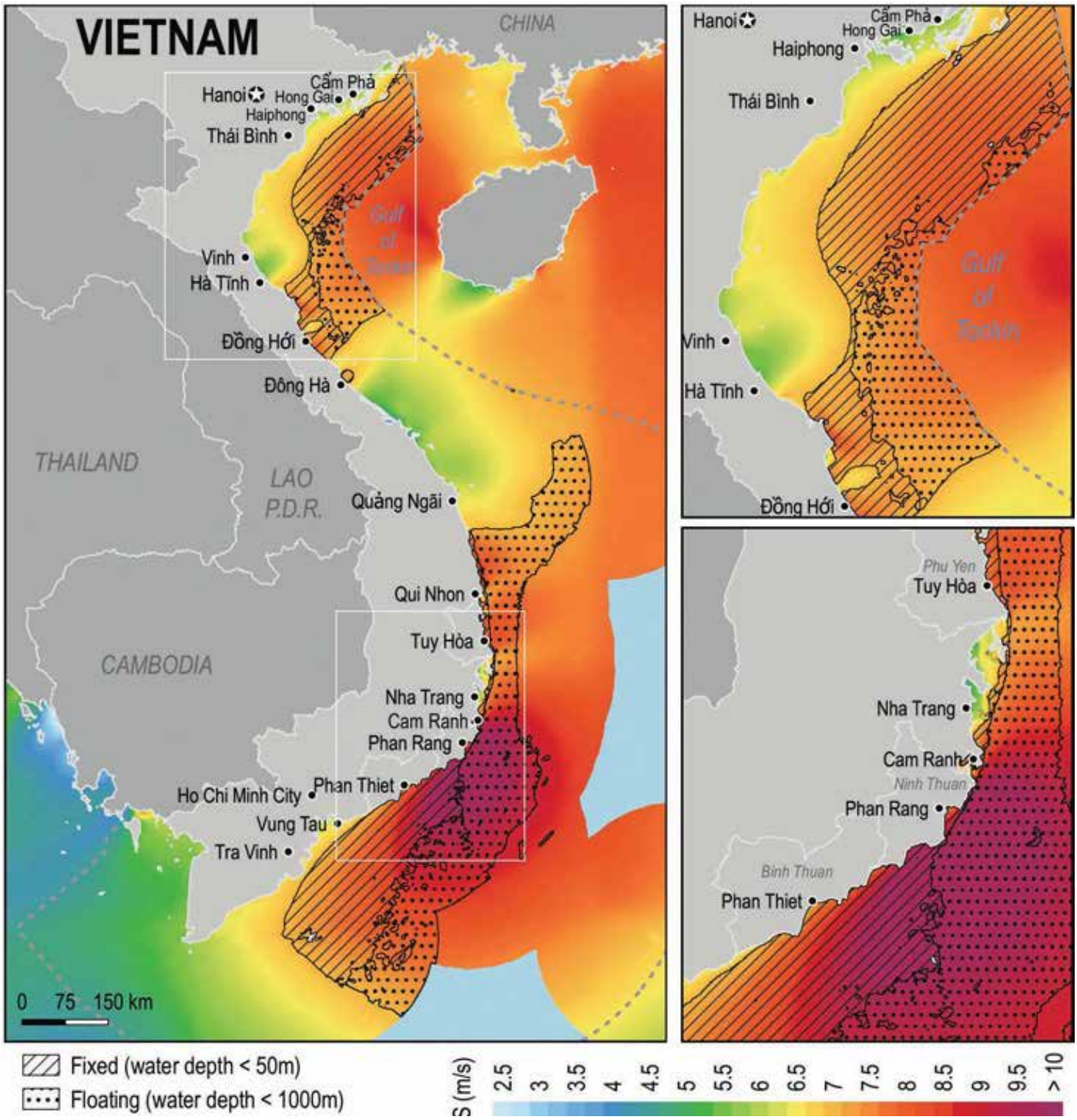
New wind farm inaugurated in Mekong Delta

Viet Nam inaugurated a 48-megawatt wind farm in the Mekong Delta province of Tra Vinh on November 23. Valued at $120 million, the Korea-Tra Vinh (Phase 1) farm was developed by Singapore-based TWPC Pte. Ltd., South Korea's Samtan Co. Ltd. and Netherlands-based Climate Investor One, a finance facility partly funded by the European Union. The farm is located on 1,209 ha of water and 2 ha of land.

Further reading

https://twpc.com.vn

Potential offshore wind areas, showing highest wind speeds in southern central Viet Nam



The low-growth scenario mostly comprises conventional, fixed offshore wind farms. Under this scenario, there will be 7 GW of conventional fixed projects by 2035 along with 3.3 GW of nearshore projects and 400 MW of floating projects. But fixed and floating projects will cover less than 3 percent of the potential development areas identified above.

Source: World Bank (2021)

Trungnam Wind Farm in Ninh Thuan province, owned and developed by Trungnam Group in Ho Chi Minh City. The wind farm has a capacity of 152 MW. Trungnam also has a 204 MW solar farm in Ninh Thuan province and a 140 MW solar farm in Tra Vinh province along with three hydropower plants in the Central Highlands provinces of Dak Lak and Lam Dong.

Photo: Nguyen Tuong Thuy

secure long-term funding for green projects from international financial institutions have included Agriculture and Rural Development of Viet Nam (Agribank), Bank for Foreign Trade of Viet Nam (Vietcombank), Tien Phong Bank, and Nam A Bank.

The State Bank of Vietnam has been spearheading the greening of the Vietnamese financial system through the Vietnam Green Growth Strategy and the National Action Plan on Green Growth for 2014-2020. The central bank's Green Project Catalogue includes renewable and clean energy. The Ministry of Natural Resources and Environment has also issued a list of green projects as a reference for financial institutions (see *Catch and Culture - Environment*, Vol 27, No 2).

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Further reading

Fitch Ratings. 2020. Fitch Affirms Vietnam Electricity at 'BB'; Outlook Stable. Rating Action Commentary, 15 September 2020. Fitch Ratings Inc. New York. https://www.fitchratings.com/research/corporate-finance/fitch-affirms-vietnam-electricity-at-bb-outlook-stable-15-09-2020

JinkoSolar. 2021. JinkoSolar Awarded Top 1 Prestigious Module PV Brand in Vietnam with over 2.5GW supplied in 2020. 11 May, 2021. JinkoSolar Holding Co. Ltd, Shanghai.

Proparco. 2021. Proparco and HDBANK Commit to Support Green Projects in Viet Nam. 14 September, 2021. Proparco, Paris. https://www.proparco.fr/en/actualites/proparco-and-hdbank-commit-support-green-projects-vietnam

UPC Renewables. 2021. UPC Renewables and T&T Group partner to o build portfolio of wind power projects across Vietnam. 28 September, 2021. UPC Renewables, Boulder. https://www.upcrenewables.com/others/upc-renewables-and-tt-group-partner-to-build-portfolio-of-wind-power-projects-across-vietnam/

World Bank. 2021. Offshore Wind Roadmap for Vietnam. World Bank, Washington. https://documents1.worldbank.org/curated/en/261981623120856300/pdf/Offshore-Wind-Development-Program-Offshore-Wind-Roadmap-for-Vietnam.pdf

PetroVietnam unit to build **substations** for **offshore wind** project in **Taiwan**

Subsidiary of Vietnamese oil giant sees 'strategic breakthrough' in growing renewables market with deal for major offshore wind project in Taiwan in partnership with global leader in offshore sub-stations for offshore farms

Vietnam National Oil and Gas Group (PetroVietnam) and Danish offshore energy company Semco Maritime A/S have secured the preferred supplier agreement for Taiwan's Hai Long Offshore Wind Project, expected to deliver more than one gigawatt (GW) of energy when commissioned in 2025-2026. In a statement released on October 12, PTSC Mechanical & Construction Co Ltd – a subsidiary of PetroVietnam Technical Services Corp – said it would build two offshore substations totaling 18,000 tonnes for the Taiwan project at its yard in Vung Tau, the port city in southern Viet Nam which serves as the hub for the country's offshore oil and gas industry.

PTSC Mechanical & Construction said the the agreement was a "strategic breakthrough" for the company in the renewable energy sector and "very important" for developing its capacities in the offshore wind segment of the energy sector. The transition from fossil fuels to clean energy is 'taking place widely in Viet Nam as well as other countries," the statement said.

The company is Viet Nam's leading contractor for construction, engineering, procurement, installation and commissioning. Since being set up in Vung Tau in 2001, the PetroVietnam unit has completed more than 60 projects in both the offshore and onshore segments of the oil and gas sector including platforms, living quarters and jetties. Foreign clients have included European oil and gas companies British Petroleum, ENI and Total as well as Malaysia's Petronas.

'Solid footprint in the exciting Asian offshore wind market'

In a separate statement, Semco Maritime said the preferred supplier agreement was the largest offshore substation contract ever awarded by a Taiwan project. The statement said the Danish and Vietnamese companies would execute the project with ISC Consulting Engineers as primary sub-contractor from the December quarter of this year with installation planned for 2024. Frank Holm, vice president for renewables at Semco Maritime, said the "strategically important order … provides us with a solid footprint in the exciting Asian offshore wind market, which is developing at a fast pace."

Dating back to 2016, the Hai Long Wind Power Project is a joint venture between Canadian-based Northland Power Inc, Singapore's Yushan Energy Pte Ltd and Japanese trading company Mitsui & Co Ltd. According to the Taipei-based venture, the project "will contribute to realising the Taiwanese government's ambition of having installed 5.5 GW offshore wind capacity … to secure a leading position for Taiwan in offshore wind in East Asia." Located about 50 km off the coast in Taiwan Strait, the project is located in waters with a depth of 35-55 meters.

Taiwan seen as 'offshore wind export hub' for Asia-Pacific region

The 1,044 MW project will comprise two farms. The first is 45-55 km from the shore in the western county of Changhua near Taichung with capacities of 300 MW (2A) and 232 MW (2B). The second is 50-70 km from the coast with a capacity of 512 MW. By 2024, the project partners say they are determined make Taiwan the "offshore wind export hub" for the Asia-Pacific region. Average winds speed at both sites are 10-11 m/s.

Further reading

Hai Long Offshore Wind. 2021. Hai Long Awarded Semco Maritime and PTSC M& C Preferred Supplier Agreement for Two Substations. 12 October, 2021. Hai Long Offshore Wind, Taipei.

PTSC M&C. 2021. PTSC M&C Achieves Important Milestone In Renewables. 12 October, 2021. TSC Mechanical & Construction Co Ltd, Vung Tau, Viet Nam.

Semco Maritime. 2021. Preferred Supplier Agreement for Hai Long 2 And 3 in Taiwan. 12 October, 2021. Semco Maritime A/S, Esbjerg, Denmark.

Offshore wind project showing a sub-station resembling an oil platform in the distance

Photo: Semco Maritime

Cambodia considers extending **fish-pass monitoring** on Pursat River

Tributary of Tonle Sap Lake is priority catchment for Cambodia under MRC fish-passage guidelines

Cambodia's Ministry of Agriculture, Forestry and Fisheries (MAFF) is considering plans to extend fish- pass monitoring to a third demonstration site on a major tributary of the Tonle Sap Lake, the largest lake in Southeast Asia. Under the Lower Mekong Fish Passage Initiative with the Ministry of Water Resources and Meteorology (MOWRAM) and the Ministry of Mines and Energy (MME), the Inland Fisheries Research and Development Institute (IFReDI) has already been monitoring two fish passes on irrigation barriers to fish migration on the Pursat River in western Cambodia.

One of the fish passes is located on the Kbal Hong Weir in Pursat town, almost 30 km upstream from where the river flows into the lake. Considered by the MRC as one of the most effective fish passes in the Mekong region, it was built under a Cambodian government partnership with the the Australian Centre for International Agricultural Research (ACIAR), the US Department of the Interior, and the MRC. The second, located about 20 km upstream from the provincial town, was built under a separate partnership with the Japan International Cooperation Agency (JICA).

A nine-member team from IFReDI – part of the Cambodian Fisheries Administration – has been monitoring fish at the two demonstration sites for a couple of years.

Fisherman with silver barb caught in front of the fish pass at Kbal Hong Weir in Pursat town in November this year

Photo: Chhut Chheana

Aerial view of Pursat town and Kbal Hong Weir with fish pass at right. The Cardamom Mountains bordering Thailand can be seen in the distance.

Photo: Chhut Chheana/USAID Wonders of Mekong

Boy fishing below Kbal Hong Weir in November this year. The weir is a popular location for recreational fishing in Pursat town.

Photos: Lem Samean

Fisherman with mud carps (*Gymnostumus* spp) caught at Kbal Hong Weir in November. Seasonal migrations of mud carps typically start around this time of the year as the floodwaters of the Tonle Sap Lake recede at the end of the wet season. Peak catches are usually in December or January. Mud carps are used to make a fish paste known as prahok, a staple food in Cambodia., especially during the dry season.

PHOTO: LEM SAMEAN

Damnak Ampil dam and fishway, about 20 km upstream from Pursat town, in November this year. This location is also popular for recreational fishing.

Photo: Chhut Chheana / USAID Wonders of Mekong

Villagers fishing around the Damnak Ampeou fish pass (above). Inland Fisheries Research and Development Institute Deputy Director Tob Chann Aun inside the fish pass (below).

Photos: Chhut Chheana

The fish pass was designed by a team led by Australian Fish Passage Services Pty Ltd based on Cambodian inputs at a regional fish passage masterclass in 2018. The masterclass – the first of its kind – brought together fish biologists and engineers from Cambodia, Lao PDR, Myanmar, Thailand and Viet Nam with Indonesian staff also present from the Southeast Asian Fisheries Development Center (SEAFDEC). It was held at the SEAFDEC training centre at Samut Prakan in Thailand and supported by MRC, the Australian Centre for International Agricultural Research and the US Department of the Interior.

Photo: Chhut Chheana/USAID Wonders of Mekong

Inland Fisheries Research and Development Institute (IFReDI) Deputy Director Tob Chan Aun (left) inspects the new fishway with colleagues in November

Photo: Chhut Chheana

Morning sampling at the Kbal Hong Weir when *Catch and Culture – Environment* visited in early November, for example, identified 16 species migrating upstream from the lake. These included slender horseface loaches (*Acantopsis ioa*), red-tail tinfoils (*Barbonymus altus*), silver barbs (*Barbonymus gonionotus*), red-tail loaches (*Yasuhikotakia modesta*) and skunk loaches (*Yasuhikotakia morleti*). In 2019, with funding for monitoring from the Department of the Interior, IFReDI recorded 119 species using the fish pass.

The team now hopes to extend such monitoring to a third site more than 50 km upstream from the town in the remote district of Veal Veng where the Asian Development Bank (ADB) completed the construction of a dam earlier this year as part of a flood and drought mitigation project. IFReDI Deputy Director Tob Chann Aun – the monitoring team leader who also serves as deputy chair of an inter-ministerial Technical Working Group on the Lower Mekong Fish Passage Initiative – said he hoped to start sampling at the new fish pass by the end of this year.

'Huge problem'

With more than 100 fish species, the Pursat River is Cambodia's priority catchment under MRC guidelines on fish-passage barriers and fish-friendly irrigation structures (others are the Nam Pa tributary in Lao PDR, the Nam Kam tributary in Thailand and the Mekong Delta in Viet Nam). Published in 2014, the guidelines note that the thousands of barriers to fish migration in the Lower Mekong are a "huge problem" for local fisheries and that rehabilitating many of these barriers is "desperately needed". The guidelines – which are being updated in partnership with ACIAR and the US Department of the Interior – highlight the importance of monitoring fish passes in consultation with design team biologists.

'Ensuring fish movement in the design of irrigation infrastructure projects is often overlooked'

The ADB has meanwhile published a report on fish passes for small-scale irrigation in Lao PDR. "Despite the important role that inland fisheries play in the hu-

man diet and rural income generation, ensuring fish movement in the design of irrigation infrastructure projects is often overlooked," it says. But "with growing investments in irrigation infrastructure and modernization, it is critical to reconcile irrigation and fisheries agendas."

'ADB work with Lao engineers and fishery experts from the National University of Laos and Charles Sturt University in Australia proved that integrating fishways into existing weirs was "effective in ensuring a functional, low-cost measure to secure fish productivity" '

The report notes that the ADB's strategy for 2030 emphasizes food security, poverty reduction, and climate resiliency. "Continuity of fish productivity is essential in reaching all these goals," the bank says. "ADB should, therefore, ensure that its infrastructure projects pose no threat to the already diminishing fish population and, ultimately, to food security. Ideally, in new ADB infrastructure projects, effective fishway construction should be required, and retrofitting of existing structures to incorporate fishways should be explored."

According to the report, which was published last year, ADB work with Lao engineers and fishery experts from the National University of Laos and Charles Sturt University in Australia proved that integrating fishways into existing weirs was "effective in ensuring a functional, low-cost measure to secure fish productivity." Moreover, the Lao experience with designing and building fishways "provided the empirical evidence needed to expand the investment in fishways into other ADB irrigation investment projects."

The report concludes that fishway research is best carried out through "adaptive management" that generates knowledge to build institutional and individual capacity, which is then translated into governance, policy, and practice. "In strong adaptive management frameworks, research informs the development agenda that changes as new knowledge is generated to make sound development decisions."

Both IFReDI and the National University of Laos are among local partners in a four-year ACIAR project launched last year to translate fish passage research and outcomes into government policy and legislation

Map of Pursat River watershed showing fish passes on three of the seven barriers to fish migration

Photo: Lem Samean

Fisherman with silver barb catch at Kbal Hong Weir in Pursat town in November this year

Photo: Lem Samean

in Cambodia and Lao PDR as well as Indonesia and Myanmar. Among the project's aims are understanding why developers decide whether or not to include fish passes in irrigation projects. ACIAR says it also aims to fill "critical knowledge gaps" needed to show proof of concept."Fish passes have helped restore fisheries in the Mekong," says Dr Ann Fleming, manager of fisheries research at the Australian centre. "And with that we have also improved the food and nutritional security of people living in those areas."

Further reading

Asian Development Bank. 2020. Diversion weirs and fish passages for small-scale irrigation: Lao People's Democratic Republic. Manila: Asian Development Bank.

Australian Centre for International Agricultural Research. 2020. Translating fish passage research outcomes into policy and legislation across South East Asia. Canberra: Australian Centre for International Agricultural Research.

Australian Centre for International Agricultural Research. 2021. Fish 'ladders' to build sustainability and livelihoods in Indonesia. 18 January, 2021. Canberra: Australian Centre for International Agricultural Research.

Baumgartner L.J., M. Roy and K. Techasarin. 2019. Lower Mekong Fish Passage Initiative. Masterclass in Fish Passage Engineering, Design, Construction, Ecology and Monitoring. 18 pp. Albury, Australia: Institute for Land, Water and Society, Charles Sturt University.

Mekong River Commission. 2014. Prioritising Fish Passage Barriers and Creating Fish Friendly Irrigation Structures. Vientiane: Mekong River Commission Secretariat.

Mekong River Commission. 2020. Safeguarding livelihoods for fishing communities in Mekong Countries. 4 March, 2020. Vientiane: Mekong River Commission Secretariat.

Marsden, T. et al. 2019. Stung Pursat Barrage Fishway: Proposed Fishway Design Criteria and Concept for Damnak Chheukrom Irrigation Scheme. Newcastle, Australia: Australasian Fish Passage Services Pty Ltd.

Theparoonrat, Y. 2021. Promoting the Installation of Fish Passage in Potential Barriers in the Lower Mekong River Basin. Fish for the People. Vol 19, No 2. Bangkok: Southeast Asian Fisheries Development Center.

Bird sanctuary in eastern Cambodia **reopens** after five-month closure

Conservation area emerges from Covid restrictions after avian influenza kills more than 2,000 storks

The Sne Lake Bird Conservation Area in Prey Veng province in eastern Cambodia reopened in August after a five-month closure triggered by a bird flu outbreak followed by Covid restrictions in line with those being imposed nationwide. Heng Senghy, deputy director of the provincial Department of Environment, told *Catch and Culture - Environment* during a visit in September that the outbreak of avian influenza in March and April affected only one species – the Asian openbill (*Anastomus oscitans*) – with 2,019 individuals killed.

This stork is by far the most common bird species in the conservation area with an estimated population of more than 10,000 individuals (see table on page 37). According to the latest assessment of the Asian openbill published by the International Union for the Conservation of Nature (IUCN) in 2016, the species is of "least concern" for conservation given its extremely large range across South Asia, Myanmar and the Lower Mekong countries of Cambodia, Lao PDR, Thailand and Viet Nam.

According to Heng Senghy, the Asian openbill is among the six most numerous species in the conservation area, located in the north of Prey Veng province in Ba Phnom district. The five others include the endangered greater adjutant (*Leptoptilos dubius*), which faces a very high risk of extinction in the wild in the near future, and the critically endangered white-shouldered ibis (*Pseudibis davisoni*), which faces an extremely high risk of extinc-

Asian openbills resting after feeding at dawn at the Sne Lake Bird Conservation Area in September, 2021. Rangers say this species feeds on aquatic snails and fish in the lake.

Photo: Chhut Chheana

Ranger Phon Yung from the Sne Lake Bird Conservation Area holding a juvenile black-crowned night heron in September. According to the ranger, this species was previously not common in the conservation area. Phan Yung said, however, that around 10 individuals had been spotted in September, 2021.

Photo: Chhut Chheana

White-shouldered ibis and greater adjutant

In the IUCN assessment of the critically endangered white-shouldered ibis published in 2018, BirdLife International noted that the species had been described as "the most threatened large waterbird" in Southeast Asia. "The species declined precipitously during the 20th century," the UK-based conservation network said.

Northern and eastern Cambodia now accounted for between 87 and 95 percent of the global population, estimated at 1,000 individuals. Other populations were in southern Lao PDR and Indonesia. The species – which can grow to 85 cm – used to be "widely but patchily" distributed across much of Thailand, Lao PDR, south and central Viet Nam, Cambodia, parts of Myanmar, Kalimantan in Indonesia, Sarawak in Malaysia and southwest Yunnan province in China.

"It is extinct in Thailand and there are no recent records from Myanmar," the assessment said. "It is almost certainly extinct as a breeding species in Viet Nam and now only occurs as a rare non-breeding visitor." But Cambodia has "significant" populations in the northeast provinces of Stung Treng, Ratanakiri and Kratie including along the Mekong River. Additional breeding grounds has been recorded on the southeastern shore of the Tonle Sap Lake as well as the provinces of Preah Vihear and Mondulkiri.

BirdLife International said widespread habitat conversion was either underway or projected across most of the bird's range, "which is likely to result in extremely rapid declines in the next 10-20 years." Despite designation as wildlife sanctuaries in Cambodia, "two of the key sites holding the bulk of the population are still suffering from encroachment and land conversion, the third area has no formal legal protection and is at even higher risk of being targeted for conversion." Ongoing and future population declines were suspected to be more than 80 percent over three generations (21 years). But if conservation efforts succeed in protecting the largest remaining populations in northeastern Cambodia and along the Mekong and reducing the predicted rates of decline, the assessment concluded that the species might warrant downlisting from its status as critically endangered.

In the separate IUCN assessment of the endangered greater adjutant published in 2016, BirdLife International noted that the huge storks used to be "widespread and common" across much of South and continental Southeast Asia but "declined dramatically during the first half of the 20th century." Breeding populations of the species – which can reach 150 cm – now seemed to be confined to northeast India and Cambodia. While birds from either country were presumed to account for records from Bangladesh, Nepal and Thailand, the assessment said the species was now "possibly extinct" in Lao PDR and Myanmar.

World's first Bengal florican breeding centre

The Angkor Centre for Conservation of Biodiversity in the Cambodian province of Siem Reap has finished building the world's first breeding centre for the critically endangered Bengal Florican (*Houbaropsis bengalensis*), Agence Kampuchea Presse (AKP) reported on November 27. The official government news agency quoted Banteay Srei District Governor Khim Finan as saying that the breeding centre — located within the forest at Kbal Spean — would offer a safe environment for the birds to lay eggs and care for their young. He said eggs would also be collected from the forest for the breeding programme which aims to eventually release adult floricans into the wild. The species is present only in Cambodia, India and Nepal with a global population estimated at only 500 individuals including 100 in Cambodia.

The assessment estimated remaining populations in India and Cambodia at between 1,200 and 1,800 individuals including 150-200 in Cambodia. Populations were suspected to be decreasing "very rapidly" – in line with direct exploitation and habitat destruction, particularly lowland deforestation and the felling of nest-trees, and drainage, conversion, pollution and over-exploitation of wetlands. "Given the species's longevity, population trends are measured over a three-generation period of 45 years and hence the impacts have been severe," it said.

At the Cambodian breeding colony at Prek Toal on the Tonle Sap Lake, the assessment noted that efforts to reduce chick and egg collection and other disturbances had been in place since the late 1990s, with permanent teams of protectors employed since 2001.

Common species at the Sne Lake Bird Conservation Area in Prey Veng province

Khmer common name	English common name	Scientific name	Estimated population	IUCN global conservation status
ស្នោញ	Oriental darter	*Anhinga melanogaster*	500-600 individuals	Near threatened
ចង្រៀលខ្យង	Asian openbill	*Anastomus oscitans*	>10,000 individuals	Least concern
រនាលពណ៌	Painted stork	*Mycteria leucocephala*	3,000-5,000 individuals	Near threatened
ត្រដក់ធំ	Greater adjutant	*Leuptoptilos dubius*	1,000 individuals	Endangered
ទុងប្រផេះ	Spot-billed pelican	*Pelecanus philippensis*	500-600 individuals	Near threatened
ត្រយ៉ងចង្កុំកស	White-shouldered ibis	*Pseudibis davisoni*	500 individuals	Critically endangered

Source: Rangers

tion in the wild in the immediate future. The three other birds are considered "near threatened" species – the oriental darter (*Anhinga melanogaster*), the painted stork (*Mycteria leucocephala*) and the spot-billed pelican (*Pelecanus philippensis*). In 2020, the Department of Environment estimated that the conservation area had 18 bird species, mainly herons, storks and cormorants. For the two endangered species, Cambodia is believed to be home to 95 percent of the global population of the white-shouldered ibis and one of only two countries with breeding populations of the greater adjutant (see box on page 35).

An oriental darter preparing to take off to feed from the Sne Lake at dawn in September, 2021. Rangers say this species can swim and mostly feeds on fish.

Photo: Lem Samean

Located in Toib Sdach Kampong Sleng village in Theay commune, 21 km north of the Ba Phnom District Hall, the conservation area dates back 15 years. "It was created by the local community to protect the flooded forest fish-breeding habitat with various bird species covering 86 hectares of land which was recognized by village, commune and district authorities in November, 2006," the management association says.

Contacts: Association Chief Mr Put Bo (015-21-4085), Deputy Chiefs Mr Nuon Sareth (015-20-7040) and Mr Pan Yon (016-21-9076), and Treasurer Mr Prak Phally (015-38-9688 or 011-65-6916 and Facebook Prak Phally).

Further reading

BirdLife International. 2016. Anastomus oscitans. The IUCN Red List of Threatened Species 2016: e.T22697661A93628985. https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22697661A93628985.en.

BirdLife International. 2016. Anhinga melanogaster. The IUCN Red List of Threatened Species 2016: e.T22696712A93582012. https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22696712A93582012.en.

BirdLife International. 2016. Leptoptilos dubius. The IUCN Red List of Threatened Species 2016: e.T22697721A93633471. https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22697721A93633471.en.

BirdLife International. 2016. Mycteria leucocephala. The IUCN Red List of Threatened Species 2016: e.T22697658A93628598. https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22697658A93628598.en.

BirdLife International. 2017. Pelecanus philippensis. The IUCN Red List of Threatened Species 2017: e.T22697604A117970266. https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T22697604A117970266.en.

BirdLife International. 2018. Pseudibis davisoni. The IUCN Red List of Threatened Species 2018: e.T22697531A134189710. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22697531A134189710.en.

Ministry of Education, Youth and Sports. 2009. Sieav Phov Prorchum Reung Preng Khmer, Part VIII, p 83. Ministry of Education, Youth and Sports, Phnom Penh.

Was **finance** the **hand behind the curtain** at the Glasgow **climate summit**?

By Denise Young*

The Twenty-Sixth Conference of the Parties (COP26) of the Intergovernmental Panel on Climate Change took place in Scotland in November amid high expectations for new pledges to reduce greenhouse gas emissions. But with a last-minute watering down of language on coal and the British chair of the meeting saying he was "deeply sorry" as he fought back tears at the final press conference, the world's media largely reported that the two-week UN climate conference was a failure. The report below argues that the public relations disaster masked concrete progress in the rapidly growing market for green finance and investment.

COP26 was gaveled close to midnight on Saturday 13 November, and the final showdown wasn't about finance, it was about power – about US Special Presidential Envoy for Climate John Kerry and European Commission First Vice President Frans Timmermans failing to stop a last-minute demand from India and China to kill the "phase out coal" paragraph. The image of those four men in a room in the final hours of COP26, and the ensuing paragraph of shame that made COP26 President Alok Sharma cry, is what everyone will remember (the final wording of the statement was to phase "down"coal rather than phase it "out").

'How to unlock flows of finance for adaptation and the energy transition in developing countries is still one big open question. The expectation from COP26 is that some public-private processes will catalyze big solutions.'

It reminds us that power and language matter deeply, that multilateral negotiations cannot be reduced to "blah blah blah", and that one or two words can make a huge difference to millions of people for decades into the future. But finance is the unhealed wound of COP26 that will continue to fester at future COPs. How to unlock flows of finance for adaptation and the energy transition in developing countries is still one big open question. The expectation from COP26 is that some public-private processes will catalyze big solutions, which begs that question: what's the theory of change behind that expectation, and will it suffice?

Green and sustainable finance

There were multiple items on the finance agenda at the multilateral negotiations, but delegates left Glasgow with only one win, namely a doubling of adaptation finance by 2025. All the rest – a new collective quantified post-2025 finance goal, how to make up the shortfall on $100 billion in climate financing, compensations to poor countries for loss and damage caused by rich country emissions, even an agreed definition of climate finance – was pushed out to the next meeting in Egypt.

These negotiations – where demands from developing countries for action points were met with text on more dialogue and more processes – were the diplomatic hot spots in Glasgow. Emblematic of that trust deficit were the disputes about format: developed countries wanted workshops + high-level ministerial dialogues (emphasis on political steering); developing countries preferred ad hoc working groups or committees, complaining that workshops disadvantaged countries with small delegations. What's more, all of this was taking place in ugly rooms that were grey and starkly lit.

On the non-state side, the big finance headline was Mark Carney's Glasgow Financial Alliance for Net Zero (Gfanz) which now brings together over 450 firms with assets under management of over $130 trillion that have committed to a net zero by 2050 goal. Carney, the UN Special Envoy on Climate Action and Finance, promises to "mobilise trillions of dollars of capital to finance decarbonisation in emerging and developing countries." John Kerry has become a big advocate for such public-private finance solutions, and he was at the Gfanz press conference, saying: "Blend the finance, de-risk the investment, and create the capacity to have

Clockwise from top left: India's Environment and Climate Minister Bhupender Yadav, US Special Presidential Envoy for Climate John Kerry, European Commission First Vice President Frans Timmermans and China Special Envoy on Climate Change Xie Zhenhua

Photo: International Institute for Sustainable Development/Earth Negotiations Bulletin

bankable deals. That's do-able for water, it's do-able for electricity it's do-able for transportation."

'Is capital, unified, capable of being a historical agent, or is it condemned forever to competition, rivalry and short-termism?'

Pointing out the flaws of this initiative is easy. It's already existing money, some of that money is subject to double-counting as the the alliance includes both asset owners and asset managers who manage part of the former group's assets. The group includes fossil fuel funders, so it's legitimate to call that greenwashing.

But the real question that underlies everything: "Is capital, unified, capable of being a historical agent, or is it condemned forever to competition, rivalry and short-termism?" That was historian Adam Tooze, commenting on Gfanz on his podcast November 5, asking on whose terms this particular public-private partnership would get done. Gfanz and other initiatives are not just about mobilizing money, but also about lobbying governments to help make green investments profitable by covering part of the initial cost. This is what "derisking" is all about.

Take US President Joe Biden's promise to quadruple US climate aid to $11.4 billion annually by 2024. Po-

Mitigation finance in Glasgow Climate Pact

The 10-page Glasgow Climate Pact adopted by COP26 contains half a page on mitigation finance. In this section, the Conference of the Parties "notes with concern that the current provision of climate finance for adaptation remains insufficient to respond to worsening climate change impacts in developing country Parties. It also "urges developed country Parties to urgently and significantly scale up their provision of climate finance, technology transfer and capacity-building for adaptation so as to respond to the needs of developing country Parties as part of a global effort, including for the formulation and implementation of national adaptation plans and adaptation communications."

The Conference "recognizes the importance of the adequacy and predictability of adaptation finance, including the value of the Adaptation Fund in delivering dedicated support for adaptation, and invites developed country Parties to consider multi-annual pledges. In addition, it "welcomes the recent pledges made by many developed country Parties to increase their provision of climate finance to support adaptation in developing country Parties in response to their growing needs, including contributions made to the Adaptation Fund and the Least Developed Countries Fund, which represent significant progress compared with previous efforts."

In addition, the Conference "urges developed country Parties to at least double their collective provision of climate finance for adaptation to developing country Parties from 2019 levels by 2025, in the context of achieving a balance between mitigation and adaptation in the provision of scaled-up financial resources, recalling Article 9, paragraph 4, of the Paris Agreement. Finally, it "calls upon multilateral development banks, other financial institutions and the private sector to enhance finance mobilization in order to deliver the scale of resources needed to achieve climate plans, particularly for adaptation, and encourages Parties to continue to explore innovative approaches and instruments for mobilizing finance for adaptation from private sources."

Source: United Nations Framework Convention on Climate Change

litico reported that Kerry, anticipating difficulties in getting Congress to stump up, is turning to the private sector. Alden Meyer, a senior associate at the E3G think tank, said the climate envoy has been lobbying investment fund managers and banks to shift their finance to green projects in developing economies. "Kerry's been running around the world and talking to BlackRock and JPMorgan and others," he said. "That's productive. But they have to deliver the goods, and they have to stop financing fossil fuels."

What could go wrong? Two academics expert in the "shock therapy" of the 1990s transition from command to market economies in the former Soviet bloc warned in the *Financial Times* of the dangers of carbon shock therapy. "The COP26 narrative on climate finance is that countries can mobilize the trillions from institutional investors like BlackRock to invest in the low-carbon transition. The key to unlocking finance for high-risk climate investments in poor countries is "derisking": countries are expected to find fiscal resources to guarantee returns for private investors. This is at the heart of the all the mistrust and hurdles in the multilateral finance negotiations in Glasgow." They write that the alternative to carbon shock therapy is unpopular – state-led decarbonisation that would require central banks and ministries of finance and industry to work together after decades of separation. Central banks would have to actively redirect private capital flows from investment in dirty to low-carbon activities.

Italian think-tank ECCO has argued that what's needed is a fundamentally new role and new rules for multilateral development banks and international development finance banks – not just "derisking" investment to incentivise private investors but rather reallocating special reserve assets that the International Monetary Fund could issue to unlock the "tens of trillions", and close the solidarity gap between developed and developing countries.

'Confusion and dissonance'

COP26 was a disastrously mishandled narrative. There was just so much going on in all directions. At times it felt like groups and coalitions were so desperate for attention and air time the only thing they

could realistically achieve was to blow up the context for other groups, thereby creating more confusion and dissonance. So it felt appropriate for the masterminds of the COP21 narrative, the Global Strategic Communications Council (GSCC) to unexpectedly "come out" in an article in Politico. GSCC is a behind-the-scenes global public relations and communications network that – among other things – played a huge role at COP21 in Paris in 2015, coordinating a single narrative among the media, civil society and business that ultimately supported, facilitated, enabled a successful Paris Agreement.

'Reallocating special reserve assets that the International Monetary Fund could issue'

"Until they were contacted by Politico in preparation for this article, the Global Strategic Communications Council operated in semi-secret – 'unbranded,' as they put it – to push a unified message from a diverse group of sources: it's real, it's us, it's urgent. The network of around 100 public relations pros in more than 20 countries has planned press conferences for the Swedish activist Greta Thunberg, trained media-shy climate forecasters to speak in soundbites, and collected and distributed scuttlebutt from closed-door climate negotiations, including in the ongoing COP26 climate talks in Glasgow."

Edouard Morena, a Paris-based researcher on philanthropy and climate action, said GSCC used a "flotilla approach" at the Paris summit to help drive the perception of a united front on the need for climate action. Behind the scenes, the network's members led a "range of different actors who are quite visible in the climate debate to more or less push a narrative that is similar," Morena said. Anonymity was key. "Everyone is not under a shared brand, but everyone is pushing

Informal negotiations on finance at the COP26 conference in Glasgow

Photo: International Institute for Sustainable Development/Earth Negotiations Bulletin

'Unity, unity, great unity. Success, success, great success.'

In remarks to the Glasgow conference on November 1, Vietnamese Prime Minister Pham Minh Chinh quoted Ho Chi Minh in calling for solidarity the global battle against climate change. "As one of the countries worst affected by climate change, Viet Nam is making every effort to both respond to climate change and foster economic development to grow and ensure an ever-better life for its people, while contributing responsibly alongside the international community. We look forward to advancing cooperation with international partners through investment programs and projects, and sustainable development," he said.


Prime Minister Chinh

"President Ho Chi Minh, the hero of national liberation and world's man of culture, once said: 'Unity, unity, great unity. Success, success, great success.' If we are to succeed in the global fight against climate change, global solidarity is the only way. Together we will discuss, work, and win. Our unity must stem from our will, awareness, and solutions, and endure as we make and execute plans, and ensure resources. Our historic commitments and actions will help preserve a green planet, a sustainable habitat, and lasting happiness for generations to come."

Prime Minister Pham Minh Chinh outlined three proposals. "First, climate change response and the restoration of nature must become the highest priority in all development decisions. They must form the highest ethical standards for all levels, sectors, businesses and citizens," he said. "Science and technology must lead the charge, and financing must lend leverage to the transitioning of the development model towards a green, circular, sustainable, inclusive, and humanistic economy. All that we do must be nature-based and centered around people, for they are the actors and drivers of sustainable development, in order to leave no one behind.

"Second, all countries need to make strong commitments on greenhouse emissions reduction, grounded in the principle of common but differentiated responsibilities, respective capacities and circumstances. Let me take this opportunity to call for justice and fairness in the fight against climate change. This is imperative to limit the global temperature increase. For its part, although we are a developing country that started industrialization only over the three decades ago, Viet Nam will capitalize on its advantage in renewable energy and take stronger measures to reduce greenhouse gas emission. To this end, we will make use of our own domestic resources, along with the cooperation and support of the international community, especially from the developed countries, in terms of finance and technology, including through mechanisms under the Paris Agreement, in order to achieve net-zero emissions by 2050.

"Third, climate finance, technology transfer, and capacity-building play a critical role in ensuring the success of the Paris Agreement. Developed countries, being major emitters in the past in exchange for present economic prosperity, need to fully meet their existing financial commitments. At the same time, it is urgent for us to arrive at more ambitious financial targets for the post-2025 period."

Lao Natural Resources and Environment Minister Bounkham Vorachit – chair of the Lao National Mekong Committee who serves as the Lao Member of the Mekong River Commission Council – also highlighted the importance of climate finance in her statement to the conference."Gaining access to climate finance and other sources of funding is crucial to supporting developing countries … to achieve their development goals and commitments made under the Paris Agreement," she said.


Minister Bounkham

Cambodian Environment Minister Say Samal told the conference that international climate finance was "far from the required scale, particularly for adaptation, and difficult to access for the most climate vulnerable countries. We call for developed countries to increase their contributions to financial mechanisms … and to further facilitate direct access to the funds." Otherwise, he said, promoting sustainable and climate-resilient infrastructure, disaster-management capabilities, and low-carbon development in lesser developed countries would little more than "empty talk".

Youth Day at COP26

PHOTO: INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT/EARTH NEGOTIATIONS BULLETIN

their own brand in the same direction," Morena said. If the lead warship is invisible, it looks like "all these little boats are, by themselves, going in the same direction." Telling the story of future COPs will require a new context – less flotilla, more space for listening, multiple perspectives, inter-generational justice, inclusion of marginalised groups and voices, solidarity between developed and devoting countries, and gender equity.

** Ms Young is the Paris-based publisher of* The Zeroist, *a monthly finance newsletter aimed at those seeking new economic narratives that go beyond the orthodox assumptions of mainstream media or with no time to dig through the latest research on green finance (https://thezeroist.substack.com). She is also the director of Climate Narratives which broadcasts* New Climate Capitalism, *a podcast featuring interviews with change-makers working at the the intersection of finance, climate and activism (https://climatenarratives.co/New-Climate-Capitalism/). Originally from Hong Kong, Ms Young has advised world leading climate scientists on communications and was an active participant in the UN Climate Change Conference that brokered the Paris Agreement in 2015.*

Further reading

Bergamaschi, L. 2021. Can Mario Draghi pull COP26 across the finish line? 11 November, 2021. Arlington, Virginia: Politico LLC.

Climate Narratives. 2021. Just Transitions: Use and misuse of language by the climate elite. New Climate Capitalism. Episode 11, Season 2. Paris: Climate Narratives.

Colman, Z. 2021. Kerry to Wall Street: Put your money behind your climate PR. 3 March, 2021. Arlington, Virginia: Politico LLC.

Gabor, D. and I. Weber. 2021. COP26 should distance itself from carbon shock therapy. 8 November, 2021. London: Financial Times.

Mathiesen, K. 2021. The last-minute coal demand that almost sunk the Glasgow climate deal. 13 November, 2021. Arlington, Virginia: Politico LLC.

Tooze, A. 2021. Jerome Powell vs The Bond Markets. 5 November, 2021. Ones and Tooze. https://podcasts.apple.com/us/podcast/ones-and-tooze/id1584397047.

Wheaton, S. 2021. The climate activists stealing Big Oil's playbook. 9 November, 2021. Arlington, Virginia: Politico LLC.

Young, D. 2021. Is climate-aligned finance the next big thing for decarbonizing finance? 28 Sep. 2021. Paris: The Zeroist.

MRC appoints **Lao** chief strategy officer to **succeed** Cambodian **CEO**

The Mekong River Commission announced on November 26 that its Lao chief strategy and partnership officer Anoulak Kittikhoun would succeed outgoing Cambodian chief executive An Pich Hatda in January. "Dr Kittikhoun's appointment follows a unanimous decision by the MRC Joint Committee," a statement said, referring to the MRC body of senior environment and water officials from Cambodia, Lao PDR, Thailand and Viet Nam. The announcement came a day after a virtual annual meeting of MRC ministers, known as the MRC Council.

Before joining the MRC Secretariat in Vientiane, Dr Anoulak worked in New York as an international staff member at the United Nations Secretariat, a researcher at the Ralph Bunch Institute for International Studies, an adjunct professor of international relations at Brooklyn College of New York, and an advisor at the Permanent Mission of Laos to the United Nations.

In addition to co-authoring the book *River Basin Organizations in Water Diplomacy* published in 2020, Dr Anoulak has authored chapters and articles in journals such as Theory and Society, International Studies Review and Journal of Hydrology. His article on the Lao revolution and geography won the Reinhard Bendix award from the American Sociological Association.


Dr Anoulak

Dr Anoulak has been selected as a "Future Leader" by the French Ministry of Foreign Affairs, "Southeast Asia Young Leader" by the International Institute for Strategic Studies, and nominated as a "Young Global Leader" by the World Economic Forum. He was the first Tedx speaker in Lao PDR and has spoken at international conferences, missions, and expert group meetings in over 30 countries. Dr Anoulak has a master's degree and PhD in political science and development from the Graduate Center of the City University of New York. He received a bachelor's degree in commerce and international relations from the Australian National University where he graduated as an international valedictorian.

Veteran scientist appointed **dean** of **fisheries faculty** at Cambodian university

The Royal University of Agriculture in Phnom Penh has appointed veteran Mekong fisheries researcher Ngor Peng Bun as dean of its Faculty of Fisheries. Dr Peng Bun has been involved with inland fisheries research in Cambodia and other countries in the Lower Mekong River Basin for 22 years, initially with Cambodia's Inland Fisheries Research and Development Institute (IFReDI) and the Fisheries Administration (FiA) of the Ministry of Agriculture, Forestry and Fisheries (MAFF).

He later worked as the capture fisheries specialist for the MRC Fisheries Programme between 2011 and 2016, when he left for France to pursue doctoral studies in ecology, biodiversity and evolution at University of Toulouse. Dr Peng Bun also has master's degrees in environmental and information management from the Australian National University in Canberra and the Asian Institute of Technology in Bangkok.

Dr Peng Bun co-authored the MRC's first technical paper published two decades ago on the status of striped catfish (*Pangasianodon hypophthalmus*) in Cambodia and Viet Nam. He also co-authored two analyses of data from MRC fish monitoring programmes and a report on the dai stationary trawl fishery on the Tonle Sap River in Cambodia, the largest commercial fishery in the Lower Mekong. His most recent work for the MRC was a photo book on 272 common fishes in the basin, produced in collaboration with IFReDI, the Living Aquatic Resources Research Centre (LARReC) in Lao PDR, the Thai Department of Fisheries (DoF) and the Research Institute for Aquaculture No 2 (RIA2) in Ho Chi Minh City. Dr Peng Bun has also authored and coauthored more than 30 articles in international peer-reviewed journals such as *Scientific Reports, Ecological Indicators, Ecosphere, Water, Ecology of Freshwater Fishes, Science, Global Ecology* and *Conservation*.


Dr Peng Bun

MRC releases new **style guide**

Training planned for Cambodia, Lao PDR, Thailand and Viet Nam to encourage simple, clear and consistent writing

The Mekong River Commission released a new style guide on November 12 to improve the quality and consistency of its documents and publications. The guide is aimed not only at MRC staff but also consultants and external users who need a style guide.

Dr An Pich Hatda, Chief Executive Officer at the MRC Secretariat in Vientiane, said the MRC Writing Publication and Style Guide was closely aligned with the commission's evolving role. "It is meant to make the preparation of written material simpler to enhance understanding of the MRC's work among a diverse range of audiences," the CEO said.

"While authors have great flexibility in choosing how they express a concept, they should recall that the point of good writing is simple, clear, concise, and engaging."

The guide includes common problems of English grammar, preferred spellings, abbreviations and acronyms, capitalization, numbers, punctuation and gender-neutral language. It builds on an earlier style guide developed by the MRC Fisheries Programme in 2007 – with modifications aimed at providing a more comprehensive guide that is easier to use. A notable addition is transliterations of Khmer, Lao and Thai names of provinces and districts which often have variant spellings in English. The transliterations extend to the names of rivers and catchments of tributaries draining into the Mekong River in Cambodia, Lao PDR and Thailand.

"To be clear in our communications, our language and style must be consistent," Dr Hatda says in his foreword to the guide. "Having a style guide at hand as writers, editors and reviewers means that we need not face unnecessary disagreements over writing style based on our subjective opinions and preferences."

But the CEO notes that the style guide is not intended as an authoritative source for style issues. "While rules and procedures are important to ensure consistency and clarity, they should not interfere with the readability of a document nor create unnecessary work for writers and editors," he says. "For this reason, some rules that were hard to enforce and did not add to quality have been eliminated. Similarly, there can be a degree of flexibility in applying the rules; nothing is carved in stone."

"The truth is that writing is a process of discovery that involves a series of steps, which are very often elements of a zigzag journey."

In a statement accompanying its release, the MRC Secretariat said the online version of the 126-page guide would be updated regularly to ensure it remains relevant and current. "Training sessions are planned for the MRC Member Countries and staff of the MRC Secretariat to help facilitate the usage of the Guide," it said.

Sources include stylebooks used by journalists at the Associated Press, the American news agency operating in 250 locations worldwide, and Fairfax Media, publisher of the *Australian Financial Review*, the *Sydney Morning Herald* and the *Age* newspapers. Another source is is a media relations handbook developed by the Independent Journalism Foundation. The New York-based group has been closely involved in training Cambodian, Lao and Vietnamese journalists – mainly at the Royal University of Phnom Penh but also at the headquarters of the Vietnam News Agency in Hanoi and its southern branch in Ho Chi Minh City. The style book complements an existing MRC communications guide.

"Human languages are extremely flexible or, as some would argue, highly complex."

Further reading

Mekong River Commission. 2021. The MRC writing, publication and style guide (2nd ed.). Vientiane: MRC Secretariat. https://doi.org/10.52107/mrc. qx5yo4

To access the MRC Communications Handbook and its Khmer, Lao, Thai and Vietnamese versions, please go to:

https://www.mrcmekong.org/assets/Publications/CommHb-EN.pdf

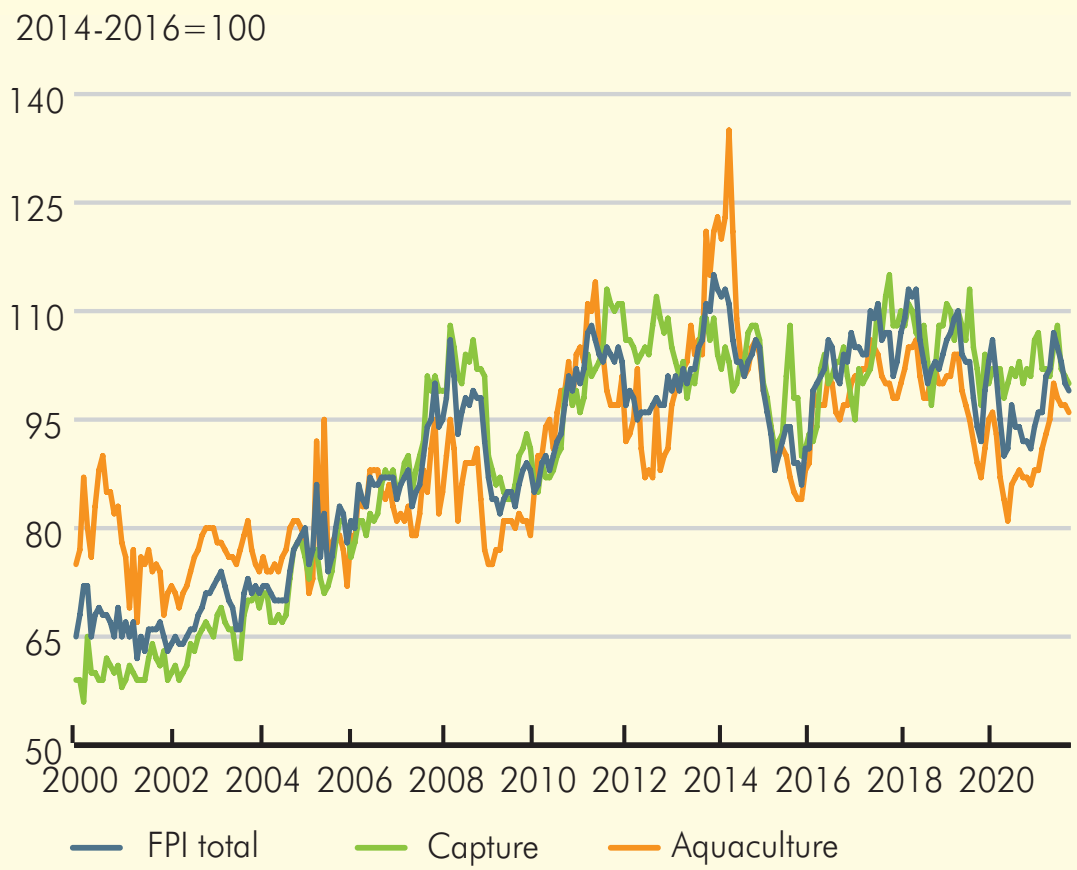
https://www.mrcmekong.org/assets/Publications/CommHb-KH.pdf

https://www.mrcmekong.org/assets/Publications/CommHb-LA.pdf

https://www.mrcmekong.org/assets/Publications/CommHb-TH.pdf

https://www.mrcmekong.org/assets/Publications/CommHb-VN.pdf

FAO Fish Price Index



Source of the raw data for the FAO Fish Price Index: EUMOFA, INFOFISH, INFOPESCA, INFOYU, Statistics Norway.

Production, trade, utilisation and consumption FAO Food Outlook, November, 2021	**2019**	**2020** Estimate	**2021** Forecast	**Change** 2021/2020
	Million tonnes			%
Production	**177.8**	**174.6**	**178.1**	**+2.0**
Capture fisheries	92.5	90.5	92.6	+2.3
Aquaculture	85.3	84.1	85.5	+1.7
Trade value (exports USD billion)	**161.9**	**151.9**	**170.1**	**+12.0**
Trade volume (live weight)	**65.5**	**63.3**	**65.6**	**+3.7**
Total utilisation	**177.8**	**174.6**	**178.1**	**+2.0**
Food	158.3	154.7	157.9	+2.1
Feed	15.5	16.1	16.4	+1.6
Other uses	4.0	3.8	3.8	-1.1
Consumption per person				
Food fish (kg/year)	20.5	19.8	20.1	+1.1
From capture fisheries (kg/year)	9.5	9.1	9.2	+1.6
From aquaculture (kg/year)	11.1	10.8	10.9	+0.6
FAO Fish Price Index (2014 – 2016 = 100)	**2019**	**2020**	**2021** Jan-Sep	**Change** Jan-Sep 2021/Jan-Sep 2020
	102	**95**	**101**	**+5.3**

Thailand Talaad Thai Wholesale Market, Pathum Thani Province		THB per kg	
		August, 2021	November, 2021
Item		Price	
Chinese edible frog *(Haplobatrachus rugulosus)* (small)	กบนา (เล็ก)	110	75 - 80
Asian redtail catfish *(Hemibagrus wyckioides)*	ปลากดคัง	125 - 160	150 - 200
Yellow mystus *(Hemibagrus filamentus)*	ปลากดเหลือง	125 - 145	125 - 145
Tire track eel *(Mastacembelus favus)*	ปลากระทิง	145 - 250	145 - 250
Clown featherback *(Chitala ornata)*	ปลากราย	190 - 200	160
Iridescent mystus *(Mystus multiradiatus)* (large)	ปลาแขยง (ใหญ่)	80 - 100	160
Iridescent mystus *(Mystus multiradiatus)* (small)	ปลาแขยง (เล็ก)	50 - 60	130
Wallago *(Wallago attu)* (large)	ปลาเค้าขาว (ใหญ่)	180	160
Wallago *(Wallago attu)* (small)	ปลาเค้าขาว (เล็ก)	120	120
Bronze featherback *(Notopterus notopterus)*	ปลาสลาด หรือ ปลาฉลาด	90	90
Farmed giant snakehead *(Channa micropeltes)* (large)	ปลาชะโด เลียง (ใหญ่)	90 - 100	90 - 100
Farmed giant snakehead *(Channa micropeltes)* (small)	ปลาชะโด เลียง (เล็ก)	80 - 90	110 - 120
Farmed North African walking catfish hybrid (*Clarias* spp.) (large)	ปลาดุก เลียง (ใหญ่)	40 - 42	40 - 45
Farmed North African walking catfish hybrid (*Clarias* spp.) ((small)	ปลาดุก เลียง (เล็ก)	40 - 43	42 - 45
Siamese red catfish *(Phalacronotus bleekeri)* (large)	ปลาแดง (ใหญ่)	250	250
Siamese red catfish *(Phalacronotus bleekeri)* (small)	ปลาแดง (เล็ก)	140 - 170	140 - 170
Silver barb *(Barbonymus gonionotus)* (large)	ปลาตะเพียนขาว หรือ ปลาตะเพียนเงิน (ใหญ่)	40 - 42	50
Silver barb *(Barbonymus gonionotus)* (small)	ปลาตะเพียนขาว หรือ ปลาตะเพียนเงิน (เล็ก)	35	35
Red tilapia hybrid *(Oreochromus* spp.) (large)	ปลานิลแดง (ใหญ่)	75	75 - 80
Red tilapia hybrid *(Oreochromus* spp.) (small)	ปลานิลแดง (เล็ก)	65	65
Nile tilapia *(Oreochromus niloticus)* (large)	ปลานิล (ใหญ่)	50 - 60	50 - 60
Nile tilapia *(Oreochromus niloticus)* (small)	ปลานิล (เล็ก)	35	35
Whisker sheatfish (*Kryptopterus* spp.) (large)	ปลาขาไก่ (ใหญ่)	380	350
Whisker sheatfish (*Kryptopterus* spp. (small)	ปลาขาไก่ (เล็ก)	160	130 - 140
Common carp (*Cyprinus carpio*) (large)	ปลาไน (ใหญ่)	35 - 40	35 - 40
Mekong giant catfish (*Pangasianodon gigas*)	ปลาบึก	65	65
Boeseman croaker (*Boesemania microlepis*)	ปลาม้า	350 - 435	200 - 350
Horse-face loach (*Acantopsis choirorhynchos*)	ปลารากกล้วย	140	140
Giant gourami (*Osphronemus goramy*)	ปลาแรด	85 - 90	100
Siamese mud carp (*Henicorhynchus siamensis*)	ปลาสร้อยขาว	50 - 60	50 - 60
Snakeskin gourami (*Trichopodus pectoralis*)	ปลาสลิด	135	120 - 170
Striped catfish (*Pangasianodon hypophthalmus*)	ปลาสวาย	26 - 30	20 - 30
Spot-fin spiny eel (*Macrognathus siamensis*) (large)	ปลาหลดจุด (ใหญ่)	170	220
Spot-fin spiny eel (*Macrognathus siamensis*) (small)	ปลาหลดจุด (เล็ก)	130	150 -180
Rice-field eel (*Monopterus javanensis*) (large)	ปลาไหลนา หรือ ปลาไหลบึง นาข้าว (ใหญ่)	250 - 280	250 - 280
Rice-field eel (*Monopterus javanensis*) (small)	ปลาไหลนา หรือ ปลาไหลบึง นาข้าว (เล็ก)	300 - 320	300 - 320
Pond snail (*Filopaludina martsensi*)	หอยขม	50 - 100	50 - 100

Viet Nam Vietnam Association of Seafood Exporters and Producers (VASEP) Dong Thap in the Mekong Delta except black tiger shrimp (Da Nang)			VND per kg unless otherwise stated	
			July, 2021	November, 2021
Item		Size	Price	
Pangasius (*Pangasianodon hypophthalmus*) (white flesh)	Cá tra thịt trắng	0.7 – 0.8 kg	20,500 – 21,000	22,500 – 23,500
Pangasius fry (*Pangasianodon hypophthalmus*)	Cá tra bột	Per fry (bột)	0.8 – 1.2	1.0 – 1.5
Pangasius fingerlings (*Pangasianodon hypophthalmus*)	Cá tra giống	28 – 35 con/kg	20,000 – 21,500	28,000 – 30,000
Red tilapia (*Oreochromis* spp.)	Cá điêu hồng	> 300 g – 1,000 g	34,000 – 35,000	33,000 – 35,000
Red tilapia fingerlings (*Oreochromis* spp.)	Cá điêu hồng giống	35 con/kg	20,000 – 22,000	23,000 – 25,000
Snakehead (*Channa* spp.)	Cá lóc nuôi	1.0 – 1.2 kg	40,000 – 42,000	33,000 – 36,000
Snakeskin gourami (*Trichopodus pectoralis*)	Cá sặc rằn	4 – 5 con/kg	25,000 – 27,000	25,000 – 28,000
Climbing perch (*Anabas testudineus*)	Cá rô đầu vuông	8 con/kg	21,000 – 22,000	22,000 – 25,000
Japanese wrinkled frog (Thai strain) (*Glandirana rugosa*)	Ếch Thái	3 – 5 con/kg	20,000 – 23,000	34,000 – 36,000
Japanese wrinkled frog fry (Thai strain) (*Glandirana rugosa*)	Ếch Thái giống	120 – 140 con/kg	200 – 250	350 – 450
Giant freshwater prawn (*Macrobrachium rosenbergii*)	Tôm càng xanh	15 – 25 con/kg	160,000 – 180,000	170,000 – 200,000
Giant freshwater prawn (*Macrobrachium rosenbergii*) P/L	Tôm càng xanh post	80,000 – 90,000 con/kg	80,000 – 90,000	70,000 – 80,000
Black tiger shrimp (*Penaeus monodon*)	Tôm sú	15 con/kg	460,000	160,000
Black tiger shrimp (*Penaeus monodon*)	Tôm sú	25 – 30 con/kg	220,000	130,000
Black tiger shrimp (*Penaeus monodon*)	Tôm sú	40 con/kg	160,000	90,000

PHOTO: LEM SAMEAN

Fisherman with mud carps (*Gymnostumus* spp) caught at Kbal Hong Weir on the Pursat River in November. The river is a major tributary of the Tonle Sap Lake, the largest lake in Southeast Asia. Seasonal migrations of mud carps typically start around this time of the year as the floodwaters of the lake recede at the end of the wet season. Peak catches are usually in December or January. Mud carps are used to make a fish paste known as *prahok*, a staple food in Cambodia, especially during the dry season. The Pursat River is a priority catchment for Cambodia under MRC fish-passage guidelines (see page 24).

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