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Executive summary

- Most of the Mekong river basin and neighboring regions in Southeast Asia are experiencing relatively dry conditions, involving most of mainland Thailand and parts of Cambodia, Laos and Vietnam. Despite a wet climate, underperforming precipitation since at least mid-2019 has hampered the yearly water balance, both in terms of precipitation *per se* and downstream river flows.
- Impacts on crops and water supply have been reported, mostly in the lower Mekong basin and in relation to saline intrusion from the river delta. Reservoirs are lower than average for the period, but generally not critically low. Substantial support is being provided by local governments.
- With the month of March marking the end of the short dry season, the precipitation outlook from March to May 2020 is overall neutral, suggesting normal rainfall for the months of transition to the wetter half of the year. If the forecasts prove correct, the affected areas may endure a couple of more months of drought before recovery.

Risk of drought impact for agriculture (RDri-Agri)

The GDO indicator RDri-Agri shows the risk of having impacts from a drought, by taking into account the exposure and socio-economic vulnerability of the area, with particular focus on the agricultural impacts.

The months from December to March are generally the driest in an otherwise wet climate. However, seasonality is quite marked, with about 50% of the annual total precipitation falling in just three or four months. In case of prolonged below-average precipitation, the agricultural

areas that are not strategically equipped with reservoirs and irrigation systems are vulnerable. In the entire lower Mekong basin, the river plays a fundamental role in water supply, as well as in keeping salty waters out of the Mekong delta. Agriculture is the major source of income and subsistence for the population, and rice is the main staple crop in the whole peninsula, requiring a significant amount of water. The total population living in the area under drought is in the order of millions.

Compared to the situation of mid-2019, the drought has moved southwards, mainly over Thailand, while also reaching Cambodia and the Mekong delta in Vietnam. The RDri-Agri indicator for the first dekad of March 2020 (Figure 1) shows a wide region under moderate risk, with Thailand as the most exposed country, as well as central and western Cambodia.

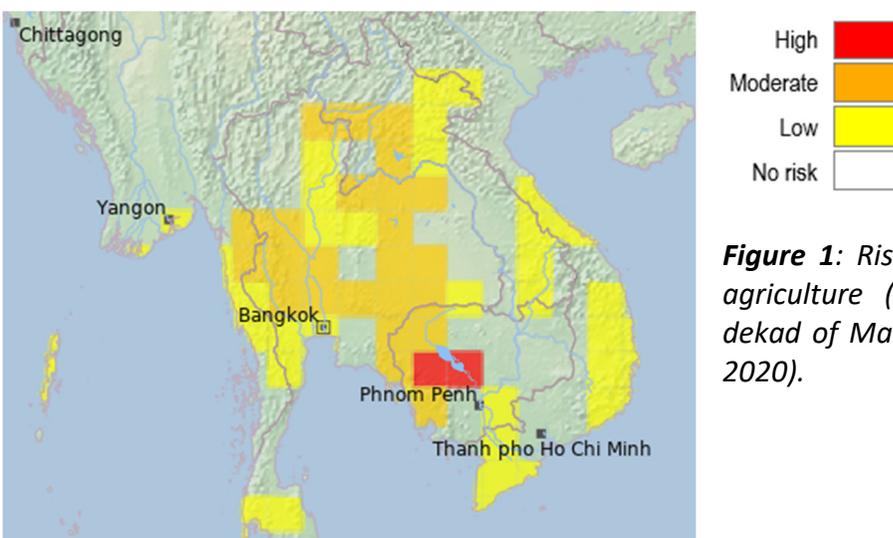


Figure 1: Risk of drought impact for agriculture (RDri-Agri) for the first dekad of March (1st to 10th of March 2020).

Precipitation

The months between November and March are generally very dry, and the driest of the year in the area of interest, regardless of the slightly different rainfall patterns during the rest of the year. As a consequence, the lack of rainfall during those months is not very relevant in general for the yearly water balance. In the two previous wet seasons several months recorded rainfall well below the expected average (Figure 2), thus generating a substantial cumulative deficit yet to be compensated (Figure 3). This cumulative pattern is not the same everywhere, notably for example in Cambodia and southern Vietnam, where precipitation deficits are milder or absent, and related only to the second half of 2019 (not shown).

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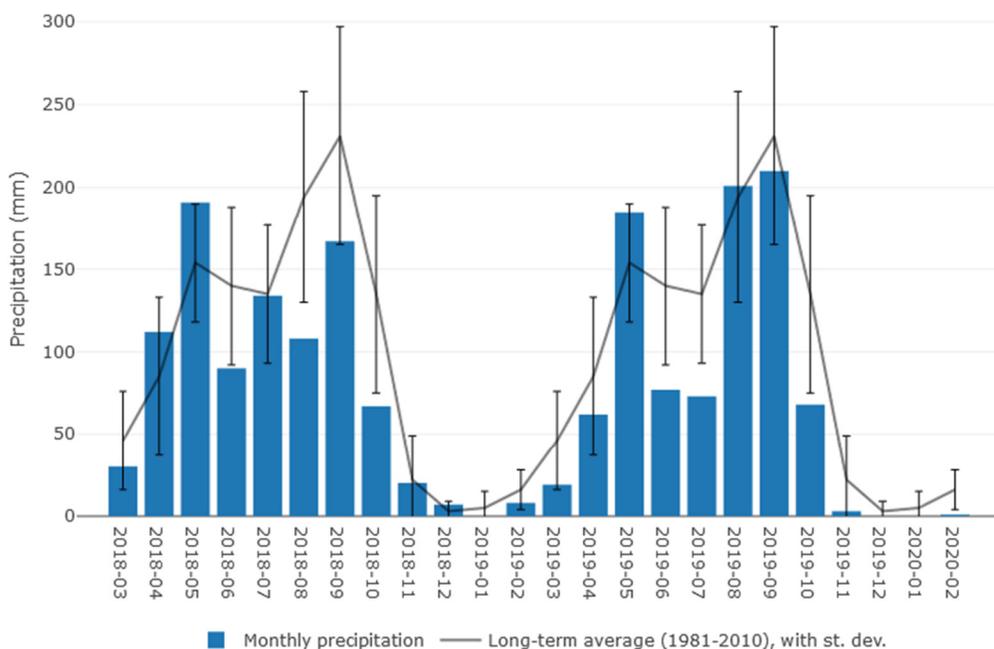


Figure 2: Monthly total precipitation near Nakhonratchasima (Thailand, coordinates: 15.13 N, 102.3 E), with the long-term monthly averages (1981-2010).

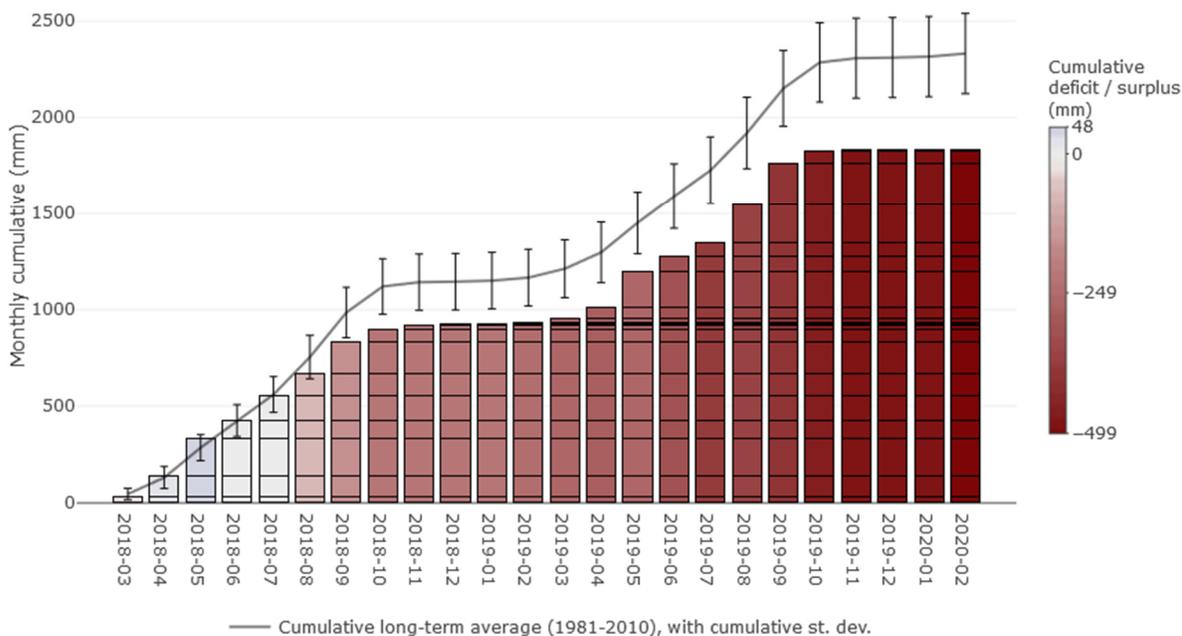


Figure 3: Cumulative precipitation over a period of 23 months near Nakhonratchasima (Thailand, coordinates: 15.13 N, 102.3 E). The bar colours indicate the cumulative deficit (red gradient) or surplus.

surplus (blue gradient), compared to the cumulated monthly long-term average (solid line), for the same time span and location. The boxes overlapping the bars are the monthly totals stacked.

Standardized Precipitation Index (SPI)

The SPI indicator is used to monitor the occurrence of meteorological drought. The lower (i.e. more negative) the SPI, the more intense is the drought.

The recent short-term SPI-3 (Figure 4, left) shows a widespread negative anomaly of precipitation, from mild to severe. For the vast majority of the area, such a deficit does not mean much in itself, as it occurs during the driest months of the hydrological year. However, looking at the time-series for the same indicator (Figure 5), a drier pattern persists for all cumulative trimesters at each of the 18 months up to February 2020, thus including all the wettest months. This pattern is common to both Thailand and northern Lao. Figure 4 (right) summarizes this trend, illustrating the precipitation anomaly distribution during the last year. It also highlights those areas further north that faced severe drought up to the third quarter of 2019 (areas of Myanmar and China). Regions at the southern end of the peninsula (Cambodia, southern Vietnam) do not seem affected over the mid-term SPI-12. In fact, the main issues reported in these regions were related to low Mekong river levels, depending on upstream precipitation, rather than local lack of rainfall.

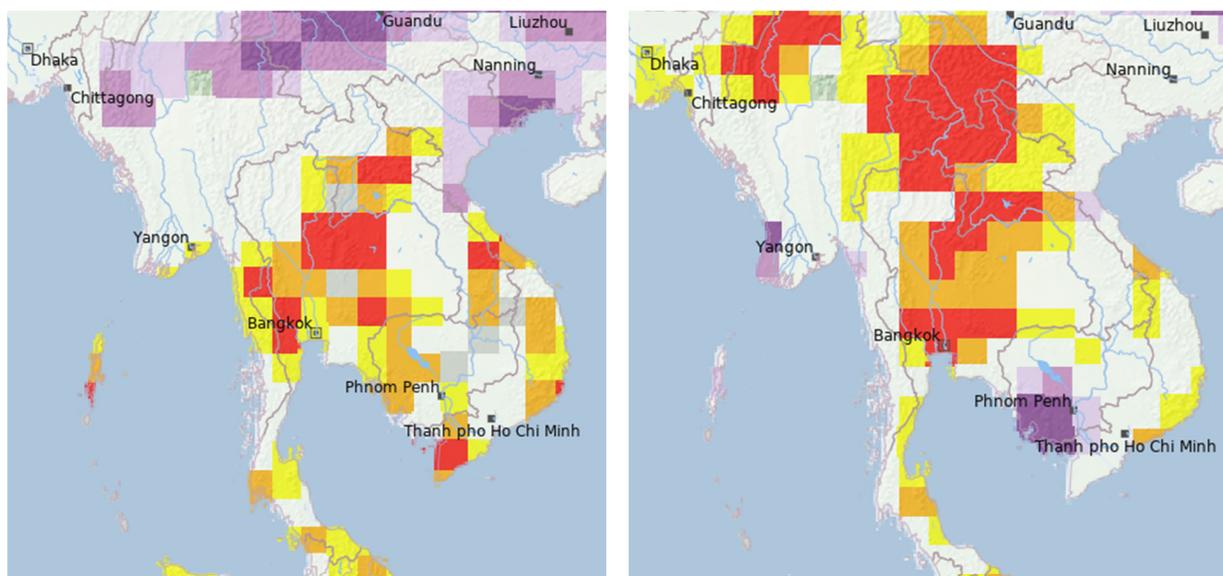


Figure 4: SPI for a cumulative period of 3 months (December to February 2020, left) and 12 months (March 2019 to February 2020, right).

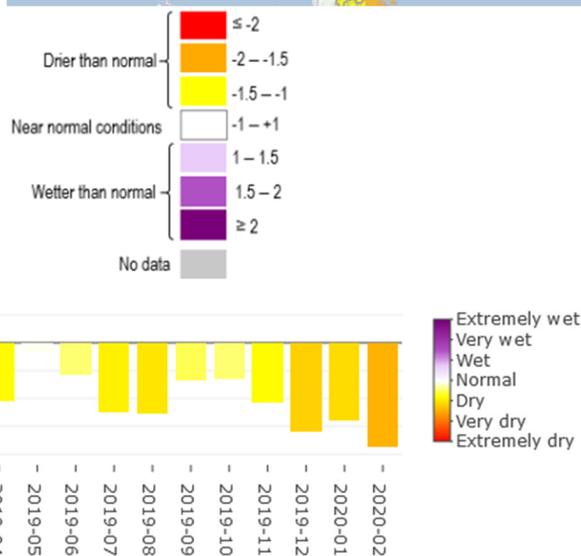


Figure 5: SPI for a cumulative period of 3 months near Nakhonratchasima (Thailand, coordinates: 15.13 N, 102.3 E).

Outlook for Standardized Precipitation Index (SPI)

Southeast Asia has a wet climate, with only a short dry season between December and February. The precipitation outlook from March to May 2020 is overall neutral or slightly drier (Figure 6). With March marking the end of the dry period, the forecast suggests normal rainfall for the

months of transition to the wetter half of the year. This Figure is confirmed by the regional monitor. In addition, temperatures are expected warmer than usual until the end of March¹.

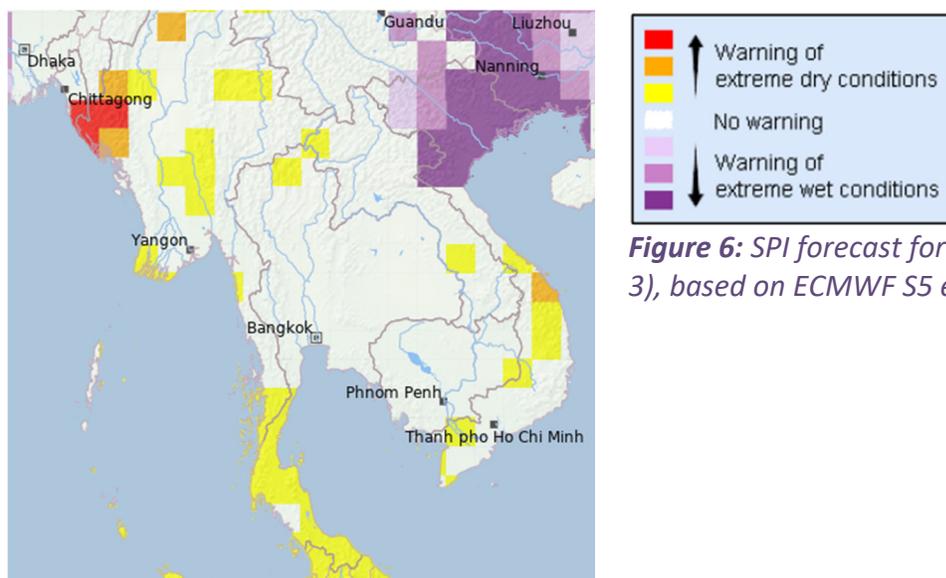


Figure 6: SPI forecast for March to May (SPI-3), based on ECMWF S5 ensemble forecasts.

fAPAR Anomaly

The fraction of Absorbed Photosynthetically Active Radiation (fAPAR) represents the fraction of the solar energy absorbed by leaves. fAPAR anomalies, specifically the negative deviations from the long-term average over the same period, are a good indicator of drought impacts on vegetation.

The overall picture for the first ten days of March 2020 is not consistent, with both positive and negative anomalies across different regions, with the latter prevailing (Figure 7, right). In line with latest data of soil moisture (Figure 8), vegetation stress appears more consistently over mainland Thailand and Cambodia, as well as northern Lao. In fact, vegetation stress intensified where negative anomalies were already present in previous months, especially across Thailand (Figure 7, left). Photosynthetic activity decreased also in southern Vietnam, where positive anomalies were still prevailing in the previous weeks.

¹ <http://asmc.asean.org/subseasonal-weather-outlook-16-31-march-2020-2/>

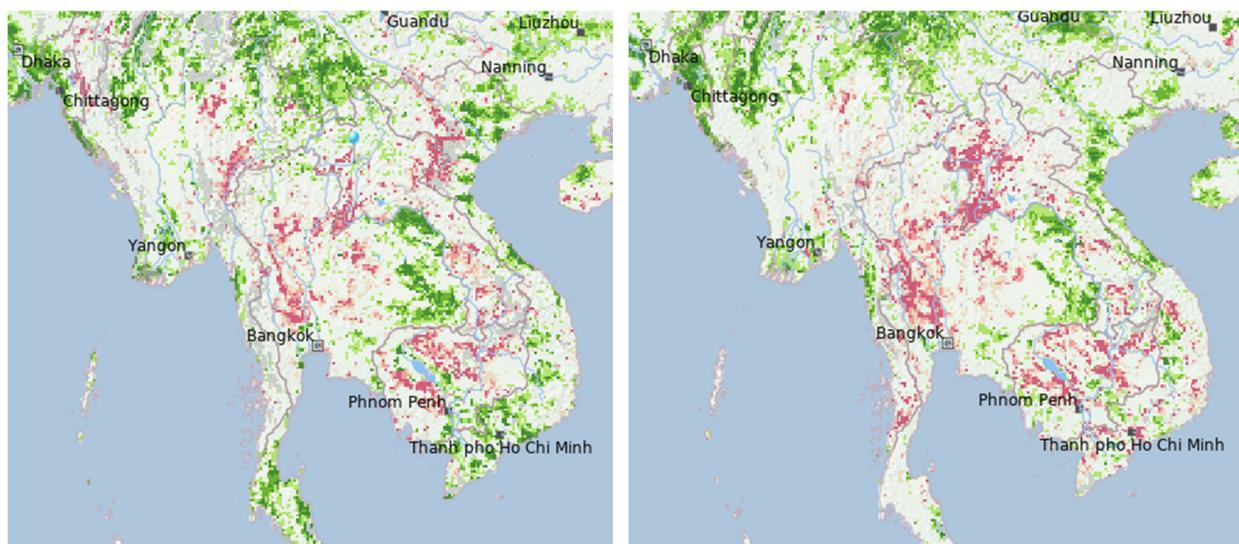
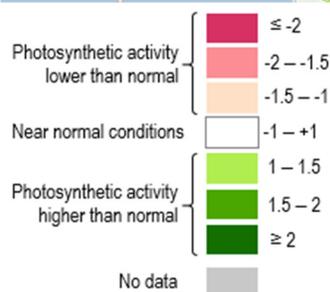


Figure 7: *fAPAR anomaly in Thailand for the period between 21st of January and 1st of February 2020 (left) and between 1st and 11th of March 2020 (right).*



Soil Moisture Anomaly

The indicator provides an assessment of the top soil water content, which is a direct measure of drought conditions, specifically the difficulty for plants to extract water from the soil.

Despite a slight improvement since January and February 2020, soil moisture is still moderately and severely below average over wide parts of mainland Thailand, Cambodia and Lao (Figure 8). Figure 9 shows the timeline of soil moisture anomalies aggregated by classes for Thailand, where significant negative anomalies persisted consistently in the last 12 months, in line with precipitation deficits in the wettest season. A similar situation is present in northern Lao and Cambodia.

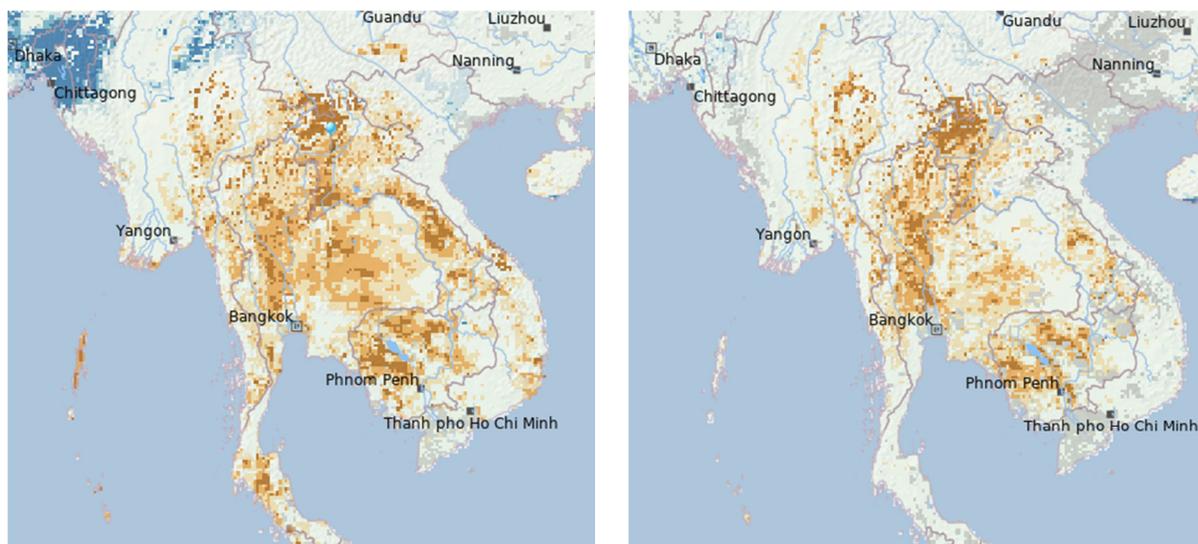


Figure 8: Soil Moisture Anomaly over continental Southeast Asia, for the period between 1st and 31st of January 2020 (left) and from 11th of February to 11th of March 2020 (right).

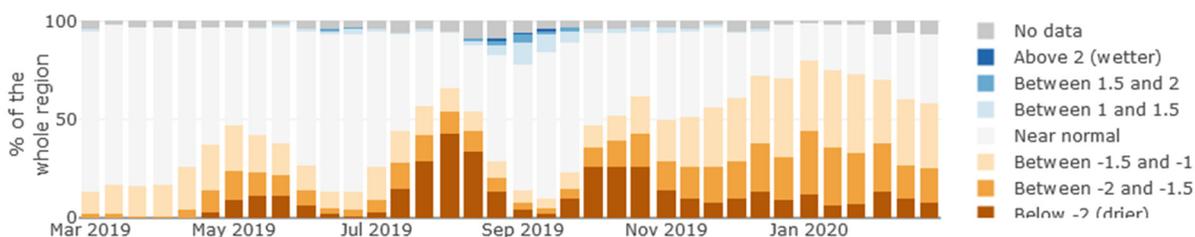
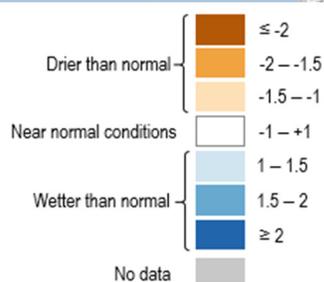


Figure 9: Soil Moisture Anomaly, recent temporal evolution in Thailand.

Reported impacts

The lower Mekong basin is currently subject to deep saline intrusion, due to the lowering of the water table associated with the drought². In Vietnam this is causing both yield losses and lack of freshwater supply^{3 4}. The government is working on providing support against salinization^{5 6}. The upstream sections of Mekong river recovered since the end of 2019 and are now hovering around the average of the period in most monitoring stations⁷. The Mekong River Commission lifted the drought emergency alert for most of the river basin in mid-March⁸.

The vast majority of reservoirs of Thailand show lower levels than the same period of 2019, but are not critically low⁹. Reportedly, rice, sugar cane and cassava are the most exposed crops¹⁰, with some estimates putting potential losses at above 800 million dollars¹¹. Thailand government allocated significant funds in support to farmers¹².

Cambodian rice farmers are hit by the drought too, with irrigation systems no able to cope with the water demand¹³. Because of drought, Lao is facing challenges to meet the planned rice production, according to reports¹⁴.

Alarms about haze and smoke were raised for mainland south-east Asia, where the combination of fires and dry conditions hampers severely air quality¹⁵.

² <https://vietnamnet.vn/en/sci-tech-environment/mekong-delta-faces-severe-saltwater-intrusion-in-march-624538.html>

³ <https://fr.vietnamplus.vn/secheresse-et-salinisation-ravagent-le-delta-du-mekong/134436.vnp>

⁴ <http://www.asianews.it/news-en/Drought%2C-salinity-force-five-provinces-to-declare-a-state-of-emergency-49494.html>

⁵ <https://fr.vietnamplus.vn/le-gouvernement-soutient-les-localites-touchees-par-la-salinisation-dans-le-delta-du-mekong/134456.vnp>

⁶ <https://vietnamnet.vn/en/sci-tech-environment/measures-sought-to-minimise-drought-s-impact-on-rice-production-624572.html>

⁷ <http://ffw.mrcmekong.org/>

⁸ <http://droughtforecast.mrcmekong.org/maps>

⁹ <http://app.rid.go.th:88/reservoir/> and <http://www1.rid.go.th/main/index.php/en/>

¹⁰ <https://www.bangkokpost.com/thailand/general/1873109/raft-peoples-lives-parched-by-drought>

¹¹ <https://www.world-grain.com/articles/13338-thailand-faces-drought>

¹² <https://fr.vietnamplus.vn/la-thaillande-renforce-les-aides-aux-agriculteurs-touchees-par-la-secheresse/134000.vnp>

¹³ <https://www.khmertimeskh.com/50700262/rice-farmers-struggle-during-drought-season/>

¹⁴ <https://www.phnompenhpost.com/business/cultivation-improvements-agenda-amid-droughts>

¹⁵ <http://asmc.asean.org/asmc-alerts/>

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Distribution: for ERCC and related partners use.

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¹⁷ European Commission, Joint Research Centre, Ispra (VA), Italy