Basin Risk Indicators - Descriptions, Sources and Links

Risk type	Risk category	#	Risk indicator	Description	Source	Link
Physical Risk	**1. Water Scarcity**	**1.0**	Aridity Index	See Global Documentation on Indicators, Sources and Description		
		1.1	Water Depletion	See Global Documentation on Indicators, Sources and Description		
		1.2	Baseline Water Stress	See Global Documentation on Indicators, Sources and Description		
		1.3	Blue Water Scarcity	See Global Documentation on Indicators, Sources and Description		
		1.4	Available Water Remaining (AWARE)	See Global Documentation on Indicators, Sources and Description		
		1.5	Drought Frequency Probability	See Global Documentation on Indicators, Sources and Description		
		1.6	Projected Change in Drought Occurrence	See Global Documentation on Indicators, Sources and Description		
	2. Flooding	**2.1**	Estimated Flood Occurrence	This indicator has been assessed from historic monthly maximum inundation extent over 162 months between 2001 and 2014. The risks of regular flooding occuring are related to the percentage of months during this period when flooding has been detected.	IWMI, South East Asia Flood Risk Mapping data product: Monthly Maximum Inundation Extent	http://waterdata.iwmi.org/Applications/Southeast_Asia_Flood_Mapping/
		2.2	Projected Change in Flood Occurrence	See Global Documentation on Indicators, Sources and Description		
	3. Water Quality	**3.1**	Surface Water Quality Index	For all Mekong countries, apart from Thailand, the risks to water quality are assessed by combining the unweighted risk scores of urban run-off, agricultural run-off and the industrial pollution risk scores. The average of these three risk scores is taken to give the overall risk to surface water quality. It does not include the two ground water quality parameters of arsenic and salinity. For Thailand the Water Quality Index below is used for all hydrobasins level 12 where water quality monitoring occurs, in other hydrobasins in Thailand, the same risk score combining agriculture and urban run-off as other countries has been applied.	Multiple sources. See below.	

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		3.1.1	*Urban Run-Off*	*Urban run-off in the region contains mixed pollutants from domestic waste waters discharged into storm drains, run-off from roads with oil and grease, and sand and grit, and probably some industrial discharges. The indicator is taken from the urban population density and it does not take into account any waste water treatment plants that may be in operation, which will tend to reduce the polluting load. It is assumed that the higher the density, the higher the risk of poor water quality from urban run-off in the rivers.*	JRC, Global Human Settlement Layer	http://cidportal.jrc.ec.europa.eu/ftp/jrc-opendata/GHSL/GHS_POP_GPW4_GLOBE_R2015A/GHS_POP_GPW42015_GLOBE_R2015A_54009_250/V1-0/
		3.1.2	*Agricultural Run Off*	*The risks to water quality from agricultural run-off depend upon the remaining Nitrogen, Phosphorus and Potash remaining in the drainage water from fields, which in turn depends upon the inetnsity of cultivation, especially for rice paddy. Thus 3 crops per year has greater intensity than 2 crops per year compared to rain fed crops. Nutrients such as these can increase the eutrophication of surface waters. The application rate of fertilisers in each country is taken as the average of the national quantity of fertilisers imported each year (from FAO statistics) divided by the area of cropped land, taking into account double and triple cropping. This average value is then applied to the area of cropped land in each hydrobasin to give the risk score across the region. Note that this does not include the pollution from pesticides and herbicides which are also used extensively in the region, but probably applied at an equivalent rate as fertilisers.*	IWMI Irrigated Area Map Asia 2010 FAO Stat	http://waterdata.iwmi.org/applications/irri_area/
		3.1.3	*Industrial Pollution*	*The water quality index from industrial pollution uses four indicators as shown below - BOD, Toxic metals and Toxic water and Total Suspended solids. It is derived from estimates on the discharges of these pollutants from different types and sizes of these industries using the Industrial Pollution Projection System (IPPS), which has been applied in Cambodia, Laos, Vietnam, and partially in Myanmar. It does not include effluents from mining, but all manufacturing facilities. The composite index measures the combined weights of these pollutants being discharged within a hydrobasin, while the individual indices will provide detail of which indicators are most important at a particular location. The analysis is based upon the estimates of wastes discharged before treatment, so the risk scores represent the risks to water quality if no treatment would be provided. In some locations, it is to be expected that there will be treatment of industrial wastes.*	GMS Core Environment Program, Estimating Industrial Pollution in Lao PDR GMS Core Environment Program, Estimating Industrial Pollution in the Kingdom of Cambodia Ayeyarwady State of the Basin Assessment, Water Pollution Survey ICEM	http://portal.gms-eoc.org/uploads/resources/1253/attachment/Estimating%20Industrial%20Pollution%20in%20Lao%20PDR_1.PDF http://www.gms-eoc.org/uploads/resources/453/attachment/Estimating%20Industrial%20Pollution%20in%20the%20Kingdom%20of%20Cambodia%20Report.pdf
		3.1.4	*Industrial Pollution BOD*	*BOD or Biological Oxygen Demand measures the organic matter discharged which will deplete the oxygen content of surface waters as the organic matter is broken down by bacteria in the water. Organic pollution comes from most industrial wastes, including food and drink sector, textiles, manufacturing, pharmaceuticals etc.*	GMS Core Environment Program, Estimating Industrial Pollution in Lao PDR GMS Core Environment Program, Estimating Industrial Pollution in the Kingdom of Cambodia Ayeyarwady State of the Basin	http://portal.gms-eoc.org/uploads/resources/1253/attachment/Estimating%20Industrial%20Pollution%20in%20Lao%20PDR_1.PDF

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					Assessment, Water Pollution Survey ICEM	http://www.gms-eoc.org/uploads/resources/453/attachment/Estimating%20Industrial%20Pollution%20in%20the%20Kingdom%20of%20Cambodia%20Report.pdf
		3.1.5	*Industrial Pollution Toxic Metals Water*	*Toxic metals load in surface waters includes the content of metals such as lead, chromium, mercury etc. discharged from factories, based upon size and type of industry. It includes both dissolved and particular forms of metals. The analysis does not include metals being mined or used in mining processes (e.g. mercury for gold mining).*	GMS Core Environment Program, Estimating Industrial Pollution in Lao PDR GMS Core Environment Program, Estimating Industrial Pollution in the Kingdom of Cambodia Ayeyarwady State of the Basin Assessment, Water Pollution Survey ICEM	http://portal.gms-eoc.org/uploads/resources/1253/attachment/Estimating%20Industrial%20Pollution%20in%20Lao%20PDR_1.PDF http://www.gms-eoc.org/uploads/resources/453/attachment/Estimating%20Industrial%20Pollution%20in%20the%20Kingdom%20of%20Cambodia%20Report.pdf
		3.1.6	*Industrial Pollution Toxic Water*	*This indicator covers non-metallic and organic toxic chemicals used in manufacturing, solvents and cleaning materials, dyestuffs, pesticides, etc.*	GMS Core Environment Program, Estimating Industrial Pollution in Lao PDR GMS Core Environment Program, Estimating Industrial Pollution in the Kingdom of Cambodia Ayeyarwady State of the Basin Assessment, Water Pollution Survey ICEM	http://portal.gms-eoc.org/uploads/resources/1253/attachment/Estimating%20Industrial%20Pollution%20in%20Lao%20PDR_1.PDF http://www.gms-eoc.org/uploads/resources/453/attachment/Estimating%20Industrial%20Pollution%20in%20the%20Kingdom%20of%20Cambodia%20Report.pdf

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		3.1.7	*Industrial Pollution TSS*	*Total Suspended Solids (TSS) make up the largest proportion by weight of industrial discharges, and represent the component of industrial wastes that does not dissolve in water, but is light enough to be suspended under usual flow conditions. The suspended solids may be organic in nature and have an influence upon BOD, or they may be inorganic, e.g. sand and silt particles, and relatively inert. They are an important water quality component increasing the turbidity of receiving waters.*	GMS Core Environment Program, Estimating Industrial Pollution in Lao PDR GMS Core Environment Program, Estimating Industrial Pollution in the Kingdom of Cambodia Ayeyarwady State of the Basin Assessment, Water Pollution Survey ICEM	http://portal.gms-eoc.org/uploads/resources/1253/attachment/Estimating%20Industrial%20Pollution%20in%20Lao%20PDR_1.PDF http://www.gms-eoc.org/uploads/resources/453/attachment/Estimating%20Industrial%20Pollution%20in%20the%20Kingdom%20of%20Cambodia%20Report.pdf
		3.1.8	*Water Quality Index*	*The Thai Water Quality Index is a composite indicator made up of Dissolved Oxygen (mg / l), Biochemical Oxygen Demand (BOD) (mg / l), Total Coliform Bacteria (TCB) (MPN / 100 ml), Fecal Coliform Bacteria (FCB) (MPN / 100 ml) and ammonia nitrogen NH3-N (mg / l) and is derived from actual measurements of water quality in over 300 water quality sampling stations covering many of the water courses in Thailand.*	Water Surface Water Quality Database (IWIS)	http://iwis.pcd.go.th/pcd-service/pcd_service.php
		3.1.9	*Arsenic*	*Arsenic is an important groundwater component derived from underlying geology and soils. Often its presence in ground water is associated with alluvial rocks and soils, so it is most often found in delta and floodplain regions of the major rivers. Arsenic is a highly poisonous element, which occurs naturally as inorganic compounds in rocks and also as a free element. Its presence in groundwater can make the water unusable for domestic and industrial uses.*	Winkel, L., Berg, M., Amini, M., Hug, S. J., & Johnson, C. A. (2008). Predicting groundwater arsenic contamination in Southeast Asia from surface parameters. Nature Geoscience, 1(8), 536-542.	http://dx.doi.org/10.1038/ngeo254
	4. Ecosystem Services Status	**4.1**	Ecosystem service (Provision) Consumption of Fish	The provisioning ecosystem services of rivers in the Greater Mekong is very important for both fish and other aquatic animals (OAA) such as snails, frogs, crabs, shrimps and prawns, and river weed. The Tonle Sap Great Lake and Mekong river which carries large volume of migratory fish species is the largest freshwater fishery on the world. Actual fish production figures in different rivers is difficult to quantify, and the provisioning services are assessed by taking the rural population densities in each hydrobasin and multiplying them with the estimated fish and OAA consumption figures for each country, based upon studies carried out for the Mekong River Commission.	Rural population density was used as a proxy for consumption of fish. JRC, Global Human Settlement Layer. HORTLE, K.G. (2007) Consumption and the yield of fish and other aquatic animals from the Lower Mekong Basin. MRC Technical Paper No. 16, Mekong River Commission, Vientiane. 87 pp JRC, Global Human Settlement Layer, Settlement Model Grid.	http://www.mrcmekong.org/assets/Publications/technical/tech-No16-consumption-n-yield-of-fish.pdf http://cidportal.jrc.ec.europa.eu/ftp/jrc-opendata/GHSL/
		4.2	Catchment Ecosystem Services Degradation Level	See Global Documentation on Indicators, Sources and Description		

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Risk type	Risk category	#	Risk indicator	Description	Source	Link
		4.3	Hydropower Dam	The risk scoring is rated as very high in hydrobasins where the dam is located, with variable risk scores attributed in hydrobasins upstream where the reservoir extends depending upon the percentage of the hydrobasin covered by a reservoir. Downstream hydrobasins are given a "some risk "score up until the mean annual flow in the hydrobasin has increased to more than 130% of the flow at the dam site. This indicator only assess the risks from existing dams and reservoirs, not future planned dams.	WLE Greater Mekong	https://wle-mekong.cgiar.org/changes/our-research/greater-mekong-dams-observatory/
Regulatory Risk	**5. Enabling Environment**	**5.1**	Freshwater Policy Status (SDG 6.5.1)	See Global Documentation on Indicators, Sources and Description		
		5.2	Freshwater Law Status (SDG 6.5.1)	See Global Documentation on Indicators, Sources and Description		
		5.3	Implementation Status of Water Management Plans (SDG 6.5.1)	See Global Documentation on Indicators, Sources and Description		
	6. Institutions & Governance	**6.1**	Corruption Perceptions Index	See Global Documentation on Indicators, Sources and Description		
		6.2	Freedom in the World Index	See Global Documentation on Indicators, Sources and Description		
		6.3	Business Participation in Water Management (SDG 6.5.1)	See Global Documentation on Indicators, Sources and Description		
	7. Management Instruments	**7.1**	Management Instruments for Water Management (SDG 6.5.1)	See Global Documentation on Indicators, Sources and Description		
		7.2	Groundwater Monitoring Data Availability and Management	See Global Documentation on Indicators, Sources and Description		
		7.3	Density of Runoff Monitoring Stations	See Global Documentation on Indicators, Sources and Description		

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	8. Infrastructure & Finance	**8.1**	Access to Safe Drinking Water	See Global Documentation on Indicators, Sources and Description		
		8.2	Access to Sanitation	See Global Documentation on Indicators, Sources and Description		
		8.3	Financing for Water Resource Development and Management (SDG 6.5.1)	See Global Documentation on Indicators, Sources and Description		
Reputational Risk	**9. Cultural Importance**	**9.1**	Cultural Diversity	See Global Documentation on Indicators, Sources and Description		
	10. Biodiversity Importance	**10.1**	Freshwater Endemism	See Global Documentation on Indicators, Sources and Description		
		10.2	Freshwater Biodiversity Richness	See Global Documentation on Indicators, Sources and Description		
	11. Media Scrutiny	**11.1**	National Media Coverage	See Global Documentation on Indicators, Sources and Description		
		11.2	Global Media Coverage	See Global Documentation on Indicators, Sources and Description		
	12. Conflict	**12.1**	Conflict News Events	See Global Documentation on Indicators, Sources and Description		
		12.2	Hydro-political Likelihood	See Global Documentation on Indicators, Sources and Description		