2020 | Water Risk Assessment Result

Delta Electronics (Thailand) Public Company Limited

Foreword

Relentlessly, Delta Group’s Sustainable Development study and performance improvement on natural resource management tracking. In this booklet, Sustainable Development Office has utilized reliable science-based tools to realize water risk in the area where Delta’s major operation sites

Readers will learn the size of nearby water sources, national or international protection status, biodiversity values (such as species diversity and endemism, and public highlighted number of protected species), and value of the water source to your local communities and indigenous people. Finally, this resource of consolidated data should help to raise awareness of water and natural resources conservation specific to each area.

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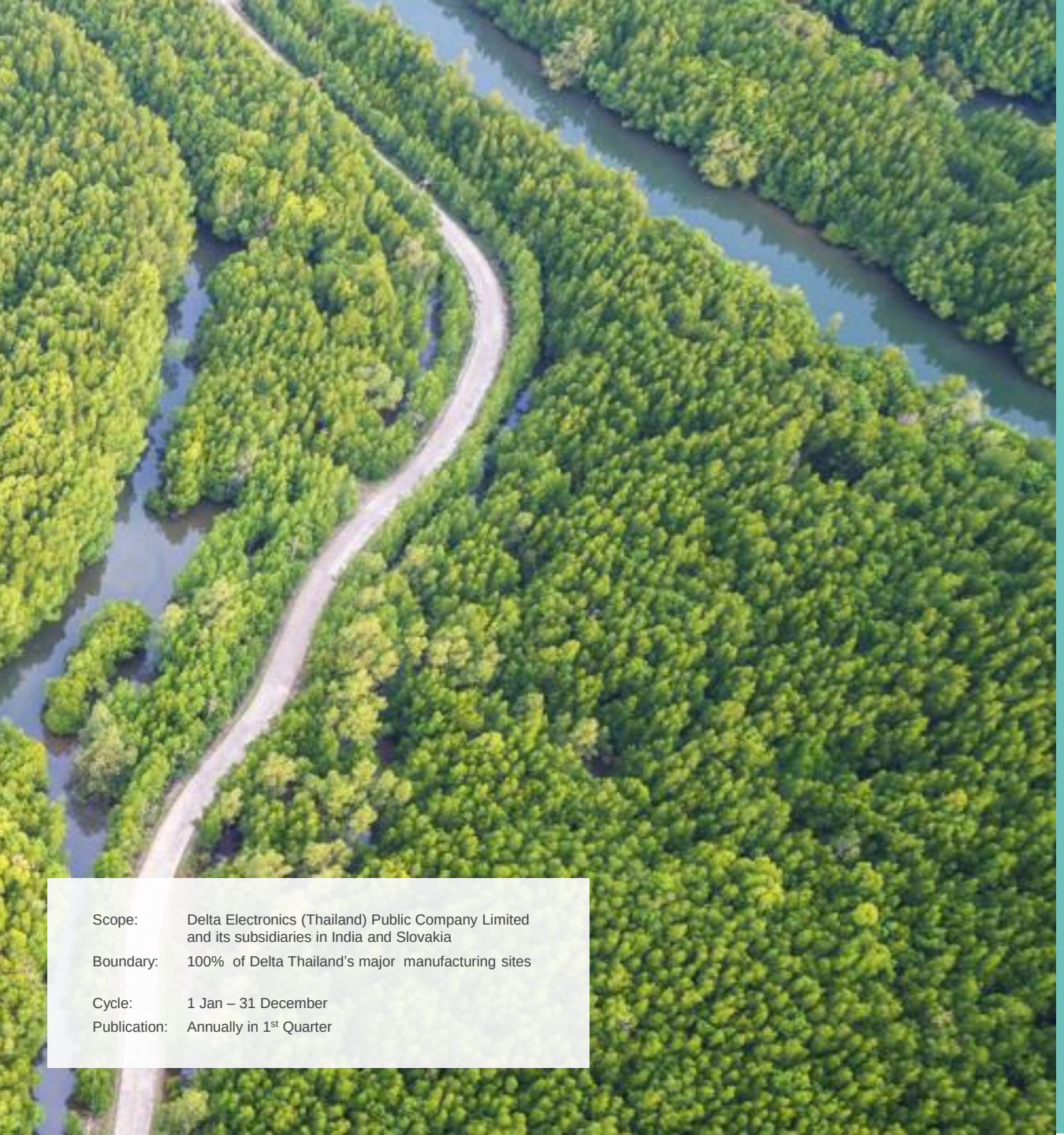
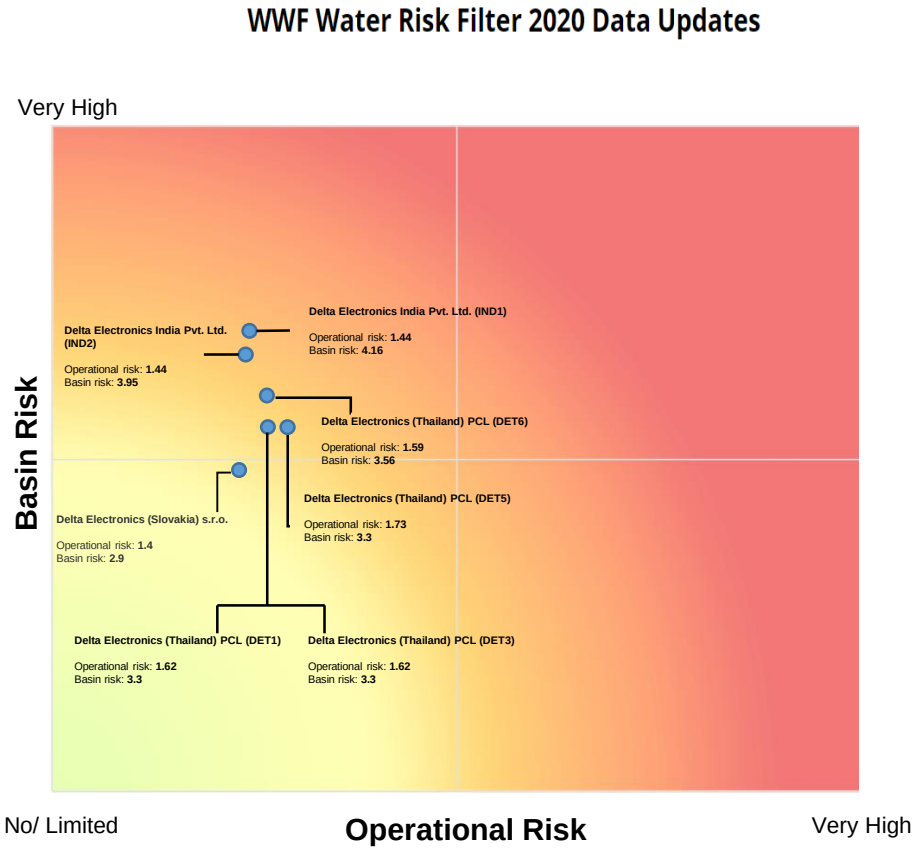
February 2021



Scope:	Delta Electronics (Thailand) Public Company Limited and its subsidiaries in India and Slovakia
Boundary:	100% of Delta Thailand's major manufacturing sites
Cycle:	1 Jan – 31 December
Publication:	Annually in 1st Quarter

Content

Delta Thailand’s Water Risk Assessment Results 2020



Reference: https://waterriskfilter.panda.org/

Delta Thailand’s Water Risk Assessment

Delta Electronics (Thailand) Public Company and its subsidiaries (India and Slovakia) apply **India Water Tool** developed by the World Business Council for Sustainable Development (WBCSD) to assess Water Stress of India’s sites and **WWF Water Risk Filter** and **WRI Aqueduct** , which recommended by WBCSD. Although Delta’s water consumption is used for domestic and sanitary purpose only and has less impacts, Delta uses those water tools to analyze and assess its activities. Using the location of the factories and the volumes of water used from each source by factories to understand the potential relates links between local basin risks and operation risks and other factors for planning its water management ensuring its activities not to impact to stakeholders or communities.

The operational risk assessment

is based on the same aggregation principles and risk scoring levels into risk categories, risk category and risk type have weightings which are industry-specific. The Water Risk Filter 5.0 contains default industry-specific weightings for a total of 25 industry categories. In other words, the operational risk score varies according to the same 1-to-5 classification organized as follows:

1) No or very limited risk
2) Limited risk
3) Some risk
4) High risk
5) Very high risk

The results of the operational risk indicators are aggregated into risk categories which inform the overall risk scores for the 3 risk types: Physical, Regulatory and Reputational. The final overall operational risk score is aggregated based on the 3 risk type scores.

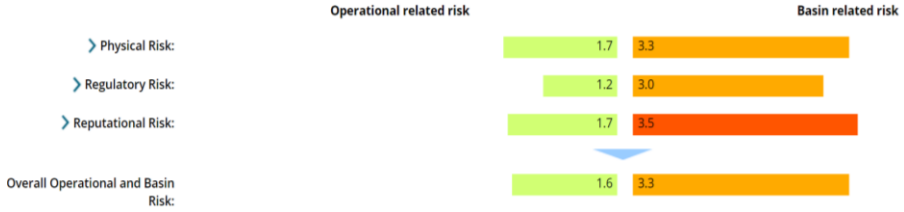
The basin risk assessment indicators are assigned to one of three risk types, and in turn, one of 12 risk categories and Each basin risk indicator, risk category and risk type have weightings which are industry-specific. The Water Risk Filter 5.0 contains default industry-specific weightings for a total of 25 industry categories (see Appendix 1 for detailed information of default weightings for each industry).

Delta Thailand's Water Risk Assessment Results

WWF Water Risk Filter 2020 Data Updates

Risk chart for Delta Electronics (Thailand) PCL (DET1)

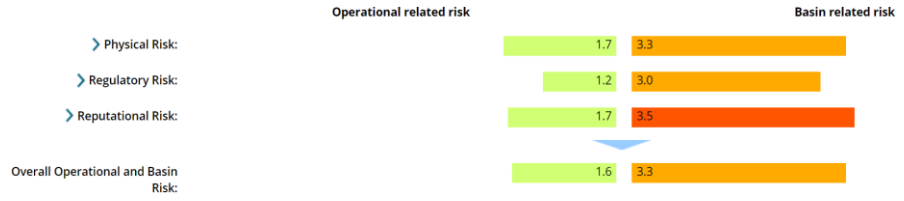
This site heat map provides direct insight in the aggregated risk scores for the selected site.



Risk chart for Delta Electronics (Thailand) PCL (DET3)

Individual Site Results: Risk Chart

This site heat map provides direct insight in the aggregated risk scores for the selected site.

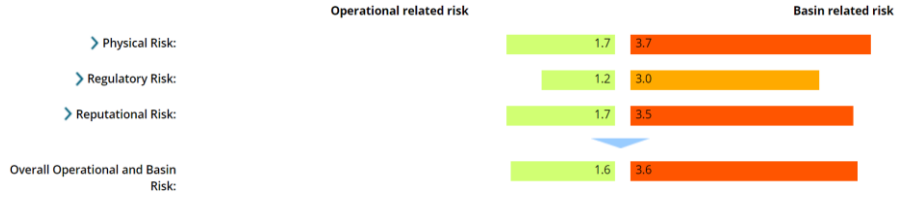


Risk chart for Delta Electronics (Thailand) PCL (DET5)

This site heat map provides direct insight in the aggregated risk scores for the selected site.

Risk chart for Delta Electronics (Thailand) PCL (DET6)

This site heat map provides direct insight in the aggregated risk scores for the selected site.



Risk chart for Delta Electronics India Pvt. Ltd. (IND1)

This site heat map provides direct insight in the aggregated risk scores for the selected site.

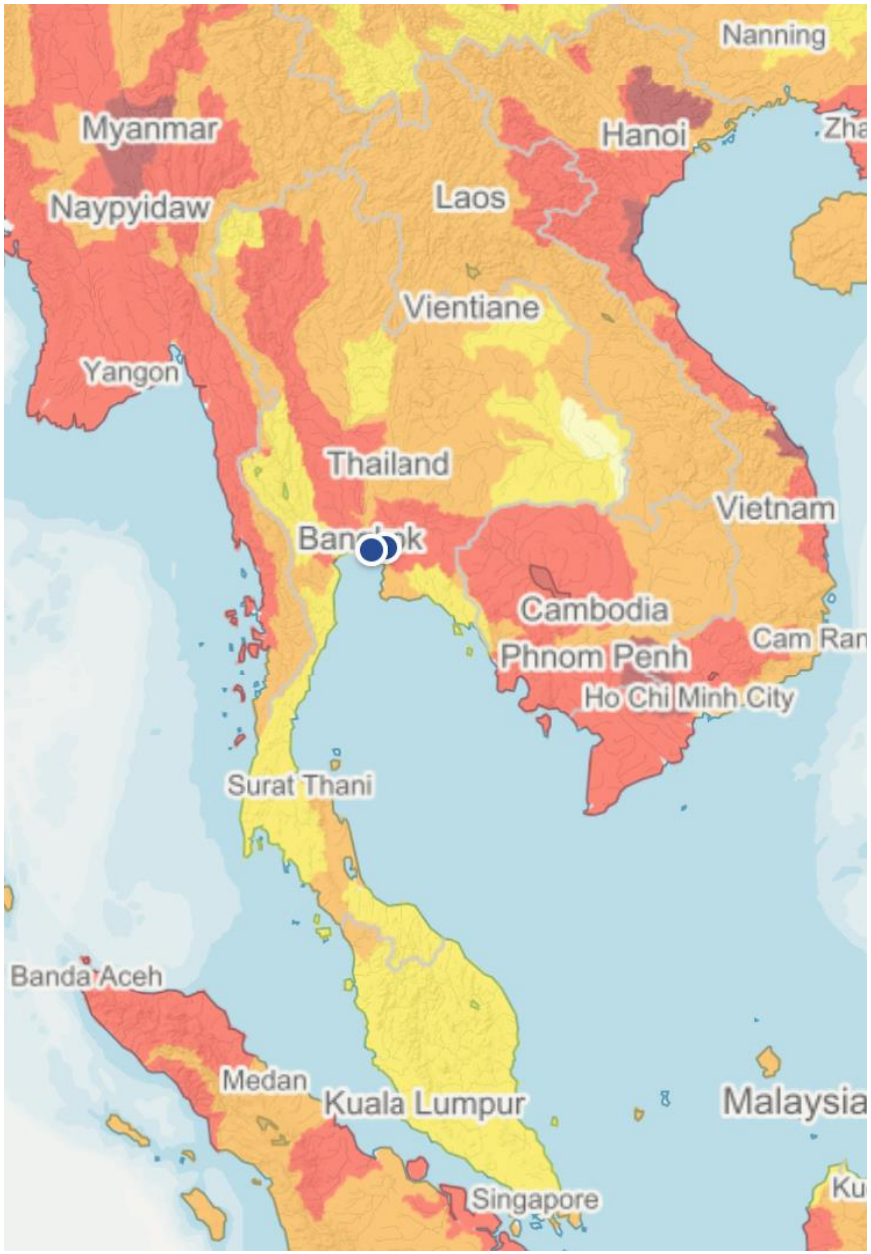
Risk chart for Delta Electronics India Pvt. Ltd. (IND2)

This site heat map provides direct insight in the aggregated risk scores for the selected site.

Risk chart for Delta Electronics (Slovakia) s.r.o.

This site heat map provides direct insight in the aggregated risk scores for the selected site.

Reference: https://waterriskfilter.panda.org/



	Name	Latitude	Longitude	Major Basin	Minor Basin	Aquifer	Country	Province	Overall Water Risk
×	DET5	13.550858	100.672012	Chao Phraya	Delta	-	Thailand	Samut Prakan	Medium - High (2-3)
×	DET3	13.555437	100.670527	Chao Phraya	Delta	-	Thailand	Samut Prakan	Medium - High (2-3)
×	DET1	13.552214	100.669424	Chao Phraya	Delta	-	Thailand	Samut Prakan	Medium - High (2-3)
×	DET6	13.588149	100.944592	Gulf of Thailand Coast	Sa Keo	-	Thailand	Chachoengsao	High (3-4)

Thailand

Thailand has substantial inland water resources in the form of numerous large river basins (Makong River and its several tributaries, Chao Phraya River basin, Ta Chin River basin). Inland capture fishery production increased drastically between 1986 and 1996., the production is dominated by unspecified freshwater fish (93,100 tonnes in 2015), which includes 47.4% of the report catch. Climbing perch, silver barb, tilapia ,striped snakehead and clariid catfish are the major identified species. (Welcomme and Food And Agriculture Organization Of The United Nations, 2011, pp.66-67,114).

Gulf of Thailand (GoT) is a semi-enclosed tropical sea located in the South China Sea (Pacific Ocean), surrounded by the countries Malaysia, Thailand, Cambodia and Vietnam (Charlier, 2006). The Gulf covers roughly 320,000 km². GoT contributes estimately 68.5% of production of marine capture fisheries in Thailand (2.6 x 10^6 tonnes in 2004) (www.fao.org, 2008).

https://tinyurl.com/yxuhwwp8

Delta Thailand group's Water Risk Assessment Results 2020

A water risk assessment results for Delta Thailand in 2019 - 2020 using both local basin risks and operation risks assessment had been fully conducted as the risk charts demonstrated.

- **Operational related risk**: the results in the risk chart showed all Delta Thailand's operational related risk* was classified in class 1. which means "No or very limited risk" for 3 risk types (Physical, Regulatory and Reputational risks).
  - There was only 1 site in Thailand (DET5) , received score 1.9 in Physical related risk which could be explained by the water consumption volume (water consumption 100,000-1,000,000 m3/ year) based on Brauman et al.'s water depletion categories, DET5 was scored in the water depletion risk indicator at 3- Moderate risk which at least 10% water depletion of the time in 2019. In 2020, DET5 was score in the water scarcity at 2.1, this circumstance was caused of the drought occurred in Thailand. (please see more detail in page 5 - 8)

- **Basin related risk**, **overall Delta Thailand's local basin risk result was scored at scale range 2.7-3.7 (Limited risk - Some risk) and 2 sites were scored at 4 (High risk)
  - **The overall scores** were reported at 2.7-3.7 because Delta Thailand sites according to its local basin Chao Phraya river data base in physical risk (reflects key issues regarding water); Quantity – Flooding and Quality was assessed at 4-5 score range (High risk – Very high risk)

    - Flooding: the recurrence of floods within the 34-year time frame period of 1985 to 2019. The occurrence of floods within a given location was estimated using data from Flood Observatory, University of Colorado. The Flood Observatory use data derived from a wide variety of news, governmental, instrumental, and remote sensing source. *(Global dataset- Basin level indicator)*

    - Quality : the quality was reported at 0.7-1.0 very high risk of surface water contamination according to Surface Water Contamination Index (*Global dataset: Basin level indicator*)
      - soil salinisation (weighting 11%)
      - nitrogen (N; 13%)
      - phosphorus (P, 13%) loading
      - mercury deposition (9%)
      - pesticide loading (13%)
      - sediment loading (12%)
      - organic loading (as Biological Oxygen Demand, BOD; 17%)
      - potential acidification (7%)
      - thermal alteration (7%) (Vörösmarty et al., 2010).

    - Biodiversity Importance Risk : The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World25 (FEOW) 2015 data developed by WWF and TNC. Companies operating in basins with higher number of endemic fish species are exposed to higher reputational risks. (please view more further detail in **Basin biodiversity related risk in Thailand** on page 9-11)

  - The high range score in reputation risk also presents the relation between the reputation and companies operating in basins with higher number of fish species are exposed to higher reputational risks. The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Count of fish species is used as a representation of freshwater biodiversity richness. According to the Freshwater Ecoregions of the World (FEOW), The fresh water fish species in Thailand estimately is 214-322. (https://www.feow.org/global-maps/biodiversity/freshwater_fish_species_richness).
  - According to the study by Tanaka et al., 2015 surveyed fish assemblages and investigated environmental and landscape parameters in a total of 135 floodplain waterbodies (rivers, diversion canals, ponds, irrigation ditches, paddy fields, and wetlands) in the Chao Phraya River Basin. This study discovered the significance of floodplain area for fishes in the mid-region of the Chao Phraya River basin. The population of juvenile fishes was increased by floodplain connects to main river and it is used by fish species to forage and breed which support the fish species richness in Chao Phraya River basin. (please view more further detail in **Basin biodiversity related risk in Thailand** on page 9-11)

* Operational related risk : the risk category and weightings in each specific industries. The Water Risk Filter 5.0 (WWF) contains default industry-specific weightings for a total of 25 industry categories (see Appendix 2 for detailed information on the default weightings for each industry)
** Local Basin risk: the global level water risk data is developed and integrated by WWF to have higher resolutions data sets into the Water Risk Filter 5.0 to provide country-specific local risk indicators for conducting risk assessment at a finer scale. (The Water Risk Filter 5.0 currently has local data sets available for the following countries and regions: Great Britain; South Africa; Brazil; Colombia; Spain; Greater Mekong countries (Thailand, Vietnam, Laos, Cambodia))

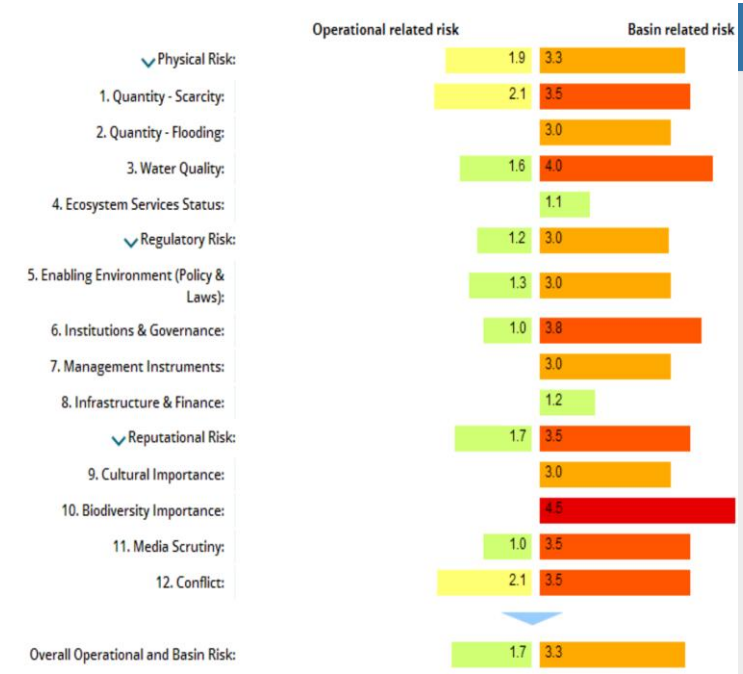
Reference: https://waterriskfilter.panda.org/

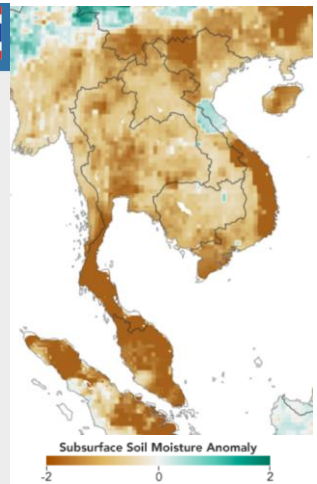
Delta Thailand group's Water Risk Assessment Results 2020

Risk chart for Delta Electronics (Thailand) PCL (DET5)

WWF Water Risk Filter 2020 Data Updates

From Thursday 17th December 2020, the basin risk results of all your sites will be automatically re-assessed using the tool's latest basin risk data.





The map shows soil moisture anomalies, or how much the water content near the land surface was above or below the norm for southeast Asia from January 1 to February 7, 2020. The measurements were derived from data collected by the Soil Moisture Active Passive (SMAP) mission, the first NASA satellite dedicated to measuring the water content of soils.

Ref: https://earthobservatory.nasa.gov/images/146293/drought-hits-thailand

Delta Electronics (Thailand) PCL. (DET5) is head quarter, it's located in Bangpoo Industrial Estate, Samut Prakan province. DET factories including DET 1,3 and 5 are supplied water from IEAT (Industrial Estate Authority of Thailand). The raw water for producing water supply is transmitted from "Sam Lae pumping station". Sam lae pumping station is the starting point of receiving raw water from the Chao Phraya River and transmits to the Eastern Water Supply Canal at Samlae Subdistrict, Pathum Thani Province.

* Chao Phraya River: used as a raw water source of Bankhen, Samsen, and Thonburi Water Treatment Plants (WTP). The water flows to the East Prapa Canal and then is delivered to raw water intake at Samlae Pumping Station, Pathum Thani Province. (https://web.mwa.co.th/download/prd01/cr/2020CCRENG.pdf)

The drought in Thailand was detected in Central and Northern parts of Thailand since 2015 till 2020. the drought hotspots areas in Thailand was Bangkok Metropolistan Region, Chon Buri, Nong Khai, Nonthaburi, Pathum Thani, Phra Nakhon Si Ayuthayya, Samut Prakan and Samut Sakhon as it shows in "Table 2-1: Hotspots of drought risk for countries in South-East Asia" (Salsiah and Dato Lim, 2021) page 6. This caused the higher chloride concentration than 250 mg/litre in raw water and it directly relates to TDS (Total Dissolved Solids) in water.

** TDS of water is directly related to the conductivity of dissolved ionized solids in the water. Ions from the dissolved solids create the ability for water to conduct an electrical current, which is measured by the IC Controls 210-C(TDS) analyzer, and immediately displayed as sodium chloride ppm or mg/L or µS/cm conductivity. When periodically standardized with IC Controls TDS standards or by laboratory gravimetric TDS measurement, TDS analyzers based on conductivity provide a quick accurate value of the TDS. (Total Dissolved Solids, 2021)

Water scarcity in Thailand

The drought of 2020 is a consequence of the rainy season of 2019, which is the least rainfall in 30 years, mainly due to the phenomenon "El Niño" causing both hot conditions and drought in many areas in the north, northeastern, central and eastern regions, causing obvious water shortages especially water in agricultural areas. (Thana-Dachophol et al., 2020)

The amount of accumulated rainfall in the rainy season 2019, in May 2019 - 31 October 2019) is less than the average cumulative rainfall of 30 years about 16 percent. The effect of accumulated rainfall in the year 2019 is less, causing water stock in large and medium-scale reservoirs during the dry season 2020 (November 2019 - April 2020) to have a small amount of water, especially the Chao Phraya River Basin which resulted in a drought crisis area. (Thana-Dachophol et al., 2020) The River levels are so low that saltwater from the ocean is creeping upstream and affecting TDS (Total Dissolved Solids) in water supplies. (Patel, 2020)

During the drought events of 2015-2020, many economic impacts of drought were recorded. For example, in Thailand in 2015-2016, drought damaged crops and land in 13 provinces and caused rice production to fall by 27 million tonnes to the lowest level since 2000-2001.79 Drought has also reduced productivity so that sugar cane output in 2020 is likely to fall by 30 per cent, potentially the worst season in five years. (Salsiah and Dato Lim, 2021)

Although the Royal Irrigation Department of Thailand diverts water from the Mae Klong River to help intrusion the saltwater in the Chao Phraya River, but the salty water supply problem still recurred periodically throughout the year 2020. (Thana-Dachophol et al., 2020)

Delta Thailand group's Water Risk Assessment Results 2020

Administrative divisions included in each hotspot, in Table 2-1: Hotspots of drought risk for countries in South-East Asia

Countries	Areas with high frequency of severe meteorological drought (over period 1981-2019, based on SPI6)	Hotspots of drought severity, exposure and vulnerability in 2015, (based on SPI6, population density and HDI)	List of provinces	Hotspots of drought severity, exposure and vulnerability in 2020 (based on SPI6, population density and HDI)	List of provinces
Philippines	Southern parts	Central and southern parts	Autonomous Region in Muslim Mindanao, Bicol, Cagayan, Calabarzon, Caraga, Central Luzon, Central Visayas, Mimaropa, National Capital Region, Northern Mindanao, Soccsksargen, Western Visayas and Zamboanga Peninsula.	Southern parts	Autonomous Region in Muslim Mindanao, Bicol, Caraga, Central Visayas, Davao, Northern Mindanao, Soccsksargen and Zamboanga Peninsula.
Singapore	All parts	Northern parts	Northern parts	None	None
Thailand	Central parts	Central and northern parts	Bangkok Metropolitan Region, Chiang Mai, Mukdahan, Nong Khai, Nonthaburi, Pathum Thani, Samut Prakan and Samut Sakhon.	Central and northern parts	Bangkok Metropolistan Region, Chon Buri, Nong Khai, Nonthaburi, Pathum Thani, Phra Nakhon Si Ayuthayya, Samut Prakan and Samut Sakhon.
Timor-Leste	All parts	Northern parts	Ermera and Oecussi.	Northern and central parts	Aileu, Baucau, Bobonaro, Cova Lima, Dili and Ermera. Some parts of Ainaro, Lautem, Manatuto, Manufahi and Viqueque.

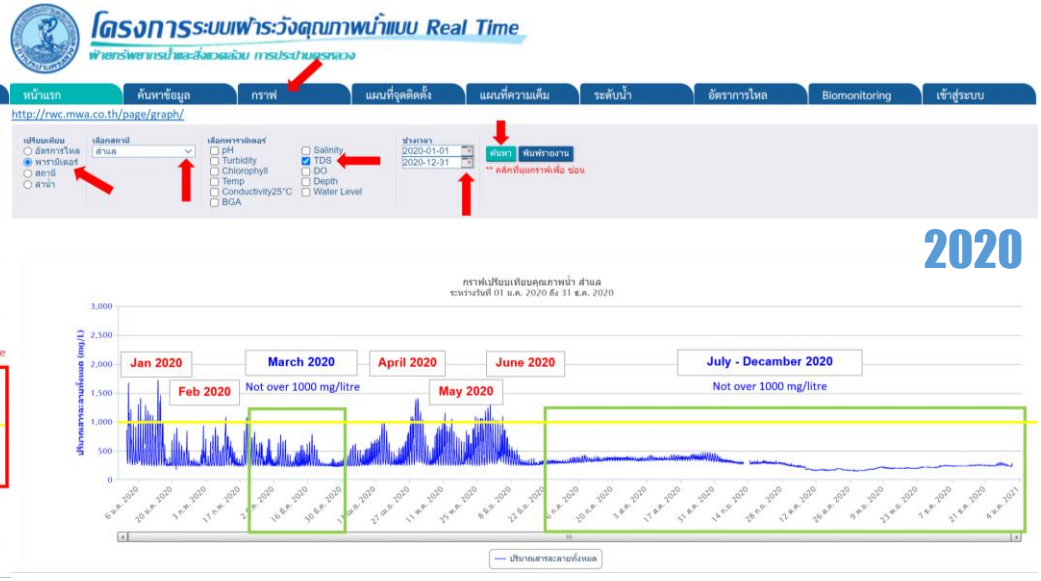
High Medium Low

Resource: Ready for the Dry Years Building resilience to drought in South-East Asia Second Edition, page 120 (Salsiah and Dato Lim, 2021)

Delta Thailand group’s Water Risk Assessment Results 2020

Metropolitan Waterworks Authority (MWA) is a State Enterprise, which has a major responsibility for tap water production in Bangkok, Nonthaburi, and Samut Prakarn Provinces in Thailand. Service areas cover 2,358-kilometer square and they are divided into 18 branches. MWA has four Water Treatment Plants and ten pumping stations. The production capacity is about 5.9 million cubic meters per day. The Chao Phraya River and Mae Klong River are water resources. Integrated water quality monitoring is managed for water resources and tap water quality. Bio monitoring and online raw water monitoring (rwc.mwa.co.th/page/graph/) are used for raw water sources (Kordach et al., 2018).

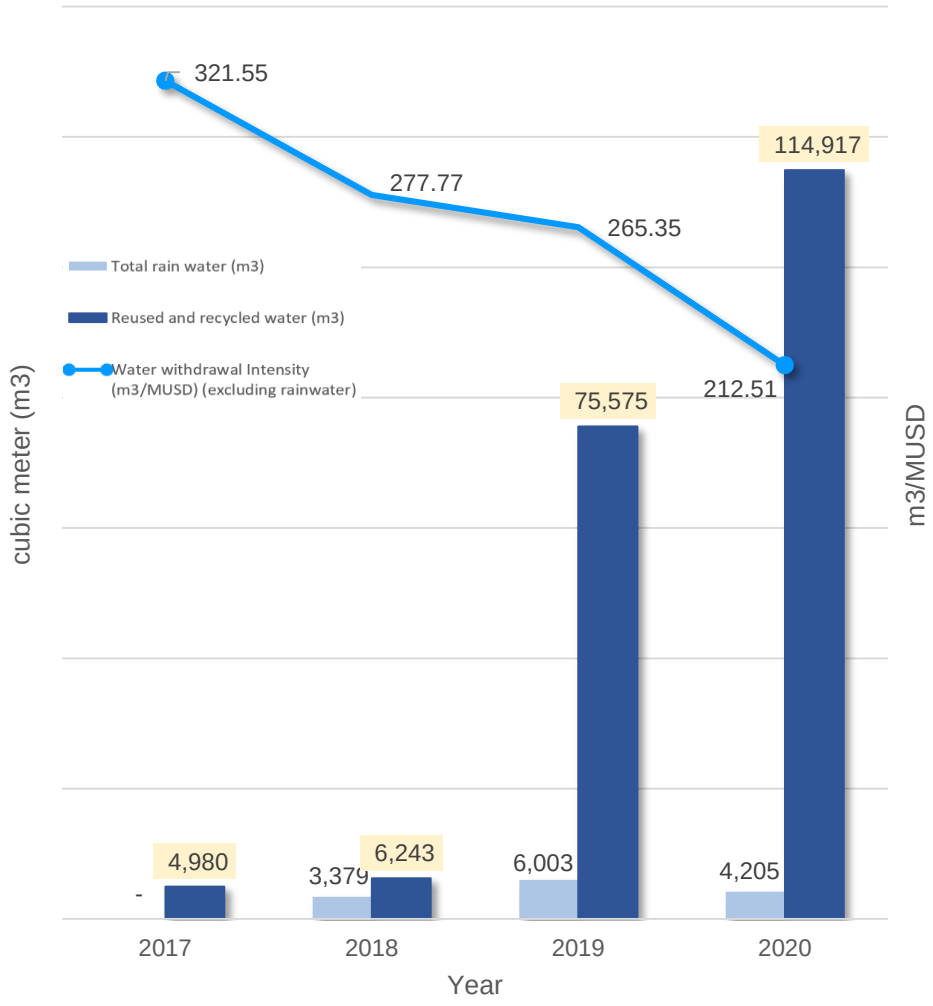
Delta Electronics (Thailand) PCL. has been monitoring quality of water both input and output water through our domestic water usage. Although water is not our production factor or used in manufacturing process, the company has taken many measures to conserve clean and accessible water for our local community. In late of 2019 to mid of 2020, the high concentration of TDS (Total Dissolved Solids) > 1,000 mg/litre was detected in raw water from Sam Lae pumping station in late December 2019 and January – June 2020 which was the consequence of the drought in Thailand. The drought of 2020 is mainly due to the phenomenon "El Niño" causing both hot conditions and drought in many areas in the north, northeastern, central and eastern regions, causing obvious water shortages (Thana-Dachophol et al., 2020). This occur drives us to be more carefully and strictly in use of water withdrawal from sources to avoiding Water scarcity and Water conflict in communities. Since 2014 to 2020, Delta has been save water from our reused and recycled water programs 320,477,446 litres. (please refer to 2021 Sustainability in numbers page 4) Apart from water management , the GHG management is also the important indicator which involves to El Niño and causes the drought. The cycle of droughts and floods has become more intense due to global warming and changing weather patterns. The increased emissions of greenhouse gasses into atmosphere from human activity over the past decades has led to global warming and climate change that is distributing weather patterns and therefore seasonal changes. The rising temperatures in Thailand increase evaporation, leading to a shorter ‘rainy season’ and therefore more frequent and intense droughts (Doyle Houghton, 2021). To mitigate the global warming and increasing of greenhouse gas, Delta aligns with the Carbon Disclosure Project guideline to provide concrete measures to continuously implement energy management to improve our energy usage efficiency while reducing carbon emissions. (please refer to page 9)



Reference : rwc.mwa.co.th/page/graph/

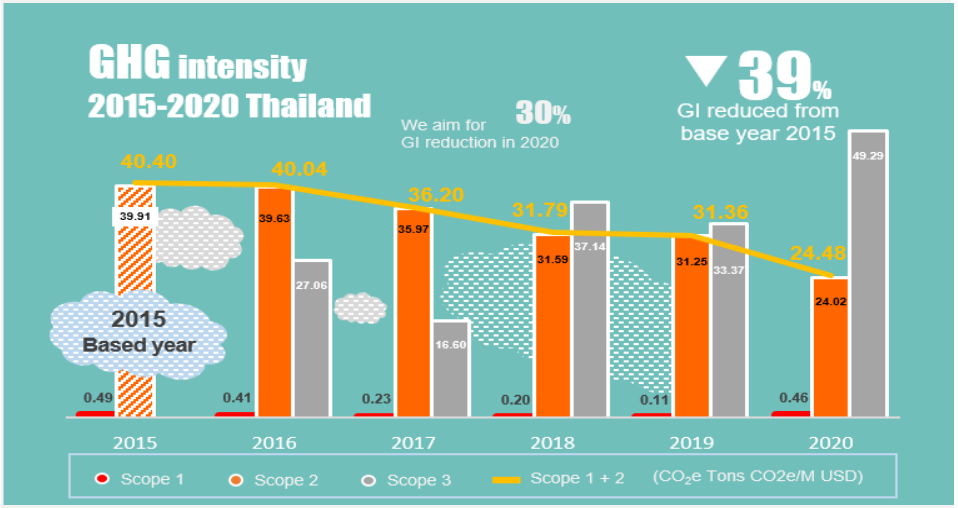
Delta Thailand group's Water Risk Assessment Results 2020

Delta Thailand's Water consumption 2017-2015



Delta measures its implementation of various water-saving at main sites, such as recycling the condensed water for cooling tower, Rejected RO water for gardening or irrigation. The company adopts water-saving taps and water-saving sanitary wear, reducing water output from taps and the water level of cisterns, managing the excess water of cooling towers as well as reusing the wastewater from RO-system water purifiers.

With target to reduce 30% water consumption intensity (m3/MUSD consolidated revenue) in 2020, Delta achieved total water reused and recycled 114,917 cubic meters (m3) or 114,917,000 litres as a result , the reduction in water withdrawal intensity in 2020 as 212.51 m3/MUSD.

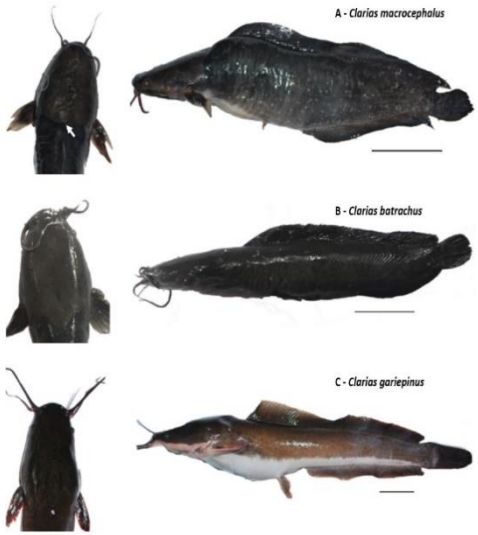


Delta's emissions disclosure had validated by an independent assurer to ensure data accuracy and transparency. Our goal in 2020 was to reduce 30% GHG intensity per 1 million USD production amount, latest statistics shows that the GHG intensity (Thailand's sites) of 2020 (scope1+2) was 24.48 tons CO2e/ M USD, a decrease of 39% from our base year 2015. Our next challenge is our target to reduce 20% of GHG reduction intensity within 2025 compared with a new base year 2020. (please see our performance in 2021 Sustainability in numbers page 5-6)

Basin biodiversity related risk in Thailand

Thailand, is abundant in biological resources, according to FishBase, approximately 875 fish species are found in the country (www.fishbase.in, n.d.). However, the number of Thai native fish species has declined gradually. It may cause of the result from the introduction of non-indigenous species, one of the critical threats to biodiversity worldwide (Crowl et al., 1992; Lowe et al., 2000; Munro et al., 2005; Hubilla et al., 2007). Biodiversity loss is of global concern, as indicated by the designation of 2011–2020 as the Decade on Biodiversity by the General Assembly of the United Nations. (Sala et al., 2000; Dirzo and Raven, 2003; Butchart et al., 2010). Exploration of fish fauna in Western Chaophraya Basin in October 2008 (flood season) and January 2009 (dry season) found species including 3 threatened species such as *Clarias batrachus*, *Phenacostethus smithi* and *Amblypharyngodon chulabhornae* . The invasive alien species, *Pterygoplichthys pardalis* also reported. (Santi et al., 2010) In 2013, The study found the populations of Thai native fish had declined and the further studies indicated that *Pterygoplichthys*, an invasive alien fish (Chaichana et al., 2011). In accordance with the study in Alien Aquatic Species in Thailand by Apichart et al., 2003 found Invasive alien species (IAS) 4 specises : *Clarias gariepinus, Hypostomus spp., Pterygoplichthys sp., Oreochromis mossambicus.* Later in 2013, the study focus on the foraging effects of *Pterygoplichthys* on the native *Clarias macrocephalus* in Thailand, which found *Pterygoplichthys* consumed and destroyed the first-feeding fry of the native catfish *Clarias macrocephalus* and also has the potential to decrease the populations of Thai native fish species (Chaichana, Pouangcharean and Yoonphand, 2013).

Threatened Native fish species in Chao Phraya basin

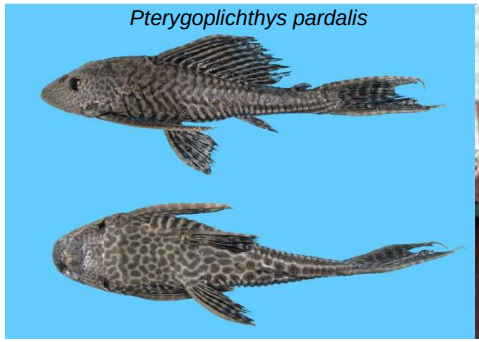


Source: Low genetic diversity in Clarias macrocephalus Günther, 1864 (Siluriformes: Clariidae) populations in the Philippines and its implications for conservation and management (Tan, Jumawan and Quilang, 2016)

Phenacostethus smithi

Source: ww.fishbase.in, n.d.

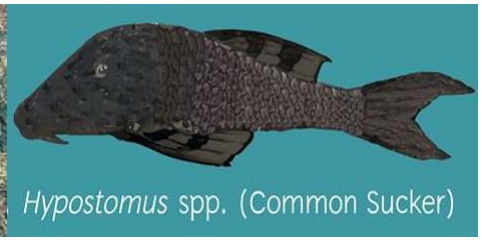
Invasive alien species (IAS)



Source: Occurrence of suckermouth armored catfish (Siluriformes, Loricariidae, Pterygoplichthys) in inland waters of Israel (Golani and Snovsky, 2013)

Source: *ww.fishbase.in, n.d.*

Source: *ww.fishbase.in, n.d.*



Source: https://www.posttoday.com/social/think/442940

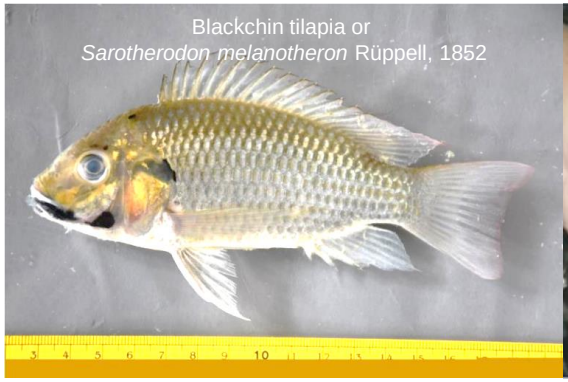
LEGISLATION RELEVANT TO ALIEN INTRODUCTION There are three relevant legal instruments that control aquatic alien introductions in Thailand. The Fisheries Act that prohibits imports of piranhas and sucker catfish, and regulates all imports of aquatic animals. The National Park Act and Wildlife Conservation Act that prohibits carrying and release of any animal into National Parks and Wildlife Sanctuary areas. The import of all living aquatic species is also controlled by the Ministry of Commerce.

Basin biodiversity related risk in Thailand *(continue)*

In Thailand 2018, There was the problems that have been found outbreak of cichlids (Invasive alien species), black cichlids (*Sarotherodon melanotheron* RÜppell, 1852), Mayan fish (*Cichlasoma urophthalmus* (GÜnther, 1862)) and butter cows (*Heterotilapia buttikoferi* (Hubrecht, 1881)) caused some suffering to the fish farmers in Thailand. These invasive alien species had been detected adapting very well in nature , other water sources and tolerant . These alien species were reported the escaping into the fish farms and appeared in Chao Phraya river basin due to the waterbodies throughout the Chao Phraya delta are interconnected and subject to flooding (Nico, Beamish and Musikasinthorn, 2007). The invasive alien species was studied that their invasion impacts to food chain in ecological system of local aquatic fish in Thailand which might lead to unavoidable extinction (พลาศัย et al., 2019). The reduction of number local aquatic animals was detected especially in Bangkok, Chumphon, Kanchanaburi, Prachuap Khiri Khan, Phetchaburi, Ratchaburi, Samut Prakan, Samut Sakhonand, Samut Songkhram provinces (more detail in: https://www4.fisheries.go.th/local/file_document/20180309101422_1_file.pdf).

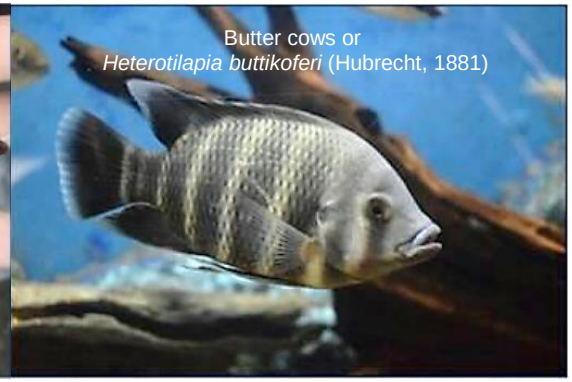
The ban on these invasive fish was announce on 18 January 2018 and effective on 19 March 2018 which was imposed under Section 65 of the Fisheries Act, the National News Bureau regarding to Notification of the Ministry of Agriculture and Cooperatives Re: Specifying species of aquatic animals that are prohibited to import, export, transit or cultivate (more detail in : http://www.ratchakitcha.soc.go.th/DATA/PDF/2561/E/011/32.PDF) (Bangkok Post Public Company, 2018) (Notification of the Ministry of Agriculture and Cooperatives, 2018). The invasive alien fishes rapidly spread and reproduce in natural and artificial inland and coastal environments. The invasive species are a significant driver of native species declines and also a reason of biodiversity loss driven by habitat degradation. They destroy the first-feeding fry of the native species fish, are behaviorally tolerant to climate change and difficult to be removed. According to Notification of the Ministry of Agriculture and Cooperatives, the fish farmers have to hand over three types of cichlids: Blackchin tilapia, Mayan cichlid and Zebra tilapia. The violators of the ban are liable to a maximum penalty of one year in prison and/or a fine of 1 million baht. (Notification of the Ministry of Agriculture and Cooperatives, 2018).

Three non-native cichlid fishes in Chao Phraya River basin, Thailand



Source: https://www4.fisheries.go.th/local/pic_activities/20180222172947 1_pic.pdf

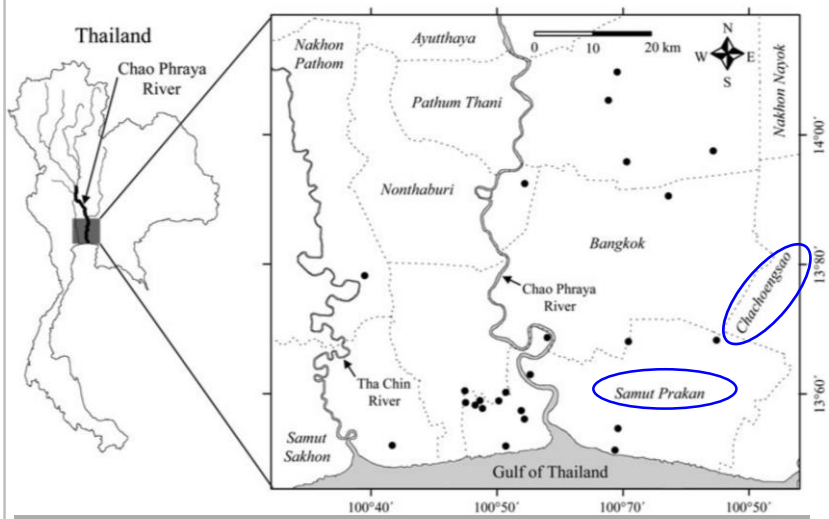
Source: https://www4.fisheries.go.th/local/file_document/20180309101422_1_file.pdf



Source: https://www4.fisheries.go.th/local/file_document/20180309101422_1_file.pdf

Basin biodiversity related risk in Thailand *(continue)*

Mayan fish (*Cichlasoma urophthalmus* (GÜnther, 1862)
Specimen (>100 mm TL) identified by Nico, Beamish and Musikasinthorn, 2007. Fish was collected 26 September 2005 by Jean-Francois Helias while angling in the lower Chao Phraya River delta, Thailand. Photograph by J.-F. Helias.
Source: Nico, Beamish and Musikasinthorn, 2007



Source: Tomojiri, Musikasinthorn and Iwata, 2019 (collection localities (black dots) in the lowermost Chao Phraya River basin in the present study. Broken lines indicate provincial boundaries. Provincial names are in italic.)

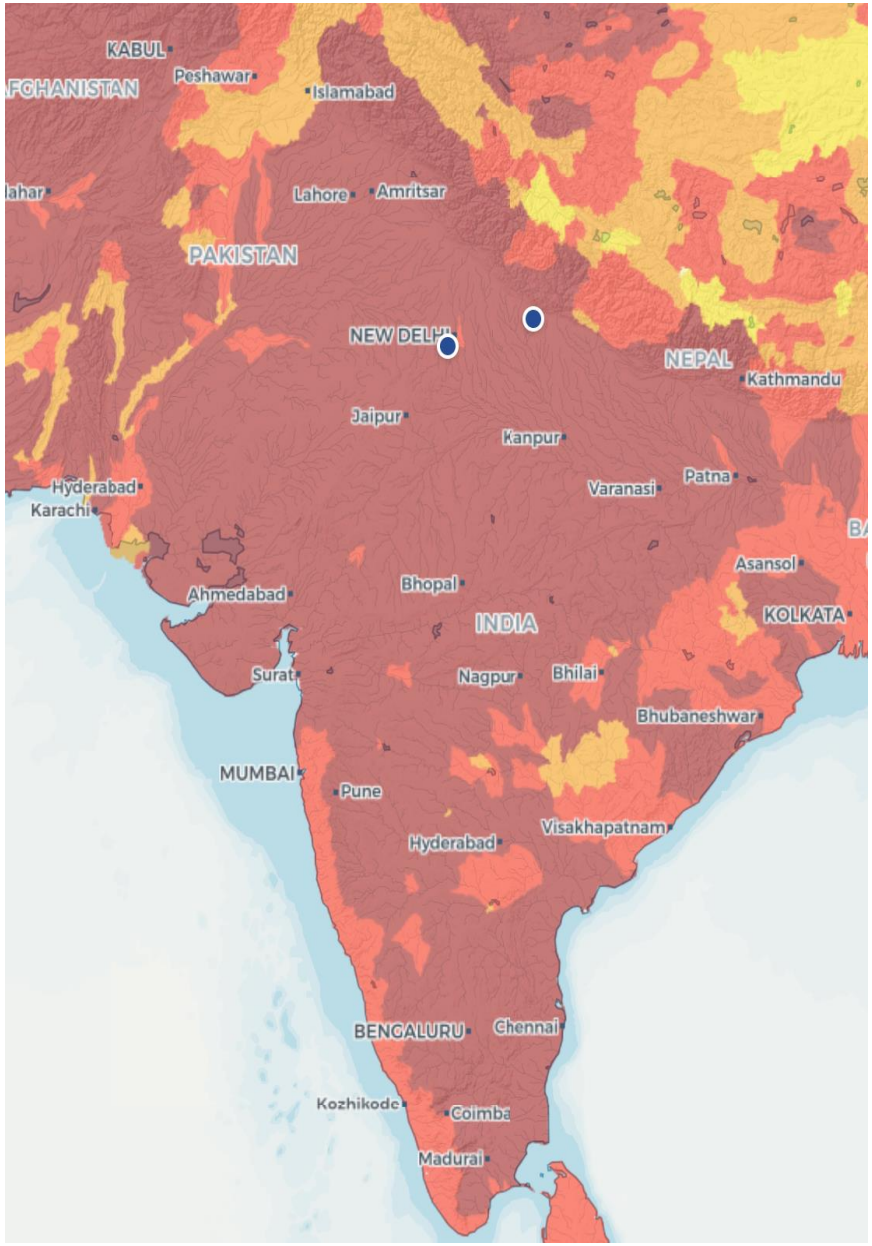
Delta electronics (thailand) public company, the company has 3 sites which 2 sites are located in Samut Prakan Province (Bangpoo Industrial Estate) and 1 site is located in Chachoengsao province (Wellgrow Industrial Estate). Samut Prakan province is identified the propagation of the invasive alien species, mainly Mayan fish (*Cichlasoma urophthalmus* (GÜnther, 1862)) which reported the escaping in to the fish farms and destroyed the native fish ecological systems.

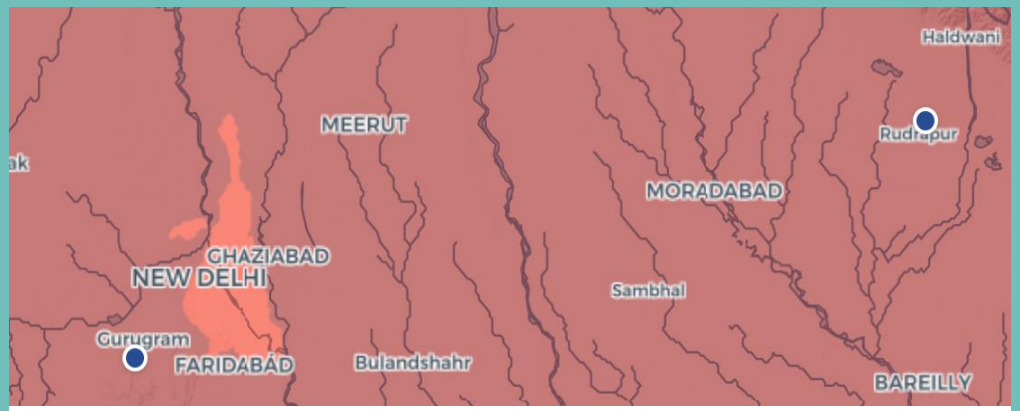
The study in 2007 of *Cichlasoma urophthalmus* or Mayan fish in Thailand was firstly found the invasion of Mayan fish in 2005 according to the photographs by Mr. Jean-Francois Helias ,were taken in September 2005 showing a fish that identified as the Mayan Cichlid "*Cichlasoma urophthalmus"* which was caught from the a brackish water canal that junction to Chao Phraya River in Bang Khun Thian District (Nico, Beamish and Musikasinthorn, 2007).

According to the data in Thailand on 30 August 2018 from Fisheries Resources Management and Measures Determination Division, Department of Fisheries in Thailand reported that Mayan fish was found in Amphoe Phra Samut Chedi, Samut Prakan Province by a local fisherman who used different types of gear, including traps, nets, and hook-and-line and also found in the cannel water for shrimp and fish farms. This invasion of Mayan fish impacted to the native fish species, destroy their habitats and juvenile fishes/shrimps (Notification of the Ministry of Agriculture and Cooperatives, 2018).

These alien species were reported the escaping into the fish farms and appeared in Chao Phraya river basin due to the waterbodies throughout the Chao Phraya delta are interconnected and subject to flooding (Nico, Beamish and Musikasinthorn, 2007).

Recently study in 2019 reported the specimens of Mayan fish (*Cichlasoma urophthalmus or Mayaheros urophthalmus*) were collected from the lower Chao Phraya River basin (see the picture below) in 2014-2015. The specimens were examined and analysed the stomach contents. The result found *M. urophthalmus utilised* more widely varied prey resources, particularly fish in the smaller-size class but the main food item of small fish. The larger Mayan fish tended to consume various aquatic animals (Tomojiri, Musikasinthorn and Iwata, 2019). This recent study supported the impact of the invasion of Mayan fish in Thailand which in accordance with Thailand's Notification of the Ministry of Agriculture and Cooperatives Re: Specifying species of aquatic animals that are prohibited to import, export, transit or cultivate, The violators of the ban are liable to a maximum penalty of one year in prison and/or a fine of 1 million baht. (Notification of the Ministry of Agriculture and Cooperatives, 2018).





Overall Water Risk

Low	Low - Medium	Medium-high	High	Extremely high
(0-1)	(1-2)	(2-3)	(3-4)	(4-5)

No data

Name	Input address	Match address	Latitude	Longitude	Major Basin	Minor Basin	Aquifer	Country	Province	Overall Water Risk
Delta Electronics India Pvt. Ltd. (IND1)	–	-	28.4162	77.0017	Ganges - Bramaputra	Yamuna 1	-	India	Haryana	Extremely High (4-5)
Delta Electronics India Pvt. Ltd. (IND2)	–	-	29.009	79.4161	Ganges - Bramaputra	Ramganga	Ganges-Brahmaputra Basin	India	Uttarakhand	Extremely High (4-5)

India

Gurgaon district is situated on South eastern part of Haryana state has an area of 1200 sq.km. In the North, it is bordered by the Union Territory of Delhi, in the east by Faridabad, in the North west by Jhajjar and Rewari districts of Haryana and in the west by the Alwar district of Rajasthan state and south by the Mewat district of Haryana state (Gurgaon district at a glance si.no. Items Statistics,n.d.).

Rudrapur city is the district headquarter of district Udham Singh Nagar in Uttarakhand state. The Rudrapur city is situated in Terai region of district Udham Singh Nagar at a distance of 72 Kms from Nainital. There are two rivers known as Kalyani and Begul flows through the city area (Abhishek, Saurabh and Dhawal, 2019).

https://tinyurl.com/y4hpksf3

Delta India's Water Risk Assessment Results 2020 *(continue)*

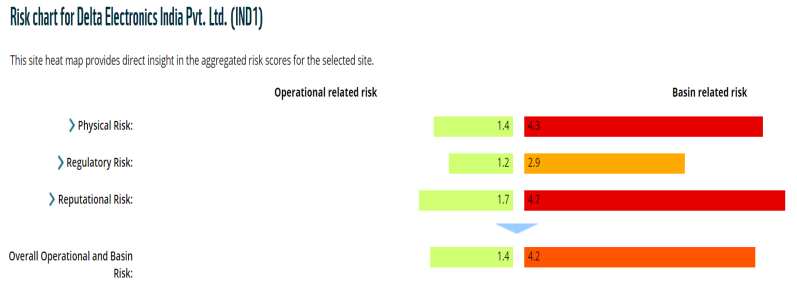
➢ **Basin risk scor**es *(continue)* , **overall Delta Thailand's local basin risk result was scored at scale range 2.7-3.7 (Limited risk - Some risk) and 2 sites were scored at 4 (High risk)

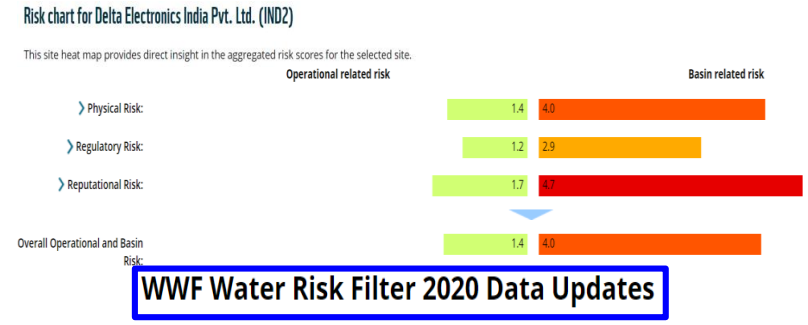
- **The overall scores** were reported at 4 (High risk) which the sites locate in India. The risks types that received score 4-5 (High risk – Very high risk) were; Physical risk and Reputational risk.
- **The physical risk** was reported range 4.0-4.2 (High risk) as the consequence of scores in Quantity – Flooding and Quality , the categories in physical risk type using Global dataset Basin level indicator;

- Flooding: the recurrence of floods within the 34-year time frame period of 1985 to 2019. The occurrence of floods within a given location was estimated using data from Flood Observatory, University of Colorado. The Flood Observatory use data derived from a wide variety of news, governmental, instrumental, and remote sensing source. *(Global dataset- Basin level indicator)*

- Quality : the quality was reported at 0.7-1.0 very high risk of surface water contamination according to Surface Water Contamination Index (*Global dataset: Basin level indicator*)
  - soil salinisation (weighting 11%)
  - nitrogen (N; 13%)
  - phosphorus (P, 13%) loading
  - mercury deposition (9%)
  - pesticide loading (13%)
  - sediment loading (12%)
  - organic loading (as Biological Oxygen Demand, BOD; 17%)
  - potential acidification (7%)
  - and thermal alteration (7%)

- **The reputational risk** score was reported at 4.0 – 4.9 (High risk) from culture importance, media Scrutiny and conflict, the categories in reputational risk type.
  - Culture importance: Number of ethnolinguistic groups: >100 , this risk indicator is based on Oviedo and Larsen (2000) data set, which mapped the world's ethnolinguistic groups onto the WWF map of the world's ecoregions. *(Global dataset- Country level indicator)*
  - Media Scrutiny: Permanent (> per week), this risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group)13. It indicates how aware local residents typically are of water-related issues due to national media coverage. The indicator is on the assumption that businesses face higher reputational risks when operating in countries with higher local/national media coverage reporting on water-related issues. *(Global dataset- Country level indicator)*
  - Conflict: Very high conflict potential, This risk indicator is based on 2018 data collected by RepRisk on counts and registers of documented negative incidents, criticism and controversies that can affect a company's reputational risk. These negative news events are labelled per country and industry class. *(Global dataset- Country level indicator)*

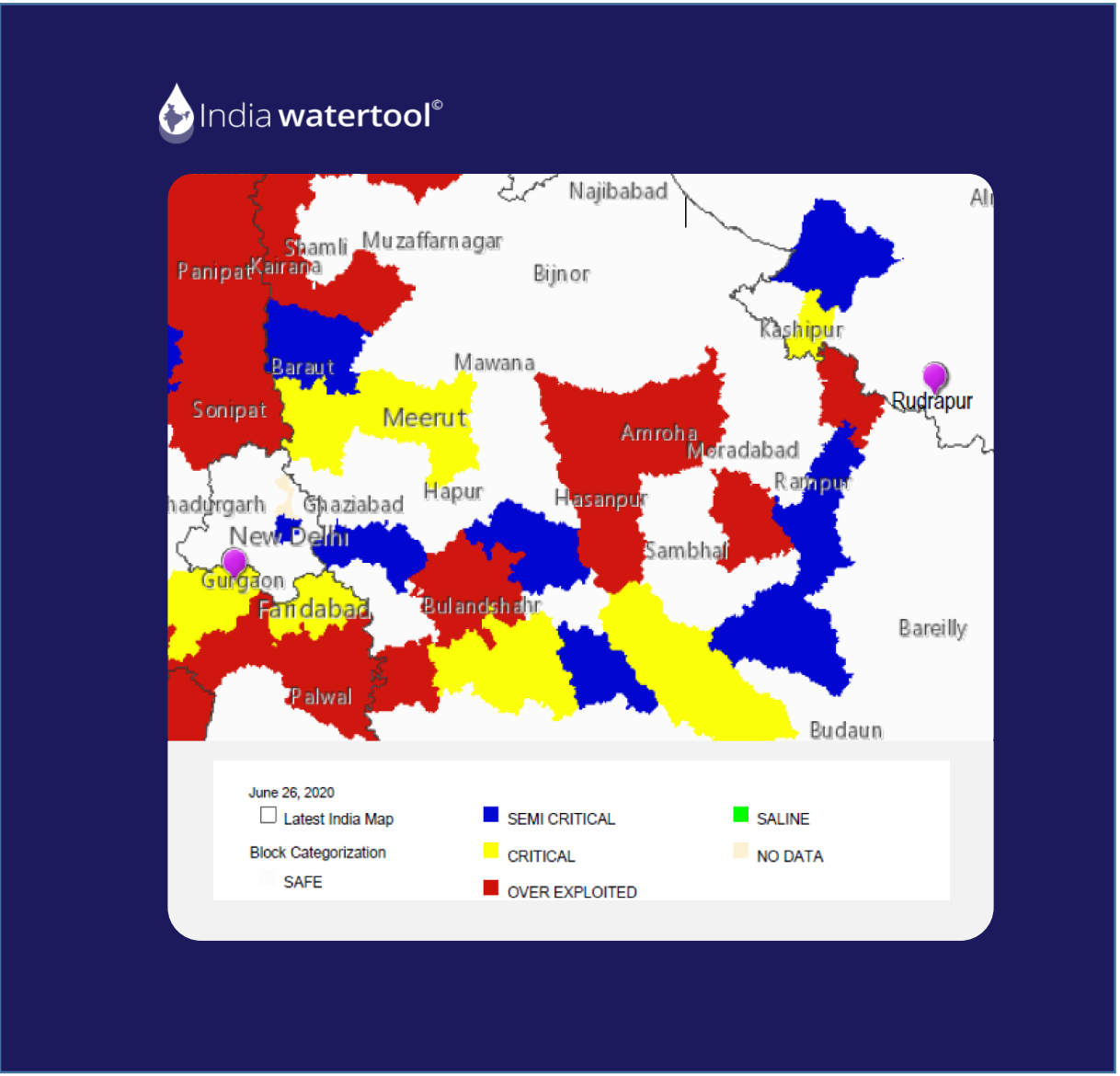




WWF Water Risk Filter 2020 Data Updates

Reference: https://waterriskfilter.panda.org/

Delta India's Water Risk Assessment Results 2020 *(continue)*



As the result of Delta Thailand's Water Risk Assessment Result, Delta Thailand keeps continuously monitoring and researching on the impact of the water consumption of its subsidiaries that located in basin related risk, especially the sites in India which were found overall score of basin related risk type in physical risk and reputational risk categories at range 4.0- 4.9. Thus Delta Thailand used **India Water Tool 3.0** (IWT3.0) to understand further in the water risks activities and the water risks associated at India sites for the water management interventions plan in the future.

The result of using India Water Tool 3.0 found 1 of 2 sites in India is located in the block categorization zone, Gurgaon district, Haryana state, India. In Haryana, the 96.8% of the total irrigation main source is tube-well. The use of underground water for agricultural and other uses has depleted the ground water to the level of over exploited category (Malik, Singh and Singh, 2012).

Central Ground Water Authority (CGWA) by Government of India has set the groundwater block categorization as regulation of groundwater development for domestic and industrial water use purpose. There is 162 blocks across the country have been notified for regulation of groundwater development by CGWA. Haryana state, Gurgaon is in the list of "Notified Areas" and categorized in " Critical" Area (http://cgwa-noc.gov.in/LandingPage/Areatype/ListNotifed.pdf) which withdrawal permit for **Non-water intensive industries** should not exceed 100% of the recharged quantity and In notified areas abstraction of ground water is not permissible for any purpose other than drinking and domestic use (http://cgwa-noc.gov.in/LandingPage/AreaType.htm).

Reference: https://www.indiawatertool.in/#

Delta India's Water Risk Assessment Results 2020 *(continue)*

G_{AV} Ground Water Availability

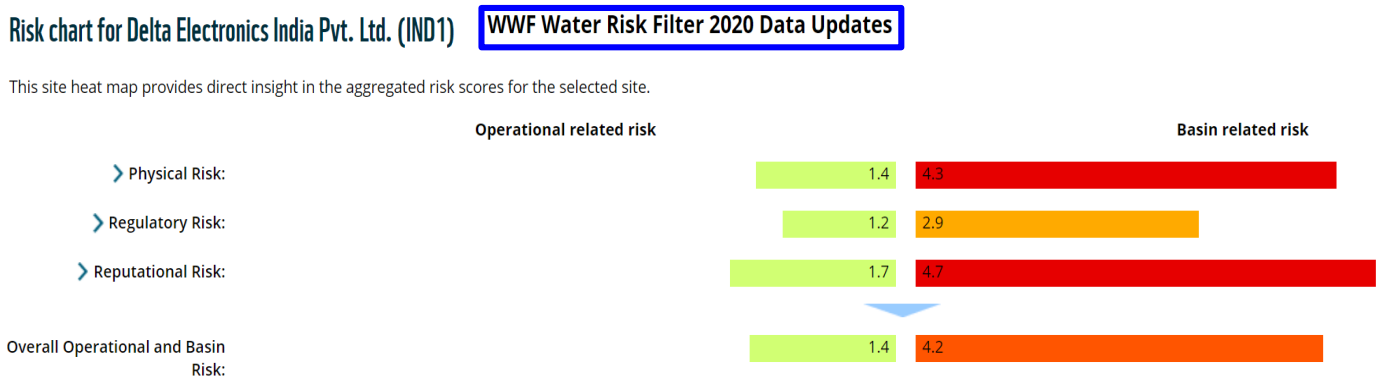
Output in **extremely** high-risk range Output in high-risk range

India watertool©

Location		Aquifer Properties			Availability Status					
Site ID #	Site Name	Type	Aquifer System	Aquifer Yield	GWL (pre-monsoon) 2017	GWL (post-monsoon) 2017	GWav	GW Block Category	Notified Block	Stage of GW Development (%)
IND1	Delta Electronics India Pvt. Ltd.	Semi-Confined to Confined	Alluvium	6 - 12%	No Data	No Data	23,827	Critical	Yes	226.00
IND2	Delta Electronics India Pvt. Ltd.	Unconfined	Alluvium	8 - 15%	3.86	3.07	63,421	Safe	No	79.00

(GWL)	Ground Water Level (m below ground level)	(GW)	Ground Water	GWav	Net Ground Water Availability (Hectare metre)

According to the Notified areas are those blocks / talukas / mandals / areas which have been notified under Environment (Protection) Act, 1986 by Central Ground Water Authority for regulation of ground water development and management. In notified areas abstraction of ground water is not permissible for any purpose other than drinking and domestic use. Haryana state's Net Ground Water Availability is at 23,827 Hectare meters or equal to 238,270,000 Cubic meters (m3). Delta's site in Gurgaon, Haryana state which is **Non-water intensive industries** does not use water as raw material**,** categorized in "Critical" of Withdrawal permitted and not over 100% of recharge proposed (see Appendix 3 CGWA criteria for Water withdrawal and recharge by industries). The site's ground water withdrawal is only for domestic purpose and it doesn't not exceed 100% of the recharged quantity in the consequence of the operational related risk result, physical risk was classified in 1.7 (No or very limited risk)

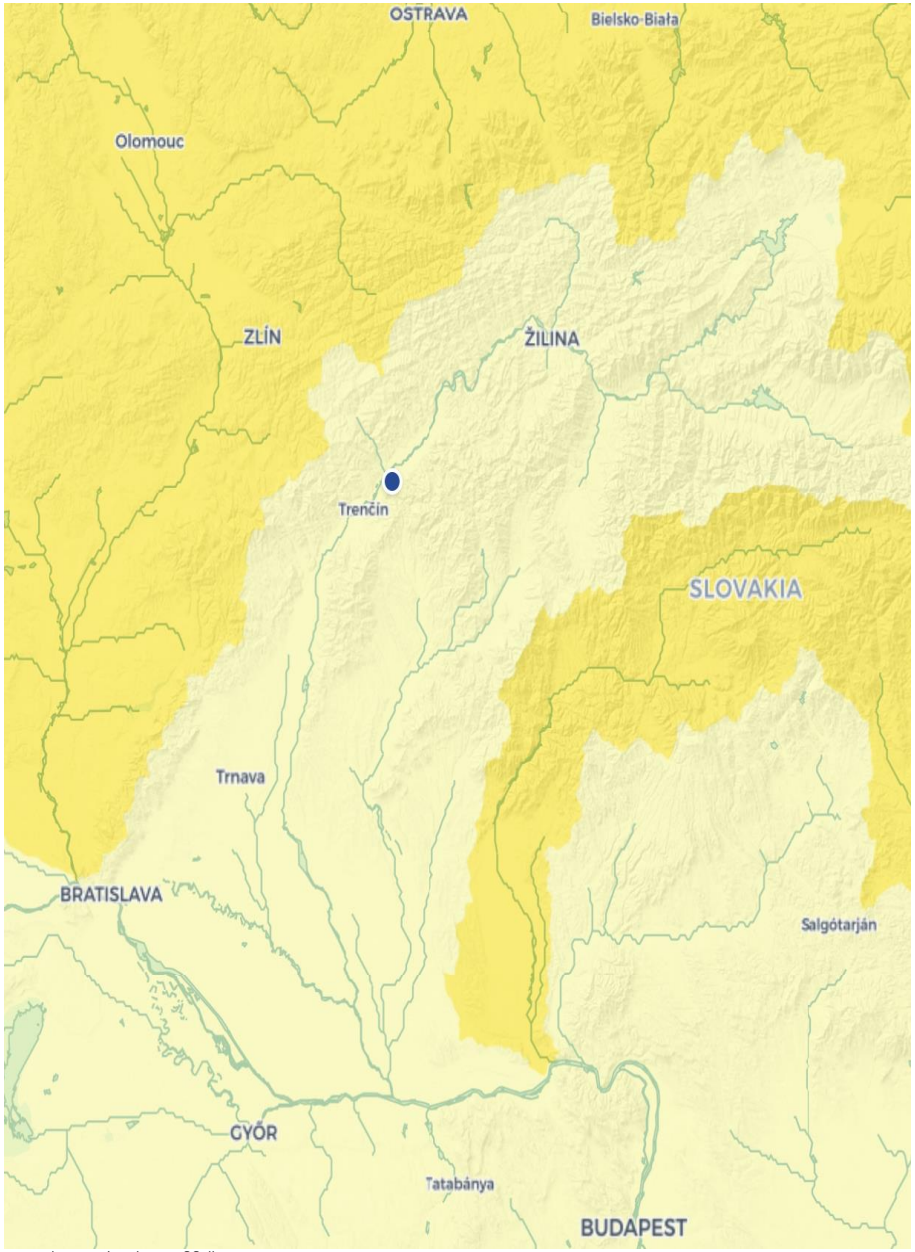


Reference: https://www.indiawatertool.in/#

CGWA criteria for Water withdrawal and recharge by industries

Groundwater Block Category	Withdrawal permitted and % of recharge proposed	
	Non-water intensive industries	Water Intensive industries, and those using Groundwater as a raw material
Safe	NOC required for groundwater withdrawal subject to adoption of artificial recharge to ground water.	Withdrawal should not exceed 200% of the recharged quantity.
Semi Critical	Withdrawal may be permitted subject to undertaking of ground water recharge** measures. The withdrawal should not exceed 200% of the recharged quantity.	Withdrawal should not exceed 100% of the recharged quantity.
Critical	Withdrawal may be permitted subject to undertaking of ground water recharge** measures. The withdrawal should not exceed 100% of the recharged quantity.	Withdrawal should not exceed 50% of the recharged quantity.
Over Exploited	Withdrawal may be permitted subject to undertaking of ground water recharge** measures. The withdrawal should not exceed 50% of the recharged quantity.	No permission for industries under this category.

Reference: https://www.indiawatertool.in/#



https://tinyurl.com/y33qlhaw

Name	Input address	Match address	Latitude	Longitude	Major Basin	Minor Basin	Aquifer	Country	Province	Overall Water Risk
Delta Electronics (Slovakia) s.r.o.	–	-	48.948557	18.143062	Danube	Vah	-	Slovakia	Trenčiansky	Low (0-1)

Slovakia

Slovakia is drained by rivers forming part of Danube basin, which drained an area of 47,087 km^2 . In addition, there are 8,164 km of canals for drainage, irrigation and navigation. The country features many relatively small, mainly artificial, waterbodies (pond and reservoirs) with a total area of 938 km^2. A total of 59 recent native and 18 non-native (nine invasive) species of fishes and lampreys currently inhabit aquatic habitats in Slovakia. In salmonid waters, brown trout *Salmo trutta fario* predominates, followed by grayling *Thymallus thymallus* , whereas in non-salmonid waters, common carp *Cyprinus carpio* is the main species associated with the fisheries. (Welcomme and Food And Agriculture Organization Of The United Nations, 2011, pp.66-67,114)

Conclusion

Although water is not our production factor or used in manufacturing process, Delta Electronics Thailand and its subsidiaries has taken many measures to conserve clean and accessible water for our local community. Based on Delta's water consumption breakdown, 95% of the water used by Delta's own operation sites for domestic and sanitary purpose (95%).However, we are continuously tacking our water management systems and water quality, covering all plants in Thailand and our subsidiaries (India and Slovakia), to ensure that our operations will not impact water to stakeholders or communities especially the nearby basins. The assessment was detected 2 sites of Delta has high risks in Basin which are the sites in Thailand and India.

1) DET1, DET3, DET5, DET6 are found seriously basin risks about **Flooding, Quality- scarcity** and **Biodiversity Importance Risk** which these 3 issues are significantly coherent. The closely tracking and monitoring of water management systems are implemented and annually observing on water quality and biodiversity's change around the sites.

2) India's site in Gurgaon is classified in Groundwater Block category as "Critical" in withdrawal permission and recharge proposed classified in **Non-water intensive industries** which means the permission of groundwater withdrawal are allowed at the limited not over 100% of water recharge. The highly monitoring and water management system tracking are implemented closely along with the observation of the forecast groundwater level in Haryana state every year to prevent the risk water situation that might happen. In additional, the water management team will discuss the opportunities and feasibilities to implement water projects at the site for water saving and groundwater recharge.

3) Slovakia's site, there is no risks found within Slovakia's site yet, however we will keep tracking the water management closely in each year to maintain the good practices and monitoring the current update status of water.

APPENDIX 1. Basin Risk Assessment

Table 1. Industry-specific weightings for risk types, categories and indicators.

	Industry	Physical Risk	1. Quantity - Scarcity	2. Quantity - Flooding	3. Quality	4. Ecosystem Service Status	Regulatory Risk	5. Enabling Environment (Policy & Laws)	6. Institutions and Governance	7. Management Instruments	8 - Infrastructure & Finance	Reputation Risk	9. Cultural Importance	10. Biodiversity Importance	11. Media Scrutiny	12. Conflict
		Risk type	Risk category				Risk type	Risk category				Risk type	Risk category			
	Averages	60%	49%	20%	17%	14%	20%	30%	30%	25%	15%	20%	16%	11%	43%	30%
1	**Agriculture (animal products)**	75%	55%	15%	20%	10%	20%	30%	30%	25%	15%	5%	20%	10%	50%	20%
2	**Agriculture (plant products)**	70%	70%	10%	5%	15%	20%	30%	30%	25%	15%	10%	20%	10%	50%	20%
3	Appliances & General Goods Manufacturing	60%	35%	25%	20%	20%	20%	30%	30%	25%	15%	20%	20%	10%	50%	20%
4	Automotive, Electrical Equipment & Machinery Production	65%	40%	20%	30%	10%	15%	30%	30%	25%	15%	20%	20%	10%	40%	30%
5	Chemicals & Other Materials Production	60%	35%	20%	30%	15%	15%	30%	30%	25%	15%	25%	10%	10%	40%	40%
6	Construction Materials	55%	55%	25%	5%	15%	20%	30%	30%	25%	15%	25%	20%	10%	50%	20%
7	Electric Energy Production - Combustion (Biomass, Coal, Gas, Nuclear, Oil)	60%	65%	10%	15%	10%	20%	30%	30%	25%	15%	20%	15%	10%	40%	35%
8	**Electric Energy Production – Hydropower**	65%	50%	25%	10%	15%	20%	30%	30%	25%	15%	15%	20%	10%	30%	40%
9	Electric Energy Production - Solar, Wind	35%	55%	20%	5%	20%	35%	30%	30%	25%	15%	30%	10%	20%	30%	50%
10	Electronics & Semiconductor Manufacturing	65%	45%	15%	30%	10%	15%	30%	30%	25%	15%	20%	20%	10%	40%	30%
11	Fishing and aquaculture	50%	45%	5%	30%	20%	30%	30%	30%	25%	15%	20%	20%	10%	30%	40%
12	**Food & Beverage Production**	70%	70%	10%	15%	5%	10%	30%	30%	25%	15%	20%	10%	5%	40%	45%
13	**Food Retailing**	40%	50%	20%	20%	10%	25%	30%	30%	25%	15%	35%	10%	10%	50%	30%
14	General or Speciality Retailing	45%	50%	20%	20%	10%	20%	30%	30%	25%	15%	35%	15%	10%	55%	20%
15	Health Care, Pharmaceuticals and Biotechnology	65%	40%	20%	25%	15%	25%	30%	30%	25%	15%	10%	30%	10%	50%	10%
16	Hospitality Services	55%	30%	25%	20%	25%	15%	30%	30%	25%	15%	30%	20%	10%	40%	30%
17	**Metals & Mining**	70%	60%	25%	5%	10%	5%	30%	30%	25%	15%	25%	5%	15%	40%	40%
18	Oil, Gas & Consumable Fuels	70%	65%	20%	5%	10%	5%	30%	30%	25%	15%	25%	5%	15%	40%	40%
19	**Paper & Forest Product Production**	70%	55%	10%	20%	15%	10%	30%	30%	25%	15%	20%	10%	10%	45%	35%
20	Professional Services, Software, Real Estate, Financial Institutions	40%	35%	35%	15%	15%	40%	30%	30%	25%	15%	20%	15%	5%	60%	20%
21	Telecommunication services (including wireless)	50%	50%	25%	10%	15%	30%	30%	30%	25%	15%	20%	20%	10%	40%	30%
22	**Textiles, Apparel & Luxury Good Production**	65%	50%	15%	20%	15%	15%	30%	30%	25%	15%	20%	20%	10%	50%	20%
23	Transportation Services	65%	40%	35%	5%	20%	20%	30%	30%	25%	15%	15%	20%	10%	40%	30%
24	Water utilities / Water Service Providers	70%	40%	20%	25%	15%	25%	30%	30%	25%	15%	5%	20%	15%	40%	25%
25	Other (cross-sector average)	60%	49%	20%	17%	14%	20%	30%	30%	25%	15%	20%	16%	11%	43%	30%

Reference: https://waterriskfilter.panda.org/

Water Risk Filter

APPENDIX 2. Operational Risk Assessment

Table 1. Industry-specific weightings for risk types, categories and indicators for full version questionnaire.

		Risk type	Risk category		Risk type	Risk category		Risk type	Risk category	
#	Industry	Physical Risk	Scarcity (Quantity)	Quality	Regulatory Risk	Laws & Policy	Institutions and Governance	Reputational Risk	Media Scrutiny	Community Conflict
1	**Agriculture (animal products)**	75%	73%	27%	20%	50%	50%	5%	35%	65%
2	**Agriculture (plant products)**	60%	93%	7%	25%	50%	50%	15%	35%	65%
3	Appliances & General Goods Manufacturing	60%	64%	36%	20%	50%	50%	20%	35%	65%
4	Automotive, Electrical Equipment & Machinery Production	65%	57%	43%	15%	50%	50%	20%	35%	65%
5	Chemicals & Other Materials Production	60%	54%	46%	15%	50%	50%	25%	35%	65%
6	Construction Materials	50%	92%	8%	20%	50%	50%	30%	35%	65%
7	Electric Energy Production - Combustion (Biomass, Coal, Gas, Nuclear, Oil)	60%	81%	19%	20%	50%	50%	20%	35%	65%
8	**Electric Energy Production - Hydropower**	65%	83%	17%	20%	50%	50%	15%	35%	65%
9	Electric Energy Production - Solar, Wind	35%	92%	8%	35%	50%	50%	30%	35%	65%
10	Electronics & Semiconductor Manufacturing	65%	60%	40%	15%	50%	50%	20%	35%	65%
11	Fishing and aquaculture	50%	60%	40%	30%	50%	50%	20%	35%	65%
12	**Food & Beverage Production**	70%	82%	18%	10%	50%	50%	20%	35%	65%
13	**Food Retailing**	40%	71%	29%	25%	50%	50%	35%	35%	65%
14	General or Speciality Retailing	45%	71%	29%	20%	50%	50%	35%	35%	65%
15	Health Care, Pharmaceuticals and Biotechnology	65%	62%	38%	25%	50%	50%	10%	35%	65%
16	Hospitality Services	55%	60%	40%	15%	50%	50%	30%	35%	65%
17	**Metals & Mining**	65%	92%	8%	5%	50%	50%	30%	35%	65%
18	Oil, Gas & Consumable Fuels	65%	93%	7%	5%	50%	50%	30%	35%	65%
19	Professional Services, Software, Real Estate, Financial Institutions	40%	70%	30%	40%	50%	50%	20%	35%	65%
20	**Paper & Forest Product Production**	65%	73%	27%	15%	50%	50%	20%	35%	65%
21	**Textiles, Apparel & Luxury Good Production**	55%	71%	29%	30%	50%	50%	15%	35%	65%
22	Transportation Services	65%	89%	11%	20%	50%	50%	15%	35%	65%
23	Water utilities / Water Service Providers	70%	62%	38%	25%	50%	50%	5%	35%	65%
24	Telecommunications	50%	90%	10%	30%	50%	50%	20%	35%	65%
25	Other	50%	60%	40%	15%	50%	50%	35%	35%	65%

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