



Ramsar Information Sheet

Published on 31 January 2019

India

Sundarban Wetland



Designation date	30 January 2019
Site number	2370
Coordinates	21°46'29"N 88°42'51"E
Area	423 000,00 ha

Color codes

Fields back-shaded in light blue relate to data and information required only for RIS updates.

Note that some fields concerning aspects of Part 3, the Ecological Character Description of the RIS (tinted in purple), are not expected to be completed as part of a standard RIS, but are included for completeness so as to provide the requested consistency between the RIS and the format of a 'full' Ecological Character Description, as adopted in Resolution X.15 (2008). If a Contracting Party does have information available that is relevant to these fields (for example from a national format Ecological Character Description) it may, if it wishes to, include information in these additional fields.

1 - Summary

Summary

Sundarban is the largest mangrove delta of the world and encompasses over hundreds of islands, with a maze of innumerable rivers, rivulets, and creeks. The name 'Sundarban' means "beautiful forest" and it is believed to be derived from a mangrove tree species 'Sundari' (*Heritiera fomes*). The Indian Sundarban is the southernmost part of the estuarine delta formed by the River Ganges and Brahmaputra, bordering the Bay of Bengal.

Sundarban Tiger Reserve is one of the initial nine tiger reserves declared during 1973 and encompasses a total area of 2584.89 km² of which 1699.62 km² has been declared as the Critical Tiger Habitat and 885.27 km² as the buffer area.

The Sundarbans constitutes over 60% of the total mangrove forest area in the entire country and has 90% of the total Indian mangrove species. These comprise of true mangroves or major elements, minor elements of mangroves or and mangrove associates, black mangrove trees and shrubs, non-halophytic non-mangrove associates in the area, halophytic herbs, shrubs, and weeds and epiphytic and parasitic plants. The mangrove forests act as a natural shelter belt and protect the hinterland from storms, cyclones, tidal surges, sea water seepage and intrusion. The mangroves serve as nurseries to shell fish and fin-fishes and sustain the coastal fisheries of the entire eastern coast.

The Sundarbans has been classified as a Tiger Conservation Landscape of global priority, as it is the only mangrove habitat (along with Bangladesh), which supports a significant tiger population. The Tiger Reserve is also home to a large number of endangered and globally threatened species like the fishing cat (*Prionailurus viverrinus*) and estuarine crocodile (*Crocodilus porosus*), Gangetic (*Platanista gangetica*) and Irrawady Dolphin (*Oracella brevirostris*), King cobra (*Ophiophagus hannah*) etc. along with a very good diversity of avian fauna. It is known as a kingfisher's paradise as 8 out of 12 species recorded in India are found here. 2 out of 4 horse shoe crab species (living fossils) found in the world, i.e. *Tachypleus gigas* and *Carcinoscorpius rotundicauda* are found here.

Thus, owing to the uniqueness of the habitat and its biodiversity and a plethora of services (both tangible and intangible) associated with the site at local, regional and global level, makes the protection and management of Sundarban Tiger Reserve a conservation priority.

2 - Data & location

2.1 - Formal data

2.1.1 - Name and address of the compiler of this RIS

Compiler 1

Name	Dr. R.P.Saini, IFS, Addl P.C.C.F & Director
Institution/agency	Sundarban Biosphere Reserve
Postal address	Bikash Bhawan, North Block, 3rd Floor, Salt lake city, Kolkata-700091.
E-mail	sbrdir@gmail.com
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2.1.2 - Period of collection of data and information used to compile the RIS

From year	2017
To year	2018

2.1.3 - Name of the Ramsar Site

Official name (in English, French or Spanish)	Sundarban Wetland
Unofficial name (optional)	Sundarban Reserve Forest

2.2 - Site location

2.2.1 - Defining the Site boundaries

b) Digital map/image

<1 file(s) uploaded>

Former maps	0
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Boundaries description

The Sundarban Region In India is located between 21° 32' and 22° 40' N latitude and 88° 05' and 89° 00' E longitude. It is bound by the river Hooghly on the west, Ichamati-Kalindi-Raimangal on the east, Dampier-Hodges line on the north and the Bay of Bengal on the south. For administrative convenience, the northern boundary has been adjusted to coincide with the police station boundaries along the Dampier-Hodges line, which demarcates the inter-tidal zone.

The total area of Indian Sundarbans region is about 9630 sq. Km., out of which the Reserve forest occupies nearly 4230 sq.km. At present, out of 108 islands of the Sundarban region, 54 are inhabited with a population of about 4.2 million approximately (2001 Census), spread over 1093 mouzas. The region is spread over two administrative districts, namely 24-Parganas (South) (13 blocks) and 24 Parganas (North) (6 blocks).

2.2.2 - General location

a) In which large administrative region does the site lie?	The Headquarters of the Sundarban Tiger Reserve is located at Canning town, South 24 Parganas district and is connected with broad gauge railway line with Sealdah South suburban station, which is 46 kms from Canning.
b) What is the nearest town or population centre?	Canning town, West Bengal

2.2.3 - For wetlands on national boundaries only

- a) Does the wetland extend onto the territory of one or more other countries? Yes No
- b) Is the site adjacent to another designated Ramsar Site on the territory of another Contracting Party? Yes No

2.2.4 - Area of the Site

Official area, in hectares (ha): 423000

Area, in hectares (ha) as calculated from GIS boundaries 424382.49

2.2.5 - Biogeography

Biogeographic regions

Regionalisation scheme(s)	Biogeographic region
WWF Terrestrial Ecoregions	The Sanctuary lies in the bio-geographical zone 7B (Lower Gangetic Plain) as recognised by Wildlife Institute of India, Dehradun (Rodgers and Panwar, 1977, subsequently revised in 1988).

3 - Why is the Site important?

3.1 - Ramsar Criteria and their justification

<no data available>

Criterion 2 : Rare species and threatened ecological communities

Criterion 3 : Biological diversity

Justification

Sundarbans provides characteristic type of habitat suitable for plants and animals inhabiting vast tidal swamp area.

Flora: According to Champion and Seth Classification, the Sundarban forest falls under the sub group 4B tidal swamp forest, with sub-divisions namely, Mangrove type 4B/TS1, 4B/TS2, Salt water type mixed forests 4B/TS3, Brackish type 4B/TS4 and Palm type 4B/E1. In general, the northern boundary and new depositions are characterized by Baen (*Avicennia marina*, *A. Alba*, *A. Officialis*) flanked by foreshore grassland of *Oryza coarctata* (Dhani Grass). Baen is gradually replaced by Genwa (*Excoecaria agallocha*) and then Goran (*Ceriops* spp.). The southern and eastern associates include garjan (*Rhizophora* spp.), Kankra (*Bruguiera* spp.), and a few patches of Sundari (*Heritiera fomes*). Pure Hental (*Phoenix* spp.) forest exists in relatively high land and compact soil. Dhundul (*Xylocarpus granatum*), Passur (*Xylocarpus mekongensis*), Golpata (*Nypa* spp) and palm swamps are extremely limited in existence. Floral diversity include 40 families, 60 Genera and 84 Species of which are true mangrove species = 26, mangrove associates = 29

Fauna: The forest floor is the domain of the Royal Bengal Tiger (*Panthera tigris*), Among other mammals, ground fauna comprises of wild boars, spotted deer, porcupines otter and monkeys, which are the principal species of wild animals found in the Sundarbans. Among the reptiles, the King Cobra, the common cobra, Banded Krait, Russells Viper comprise the community of venomous reptiles, while the python, Chequered Kill-Back, Dhaman, Green Whip Snake and several other species constitute the non-venomous snake. The lizards are mainly *Varanus salvator* which is a rare monitor. The sea-facing beach of the Reserved Forest forms a nesting ground for Olive Ridley Turtles (*Lepidochelys olivacea*), the endangered River Terrapin (*Batagur baska*) also uses the beaches as their nesting ground. Other coastal soft shell turtle (*Pelochelya bibroni*), Single eyed terrapin (*Morenia ocellata*) and three keeled terrapin (*Geomada tricarinata*) has also been recorded. The birds are in plenty including a large number of migrants from the higher latitudes that visit the area in winter. It consists of herons, egrets, cormorants, vultures, sandpipers, large and small spoonbills, darters seagulls. The cetaceans like Gangetic Dolphin (*Platisista gangetica*) is frequently found in the eastern side, particularly in the Raimangal river. The Block Finless Porpoise (*Necmeris porosus*) is also found in the rivers near the estuary. The marshes and river offer asylum to the Estuarine Crocodile. Among the crustaceans, commonly found are the One Armed Fiddler Crab (*Uca* spp) and the two species of trilobite (*Tachepleurs gigas* and *Carcinoscropius rotundicauda*). The latter is also known as the Horse shoe Crab, which are living fossils and now protected owing to its medicinal value. Insects like honey bee (*Apis dorsata*) is a source of considerable income for the local people.

Criterion 7 : Significant and representative fish

Justification

The estuaries and creeks in the mangrove forest of Sundarban act as the breeding ground as well as the nursery of a large number of fish species, prawns, molluscs and crabs. The mangrove leaves, which decompose slowly in the water, offer food for the larvae, which migrate from the sea into the mangrove estuary for growing up to the adult stage. Mullet or edible fishes, like Bhetki and Bhangon, depend very much on the mangrove forest for attaining their adult stage. The site supports at least 87 species of fish. A detailed, but not exhaustive, list of fish and other species found in the waters of Sundarban mangrove is enclosed

Common Shark species found in and around Sundarbans:












1. Scoliodon laticaudus Indian Dog Shark [lower risk]
2. Carcharhinus dussumieri White cheeked shark [lower risk]
3. Carcharhinus limbatus Blacktip shark [lower risk]
4. Sphryna blochii Arrow headed hammer headed shark [vulnerable]
5. Sphryna zygaena Hammer headed shark [vulnerable]
6. Glyphis gangeticus River shark [Critically endangered, Schedule I]
7. Glyphis glyphis Sharpteeth shark
8. Glyphis siamensis Irrawady river shark
9. Galeocerdo cuvier Tiger shark [lower risk]
10. Carcharhinus leucus Bull shark [lower risk]

Criterion 8 : Fish spawning grounds, etc.

Justification

The estuaries and creeks in the mangrove forest of Sundarban act as the breeding ground as well as the nursery of a large number of fish species, prawns, molluscs and crabs. The mangrove leaves, which decompose slowly in the water, offer food for the larvae, which migrate from the sea into the mangrove estuary for growing up to the adult stage. Mullet or edible fishes, like Bhetki and Bhangon, depend very much on the mangrove forest for attaining their adult stage.

3.2 - Plant species whose presence relates to the international importance of the site









Scientific name	Common name	Criterion 2	Criterion 3	Criterion 4	IUCN Red List	CITES Appendix I	Other status	Justification
<i>Avicennia marina marina</i> 	Peara Baine	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	LC 	<input type="checkbox"/>		This species is widespread, is fast-growing and can be locally common. It is threatened by the loss of mangrove habitat throughout its range, primarily due to extraction and coastal development, and there has been an estimated 24% decline in mangrove area within this species range since 1980. Although there are overall range declines in many areas, they are not enough to reach any of the threatened category thresholds.
<i>Excoecaria agallocha</i> 	Gewa	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	LC 	<input type="checkbox"/>		This species is widespread and common. There are overall range declines in many areas due to habitat loss or extraction, but not enough to reach any of the threatened category thresholds. This species is listed as Least Concern.
<i>Heritiera formos</i> 	sunderi	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		
<i>Nypa fruticans</i> 	Golpata	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	LC 	<input type="checkbox"/>		This species is widespread and can be locally common. There are some localized threats to this species from habitat loss and extraction, but this species is planted in many areas and is used for many goods and services. As a result, the population is very dynamic with declines in some regions and increases in others. Mangrove species are more at risk from coastal development and extraction at the extremes of their distribution, and are likely to be contracting in these areas more than in other areas. It is also likely that changes in climate due to global warming will further affect these parts of the range.
<i>Sonneratia griffithii</i> 		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	CR 	<input type="checkbox"/>		
<i>Xylocarpus moluccensis</i> 	Pasur	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	LC 	<input type="checkbox"/>		This species is widespread and common. It is threatened by the loss of mangrove habitat throughout its range, primarily due to extraction and coastal development, and there has been an estimated 21% decline in mangrove area within this species range since 1980. Although there are overall range declines in many areas, they are not enough to reach any of the threatened category thresholds. This species is listed as Least Concern.















Sundarban mangrove is also perhaps having the largest floral diversity with 84 species of natural higher group of plants in the Indian Sundarbans including trees, shrubs and herbs true of which mangroves(=26), mangrove associates (=29), and back mangroves (=29) species belonging to 40 families and 60 genera. In this inter-tidal high saline deltaic area, most of these plants are endemic for having their special adaptation in this physiologically dry soil. Apart from these, 1100 non-mangrove flowering plants under 154 families were reported. The ten most dominant and distinct families are- Fabaceae, Poaceae, Asteraceae, Cyperaceae, Euphorbiaceae, Malvaceae, acanthaceae, Rubiaceae, Convolvulaceae and Scrophulariaceae.

Mangrove ecosystem itself presents an extremely interesting subject of study. The mangrove flora are typically salinity resistant and has the following specialities:

- 1> There exists extensive lateral root system for a proper anchorage against diurnal tidal inundation/scouring. These may be a neckline system or long buttresses (Heritiera spp., Bruguiera parviflora) or strangled roots (Brownlowia spp.)
- 2>The lateral roots get submerged and to breath oxygen pneumatophores are developed such breathing facilities are also adopted by throwing stilt roots from branches and stem studded with lenticles in case of Rhizophora mucronata, vertical knee roots from horizontal lateral roots are thrown by Lumnitzera, Bruguiera gymnorrhiza, Kandelia candel etc.
- 3>The plant cells extort very high osmotic pressure in order to draw water from outside salt solution. This cell sap is rich in organic electrolyte in case of Rhizophora etc. And inorganic electrolyte incase of Suaeda spp.
- 4>The leaves are normally thick and often contains salt excretory channels to deposit crystals of various composition on leaves and also waxes. Salt hairs on leaves of Potraceae coarctate bursts to excrete salt. Mangrove leaves have sunken stomatae. Khalsi, Kala baen, Harguza and Tora show salt excretory mechanisms.
- 5>The fruits of Rhizophora, Bruguiera etc. germinate right on the tree and fall like a dart on the mud flats to get anchored against tidal inundation(Vivipary)
- 6>Shows perforated burr formation on its stem in more inundated areas, for breathing facility.

3.3 - Animal species whose presence relates to the international importance of the site

Phylum	Scientific name	Common name	Species qualifies under criterion				Species contributes under criterion				Pop. Size	Period of pop. Est.	% occurrence 1)	IUCN Red List	CITES Appendix I	CMS Appendix I	Other Status	Justification
			2	4	6	9	3	5	7	8								
Birds																		
CHORDATA/ AVES	<i>Leptoptilos javanicus</i> 	Lesser Adjutant	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				VU 	<input type="checkbox"/>	<input type="checkbox"/>		This stork is listed as Vulnerable because its population is suspected to be rapidly declining as a result of a variety of threats including hunting pressure, loss of nesting habitat, conversion and degradation of wetlands and agricultural changes and intensification.
Fish, Mollusc and Crustacea																		
CHORDATA/ ELASMOBRANCHII	<i>Eusphyrus blochii</i> 	Arrow-headed hammer-head	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				EN 	<input type="checkbox"/>	<input type="checkbox"/>		
CHORDATA/ ELASMOBRANCHII	<i>Glyphis gangeticus</i> 	Ganges shark	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				CR 	<input type="checkbox"/>	<input type="checkbox"/>		
CHORDATA/ ELASMOBRANCHII	<i>Sphyrna zygaena</i> 		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				VU 	<input type="checkbox"/>	<input type="checkbox"/>		
Others																		

Phylum	Scientific name	Common name	Species qualifies under criterion				Species contributes under criterion				Pop. Size	Period of pop. Est.	% occurrence 1)	IUCN Red List	CITES Appendix I	CMS Appendix I	Other Status	Justification
			2	4	6	9	3	5	7	8								
CHORDATA/ MAMMALIA	 <i>Axis axis</i>	Chital	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			LC 	<input type="checkbox"/>	<input type="checkbox"/>		It occurs over a very wide range within which there are many large subpopulations. Although it is still declining in Sundarban mainly due to habitat loss and poaching for their meat. Chital constitutes one of the major diets of tiger. Firstly, current densities are mostly well below what the habitat could support (and have been for decades), and secondly, the long-term persistence of nearly all subpopulations is dependent upon well secured protected areas: anything which caused the breakdown of current effective protection would allow a rapid rise in hunting levels and perhaps of domestic stock-grazing. These are the factors with which current Chital numbers are in fragile relationship.	
CHORDATA/ REPTILIA	 <i>Batagur baska</i>	Northern River Terrapin	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			CR 	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Critically Endangered in Bangladesh and India because the subpopulations are all very small and declining. However Sundarban Tiger Reserve has taken an initiative along with Madras Crocodile bank trust in saving this critically endangered animal. Breeding of Northern River Terrapin is successfully done in Sajnekhali. Due to wide spread killing of this animal for its meat damage to its habitat the population has severely declined.	
CHORDATA/ REPTILIA	 <i>Crocodylus porosus</i>	Estuarine Crocodile	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			VU 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Cites Appendix II	This species is listed as Vulnerable in India as because of the constant threat to their habitat. Habitat loss often leads to destruction of their nest and thus their eggs are being destroyed eventually. Their eggs are often preyed by Water Monitor Lizard. There are other factors like poaching eventually leading to decline of population number of this species.	
CHORDATA/ REPTILIA	 <i>Lepidochelys olivacea</i>	Olive Ridley Turtle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			VU 	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Their population is constantly declining. Hence they are listed as Vulnerable. In accordance with the IUCN guidelines for Red List Assessments, the focus of this evaluation has been the number of mature individuals (IUCN 2001). For Olive Ridelys, as with other sea turtle species, as it is not possible to survey mature individuals we used an index of abundance in the form of the number of annual nesting females.	
CHORDATA/ MAMMALIA	 <i>Lutrogale perspicillata</i>	Smooth-coated Otter	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			VU 	<input type="checkbox"/>	<input type="checkbox"/>		This species is confirmed to be Vulnerable due to an inferred population decline due to habitat loss and exploitation. The Smooth-coated Otter is essentially an otter of lowlands and floodplains. Major threats to this species are loss of wetland habitats due to construction of large-scale hydroelectric projects, reclamation of wetlands for settlements and agriculture, reduction in prey biomass, poaching and contamination of waterways by pesticides. Consequently, most of the wetlands and waterways do not have an adequate prey base for sustaining otter populations.	
CHORDATA/ MAMMALIA	 <i>Neophocaena phocaenoides</i>	Finless Porpoise	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			VU 	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
CHORDATA/ MAMMALIA	 <i>Orcaella brevirostris</i>	Irrawady Dolphin; Irrawaddy Dolphin	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			EN 	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			

Phylum	Scientific name	Common name	Species qualifies under criterion				Species contributes under criterion				Pop. Size	Period of pop. Est.	% occurrence 1)	IUCN Red List	CITES Appendix I	CMS Appendix I	Other Status	Justification
			2	4	6	9	3	5	7	8								
CHORDATA/ MAMMALIA	<i>Panthera tigris</i>	Tiger	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			EN ● 57	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Bengal Tigers population census revamped its methodology to be more scientific, extrapolating site-specific densities derived from camera trap and sign surveys using GIS. The population in Sundarbans is slowly increasing but the species is listed as Endangered according to IUCN Red Data. There are major threats posing on this species is mainly due to Habitat loss and illegal poaching.	
CHORDATA/ MAMMALIA	<i>Platanista gangetica</i>	Ganges River Dolphin	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			EN ● 57	<input checked="" type="checkbox"/>	<input type="checkbox"/>		This species is the sole living representative of its family (which represents an ancient lineage in the order Cetartiodactyla), and therefore its extinction would mean not just the loss of a single species, but loss of an entire mammalian family regarded as a sister taxon to all other cetaceans. Based on available evidence, the species qualifies for listing as Endangered under criterion A	
CHORDATA/ MAMMALIA	<i>Prionailurus viverrinus</i>	Fishing Cat	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			VU ● 57	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Previously Fishing Cat was categorized as Endangered (2010) but now it is classified as Vulnerable according to Red List. The population is constantly decreasing due to major threats like poaching and retribution killing. Continuous habitat loss along with the killing of Fishing Cats because of conflict with local people throughout the species range has led to a global population decline. Therefore the population is in decreasing trend .	
CHORDATA/ MAMMALIA	<i>Sus scrofa</i>	wild boar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			LC ● 57	<input type="checkbox"/>	<input type="checkbox"/>		This animal species can reproduce and grow very fast and is abundant in Sundarbans and hence listed as Least Concern by IUCN. Their exact population estimation is unknown and they mainly constitute of tigers diet. They are often considered as invasive animal species.	

1) Percentage of the total biogeographic population at the site

The forest floor is the domain of the Royal Bengal Tiger (*Panthera tigris*). Among other mammals , ground fauna comprises of wild boars, spotted deer, porcupines, otter and monkeys, which are the principal species of wild animals found in the Sundarbans. Among the reptiles, the King Cobra, the common cobra, Banded Krait, Russells Viper comprise the community of venomous reptiles, while the Python, Chequered Kil-Back, Dhaman, Green Whip Snake and several other species constitute the non venomous snakes. The tidal creeks harbour Homalopsid snakes adapted to living in water, the common being the *Cereberus rhynchops*. The lizard are mainly *Varanus salvator* which is rare monitor reaching about 2.4 mt in length. This can be very frequently found within the reserve. The sea facing beaching of the Reserve forms a nesting ground for Olive Ridley Turtles (*Lepidochelys olivacea*), and the egg laying takes place mainly during December to March. The water monitors are the greatest predators of their eggs and hatchlings along with Wild Pigs, Terns and Sea Gulls. The endangered Northern River Terrapin (*Batagur baska*) also uses the beaches as their nesting round.

Sundarban is extremely rich in avifauna which includes a large number of migrants from the higher latitudes that visit the area in Winter. It consists of herons, egrets, cormorants, vultures, green pigeons, sand pipers, large and small spoonbills, darters, seagulls, teal, partridges and a great variety of wild geese and ducks.

The cetaceans like Gangetic Dolphin (*Platinista gangetica*) is frequently found in the eastern side, particularly in the Raimangal river. The Block Finless Porpoise (*Necmeris porosus*) is also found in the rivers near the estuary. The marshes and river offer asylum to the Estuarine Crocodile, one of the rare and largest of crocodiles and the endangered Olive Ridley Turtles. A wide variety and assortments of fishes, molluscs, crabs and prawns inhabit the estuaries. The amphibious mud-skipper fish such as *Peripthalmus* and *Boleophthalmus* arouse considerable interest. Also found are Whale Shark, Tiger Shark, Hammer Headed Shark, Saw fish, Guitar Fish and some common edible fishes for e.g., Hilsa ilisha, *Septipinna breviceps*, *S. Taty*, *Gudusia chapra* etc. Among the crustaceans, commonly found are the One Armed Fiddler Crab (*Uca* spp) and the two species of trilobite (*Tachepleursygyus* and *Carcinoscropius rotundicauda*). The latter is also known as the Horse shoe Crab, which are living fossils and now protected owing to its medicinal value. Insects abound in the forests amongst which the honey bee (*Apis dorsata*) is a source of considerable income for the poor fringe people.

3.4 - Ecological communities whose presence relates to the international importance of the site

<no data available>

[Optional text box to provide further information](#)

Mangroves are diverse and highly productive ecological communities which provide important ecosystem functions. Located at the land-sea interface, they protect coastal areas against natural hazards such as cyclones and tsunamis ; they retain terrestrial sediment and recycle nutrients, thus supporting clear offshore waters, which in turn favors the photosynthetic activity of phytoplankton as well as growth and robustness of coral reefs, seagrass beds and reef fish communities ; they serve as an important habitat, nursery and refuge, providing food for countless organisms including humans. These ecosystems are also vital carbon sinks, either storing carbon temporarily within organic peat soils, or as dissolved organic carbon in ocean sediments at greater depths, offsetting climatic-active greenhouse gasses for longer periods . Because of these collective ecosystem services, mangroves are also of great economic value.

The Sundarban mangrove forests are the largest in the world. They provide a wide range of important ecosystem services, including: the provision of food and water for millions of its inhabitants; protection against the worst effects of natural hazards, such as with cyclones and tsunamis; the ability to act as a giant long-term carbon sink; the retention of terrestrial sediments; and as a habitat for many species, including for the rare and protected Royal Bengal tiger. The biodiversity includes true mangrove plants (34 species) and their associate plant species (40), 150 species of algae, 163 species of fungi, 32 species of lichen, 250 species of fishes, 7 species of amphibian, 59 species of reptiles, around 200 species of birds, 39 species of mammals, besides numerous species of phytoplankton, zooplankton, ichthyoplankton, benthos, soil inhabiting micro arthropods and mangrove plants dependant insects. Species composition, and their distributional pattern, population dynamics and community structure of different groups of fauna experience wide range of changes spatially and temporally because of the prevailing fluctuating environmental condition of

Mangrove ecosystem of Sundarbans, India. The sanctuary provides characteristic type of habitat suitable for animals inhabiting in vast tidal swamp area. Due to typical terrain condition, where land features are broken by rivers and creeks, which forms substantial part of the total surface area, Sundarban tiger has become excellent swimmer. Other prey animals also cross the streams. Prey animals include chital, wild pig and rhesus macaque among other animals. The secondary predators are mainly the fishing cat and to small extent the jungle cat. There is no dearth of fodder for chital which substitute mainly on the leaves, twigs and fruits of kaeora and leaves of baen and kankra.

4 - What is the Site like? (Ecological character description)

4.1 - Ecological character

The Sundarbans forests according to Champion and Seth falls under sub-group 4B Tidal Swamp forests with sub-divisions mentioned below:-

1. Mangrove Type - 4B/TS1- *Ceriops*, *Avicennia alba*, *Acgialitis*- Along the edge of tidal ways and sheltered muddy coast .
2. Mangrove Type- 4B/TS2- *Rhizophora*, *Kandelia*, *Avicennia* – Along the edge of tidal water ways and sheltered muddy cast at slightly higher level.
3. Salt Water type mixed forests (*Heritiera*) – 4B/TS4 – *Heritiera fomes minor*, *Excoecaria agallocha*, *Nypa fruticans* (relatively uncommon) – Bigger river deltas.
4. Brackish Type – 4B/TS4 – *Heitiera fomes minor* , *Sonneratia apetala*, *Acanthus ilicifolius* – In the larger deltas, notably of the Ganges.
5. Palm Swamp Type – 4B/E1 – Poorly represented in Sundarbans.

In general the northern boundary and new depositions are characterized by *Baen* (*Avicennia marina*, *A. abba*, *A. Officinalis*) flanked by foreshore grassland of *Oryza coarctate*. *Baen* is gradually replaced by *Genwa* (*Excoecaria agallocha*) and then *Goran* (*Ceriop decundra*). About 70% area is covered with *Genwa-Goran* association. There are, however, southern and eastern associations of *Garjan* (*Rhizophora apiculata*, *R. mucronata*), *Kankra* (*Bruguiera sexangula*, *B. gymnorhiza*) and patches of *Sundari* (*Heritiera minor*) – *Genwa* – *Garan*, *Pure Hental* (*Phoenix paludosa*) forests exist on relatively high lands. *Nypa* palm swamp is common on central, eastern and southern portions, along creeks and rivers. The floristic change is very dynamic. Within a short span of time politic phase of matured soil having *Genwa-Garan* association, high salt percentage of soil may start experiencing a palmitic depositional phase with sustaining a foreshore *Oryza- Baen* association (low salt percentage).

Mangrove ecosystem is no way exception from the other typical tropical ecosystem. Sundarban is unique being the only mangrove tiger land on globe where tiger occupies the pinnacle of both aquatic as well as terrestrial food web. The existence of mangrove ecosystem and its diverse animal and plant community in the area depends on their symbiotic relationship. Here the basic and the producer group of organisms are planktonic, benthic, periphytic algae and the intertidal mangrove plants. The primary consumers are zooplanktons, zoobenthos, large group of microbes, mollusc, crabs and crustacean; all these microfauna gaze on these algae and the decomposed mangrove detritus. Furthermore , these algae, mangrove detritus, smaller group of microfauna, mollusca and crustaceans act as a natural food for the secondary group of consumers, particularly the smaller fish, amphibians, reptiles and others. Predator fish, catfish, different species of sharks, dolphins are the secondary and tertiary consumers and the crocodiles in the estuarine water is the top consumers in Sundarbans. The herbivorous deer, wild boar and monkey graze on the mangrove seedlings and tender leaves or grasses. All these herbivorous primary consumer group are the important food for the secondary, tertiary and top consumers viz., different types of wild cats including tiger. Prey animals of tiger mostly comprise of Wild Pig and Chitals along with monkeys, water monitor and birds. Aquatic animals like turtles, crabs and several fishes also appear in the list of feeds of tiger. This is confirmed from the faecal matter analysis.

4.2 - What wetland type(s) are in the site?

Marine or coastal wetlands

Wetland types (code and name)	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type	Justification of Criterion 1
F: Estuarine waters		1		Representative
J: Coastal brackish / saline lagoons		2		Unique

(ECD) Habitat connectivity

Mobility is the key to survival for many wildlife species. Animals need to move from place to place for food, protective security cover, and in response to seasonal conditions.

4.3 - Biological components

4.3.1 - Plant species

Invasive alien plant species

Scientific name	Common name	IUCN Red List	Changes at RIS update
<i>Derris trifoliata</i>	Sea derris		No change
<i>Eichhornia crassipes</i>	Common water hyacinth		No change

Optional text box to provide further information

Sundarban mangrove is also perhaps having the largest floral diversity with 84 species of natural higher group of plants in the Indian Sundarbans including trees, shrubs and herbs true of which mangroves(=26), mangrove associates (=29), and back mangroves (=29) species belonging to 40 families and 60 genera. In this inter-tidal high saline deltaic area, most of these plants are endemic for having their special adaptation in this physiologically dry soil. Apart from these, 1100 non-mangrove flowering plants under 154 families were reported. The ten most dominant and distinct families are- Fabaceae, Poaceae, Asteraceae, Cyperaceae, Euphorbiaceae, Malvaceae, acanthaceae, Rubiaceae, Convolvulaceae and Scrophulariaceae.

Mangrove ecosystem itself presents an extremely interesting subject of study. The mangrove flora are typically salinity resistant and has the following specialities:

1> There exists extensive lateral root system for a proper anchorage against diurnal tidal inundation/scouring. These may be a neckline system or long buttresses (*Heritiera* spp., *Bruguiera parviflora*) or strangled roots (*Brownlowia* spp.)

2>The lateral roots get submerged and to breath oxygen pneumatophores are developed such breathing facilities are also adopted by throwing stilt roots from branches and stem studded with lenticles in case of *Rhizophora mucronata*, vertical knee roots from horizontal lateral roots are thrown by *Lumnitzera*, *Bruguiera gymnorhiza*, *Kandelia candel* etc.

3>The plant cells extort very high osmotic pressure in order to draw water from outside salt solution. This cell sap is rich in organic electrolyte in case of *Rhizophora* etc. And inorganic electrolyte incase of *Suaeda* spp.

4>The leaves are normally thick and often contains salt excretory channels to deposit crystals of various composition on leaves and also waxes. Salt hairs on leaves of *Potraceae coarctate* bursts to excrete salt. Mangrove leaves have sunken stomatae. *Khalsi*, *Kala baen*, *Harguza* and *Tora* show salt excretory mechanisms.

5>The fruits of *Rhizophora*, *Bruguiera* etc. germinate right on the tree and fall like a dart on the mud flats to get anchored against tidal inundation(*Vivipary*)

6>- shows perforated burr formation on its stem in more inundated areas, for breathing facility.

4.3.2 - Animal species

Other noteworthy animal species

Phylum	Scientific name	Common name	IUCN Red List	Pop. size	Period of pop. est.	%occurrence	Position in range /endemism/other
CHORDATA/AMPHIBIA	<i>Hoplobatrachus crassus</i>	Jerdon's Bull Frog	LC				Least Concern
CHORDATA/MAMMALIA	<i>Macaca mulatta</i>	Rhesus Monkey,Rhesus Macaque	LC				Least Concern
CHORDATA/REPTILIA	<i>Python molurus</i>	Indian Python					
CHORDATA/MAMMALIA	<i>Viverra zibetha</i>	Large Indian Civet	LC				

Optional text box to provide further information

The forest floor is the domain of the Royal Bengal Tiger (*Panthera tigris*). Among other mammals , ground fauna comprises of wild boars, spotted deer, porcupines, otter and monkeys, which are the principal species of wild animals found in the Sundarbans. The sea facing beaching of the Reserve forms a nesting ground for Olive Ridley Turtles (*Lepidochelys olivacea*) , and the egg laying takes place mainly during December to March. The water monitors are the greatest predators of their eggs and hatchlings along with Wild Pigs, Terns and Sea Gulls. The endangered Northern River Terrapin (*Batagur baska*) also uses the beaches as their nesting round.Sundarban is extremely rich in avifauna which includes a large number of migrants from the higher latitudes that visit the area in Winter. It consists of herons, egrets, cormorants, vultures, green pigeons, sand pipers, large and small spoonbills, darters, seagulls, teal, partridges and a great variety of wild geese and ducks.The cetaceans like Gangetic Dolphin (*Platinista gangetica*) is frequently found in the eastern side, particularly in the Raimangal river. The Block Finless Porpoise (*Necmeris porosus*) is also found in the rivers near the estuary. The marshes and river offer asylum to the Estuarine Crocodile, one of the rare and largest of crocodiles and the endangered Olive Ridley Turtles. A wide variety and assortments of fishes,molluscs, crabs and prawns inhabit the estuaries.

4.4 - Physical components

4.4.1 - Climate

Climatic region	Subregion
A: Tropical humid climate	Am: Tropical monsoonal (Short dry season; heavy monsoonal rains in other months)

Ordinarily, the climate in Sunderbans ranges from 34 °C and 20 °C, and the rainfall is extremely high. So the weather is almost always moist and with the humid air from Bay of Bengal blowing constantly carrying 80% humidity.Although the tract is situated south of the Tropic of Cancer, the temperature is euable due to its proximity to the sea. It receives good amounts of rainfall and is humid for most parts of the year. The summer extends from the middle of March to the middle of June and the winter extends from December to February. The monsoon starts usually between the middle of June and lasts up to the middle of September. This is followed by autumn from middle of September to November. Overall , rough weather lasts from 15th March to 15th September and the fair weather prevails between middle of September to middle of March.Every year, 4-5 cyclonic storms are common. Locally known as 'Kalbaishakhi' these are of common occurrence in the lower Ganga delta during mid March-mid June.

4.4.2 - Geomorphic setting

a) Maximum elevation above sea level (in metres)

- Entire river basin
- Upper part of river basin
- Middle part of river basin
- Lower part of river basin
- More than one river basin
- Not in river basin
- Coastal

Please name the river basin or basins. If the site lies in a sub-basin, please also name the larger river basin. For a coastal/marine site, please name the sea or ocean.

A close network of rivers, channels and creeks intersects the whole area which has resulted in formation of innumerable flat islands. These are submerged completely during high spring tides and partially during ordinary high tides. The main rivers in and around the Reserve area are Malta, Bidya, Gomdi, Gosaba, Gona, Jhilla, Kapura, Raimangal, Harinbhanga and Kalindi. The existing large rivers running north to south are the remnants of the old courses of the Ganga. The Malta and Bidyadhari river system formed innumerable network of creeks between Ganges and Padma however, these river systems got completely cut off from sweet water source and are presently fed by the back waters of sea.During the rains the Raimangal receives an overflow of the Ganga through the Ichhamati which connects them.All the rivers receive a considerable quantity of local drainage. The rivers Malta, Saptamukhi and Thakuran have practically no connection with their original stream and are now creeks of the sea.

4.4.3 - Soil

- Mneral
- Organic
- No available information

Are soil types subject to change as a result of changing hydrological conditions (e.g., increased salinity or acidification)? Yes No

Please provide further information on the soil (optional)

The sundarbans saline soils are considered to cause higher plant mortality and the white salt encrustations are very often visible on the soil surface. The salinity rises to the maximum in the middle of May and decreases on the onset of monsoon. The salt contents are of mostly chlorides and sulphates of sodium, magnesium and calcium, though bicarbonates are also present in traces. The subsoil layer remains under reduced condition along with mottles of different sized dark coloured horizons. The soil is slightly acidic to alkaline, pH ranges between 5.4 and 8.5 in reaction. Salinity rises with the age of the sediment, higher in the salinity within the Tiger reserve area. pH has been reported by the Management plan of STR- 2000-2010 (Anon, 2001) to be as low as 6.9 in case of Excoecaria – *Cerriops* association and as high as 9.7 in case of *Rhizophora* – *Bruguiera* association.

4.4.4 - Water regime

Water permanence

Presence?
Usually permanent water present

Source of water that maintains character of the site

Presence?	Predominant water source
Marine water	<input checked="" type="checkbox"/>
Water inputs from rainfall	<input type="checkbox"/>

Stability of water regime

Presence?
Water levels fluctuating (including tidal)

Please add any comments on the water regime and its determinants (if relevant). Use this box to explain sites with complex hydrology.

Main watercourses within the Sundarban region are Saptamukhi, Thakuran, Matla, Bidya, Gosaba, Jhilla, Gona, Raimangal, Harinbanga and Kalindi. A close network of rivers, channels and creeks intersects the whole area, thus forming innumerable flat islands, which are submerged completely during high spring tides and partially during ordinary high tides. The remnants of the old courses of the Ganga (main current of which has gradually shifted eastwards) runs north to south of the area. The Hooghly is fed mainly by the Rupnarayan and is also connected with the Ganga through the Jalangi and the Bhagirathi. But the estuary of the Hooghly remains brackish even during the rains on account of its great width. During the rains the Raimangal receives an overflow of the Ganga through the Ichhamati, which connects them. All the rivers receive a considerable quantity of local drainage.

(ECD) Connectivity of surface waters and of groundwater	There is no direct recharge of the groundwater from the precipitation of that area due to clay soil texture.
(ECD) Stratification and mixing regime	In an interface ecosystem the sweet water discharge the rivers react with sea water and a complete intermixing takes place with saline water.

4.4.5 - Sediment regime

- Significant erosion of sediments occurs on the site
- Significant accretion or deposition of sediments occurs on the site
- Significant transportation of sediments occurs on or through the site
- Sediment regime is highly variable, either seasonally or inter-annually
- Sediment regime unknown

Please provide further information on sediment (optional):

The Sundarban delta is the largest producing delta of the globe. The formations of different litho logic units of deltaic deposition in this system took place at major shifts of strand lines. The high strand shoreline was far west 2,15,000 years back, a strandline change took place 82000 years back and the present deposition of detritus formed since last 6000 years of stable phase. There is general slope towards south as well as west to east. The upper 100 m. Layer is composed of thick clay with occasional clay balls. There occurs unconsolidated sediment at 137 to 152 m. Depth composed of sand, silt and clay and gravels of varying colours. This serves as boundary of upper aquifer. At about 350 m. Level there lies a second aquifer of potable water. The whole sediment is composed mainly of montmorillonitic, which is very sticky. They are derived from the basic and semi acidic rocks like Dolerite, Gneiss and Mica schists lying within the course of Ganga flow.

(ECD) Water turbidity and colour	The correlation coefficient (r) between turbidity and temperature showed a positive value (r = 0.502, P = 0.01)
(ECD) Water temperature	Average surface water temperature recorded during the study period was 24.63 – 27.89 degree C.

4.4.6 - Water pH

- Acid (pH<5.5)
- Circumneutral (pH: 5.5-7.4)
- Alkaline (pH>7.4)
- Unknown

Please provide further information on pH (optional):

Over the past three centuries, the concentration of carbon dioxide has been increasing in the Earth's atmosphere because of human influences. Owing to gradual increase of CO2 concentration in the atmosphere, a large fraction tended to be dissolved into the ocean and thereby increased the total amount of dissolved inorganic carbon which contributed a shifting of seawater chemistry towards a lower pH condition. This indicates rising acidification of coastal waters and a decrease in the carbonate ion [CO32-], which is believed to affect the ability of marine animals to build up shells (Mitra et al., 2009). The IPCC in its 4th Assessment Report estimates that by the end of the century, ocean pH will decline from current level of 8.1 to 7.8 due to rising concentration of CO2 (Chandra, 2013).

4.4.7 - Water salinity

- Fresh (<0.5 g/l)
- Mxohaline (brackish)/Mxosaline (0.5-30 g/l)
- Euhaline/Eusaline (30-40 g/l)
- Hyperhaline/Hypersaline (>40 g/l)
- Unknown

Please provide further information on salinity (optional):

Around 40% of the tract is under water, which is undrinkable and unfit for cultivation throughout the year due to high salinity. Cultivation in Sundarbans is solely dependent on rainwater. In an interface ecosystem the sweet water discharge of rivers react with seawater and a complete intermixing takes place with saline water. The most parts of the Sundarbans used to experience almost equal level of salinity in monsoon (12.0 to 14.0 ppt) and summer (29.0– 30.0 ppt) indicating less degree of spatial variations. Mangroves being woody halophytic trees and shrubs that normally grow in saline intertidal zones of tropical and subtropical coastline. Salinity, therefore, appears to be one of the key environmental factors influencing the growth and survival of mangrove species. But the tolerance of salinity also varies among the mangroves (Annon 2003).

(ECD) Dissolved gases in water

The concentration of dissolved oxygen (D.O.) in the Western Sector of the Indian Sundarbans showed an increasing trend in contrast to the eastern part over the last 30 years. The observed increase in the dissolved oxygen levels is around 1mg/l over this period. The increase of D.O. concentration in the western side is in contrast to the prevalent notion of decrease in the D.O. levels with increasing temperature (Mitra et al., 2009).

4.4.8 - Dissolved or suspended nutrients in water

- Eutrophic
- Mesotrophic
- Oligotrophic
- Dystrophic
- Unknown

Please provide further information on dissolved or suspended nutrients (optional):

Eutrophication as well as presence of toxic Dinoflagellates and Cyanophyceae in the tidal creek of Sundarban estuary definitely revealed the deteriorated status of the water quality. The structure and function of the mangrove food web is unique, driven by both marine and terrestrial components. Mean phosphate levels were observed to be maximum (1.96 µgm-atom L-1) at Dhamakhali (S7). This indicated that land based nutrients especially, from the adjacent agricultural fields near this site contributed greatly. Mathew and Pillai (1990) reported that the higher concentration of phosphate in coastal waters might be enriched by freshwater drainage. The nitrate and phosphate ratio showed more or less a similar trend in all the stations. It might be due to recycling of nutrients and utilization of secondary producers (Maruthanayagam, 1998). Mean concentration of chlorophyll a varied from 1.29 – 5.5 mg m-3 for all the sites.

4.4.9 - Features of the surrounding area which may affect the Site

Please describe whether, and if so how, the landscape and ecological characteristics in the area surrounding the Ramsar Site differ from the i) broadly similar ii) significantly different site itself.

- Surrounding area has greater urbanisation or development
- Surrounding area has higher human population density
- Surrounding area has more intensive agricultural use
- Surrounding area has significantly different land cover or habitat types

4.5 - Ecosystem services

4.5.1 - Ecosystem services/benefits

Provisioning Services

Ecosystem service	Examples	Importance/Extent/Significance
Food for humans	Sustenance for humans (e.g., fish, molluscs, grains)	High
Wetland non-food products	Timber	High

Regulating Services

Ecosystem service	Examples	Importance/Extent/Significance
Erosion protection	Soil, sediment and nutrient retention	High
Climate regulation	Local climate regulation/buffering of change	High
Hazard reduction	Coastal shoreline and river bank stabilization and storm protection	High

Cultural Services

Ecosystem service	Examples	Importance/Extent/Significance
Recreation and tourism	Nature observation and nature-based tourism	High
Spiritual and inspirational	Spiritual and religious values	High
Scientific and educational	Important knowledge systems, importance for research (scientific reference area or site)	High

Supporting Services

Ecosystem service	Examples	Importance/Extent/Significance
Biodiversity	Supports a variety of all life forms including plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part	High

Outside the site:

Have studies or assessments been made of the economic valuation of ecosystem services provided by this Ramsar Site? Yes No Unknown

4.5.2 - Social and cultural values

- i) the site provides a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland
- ii) the site has exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland
- iii) the ecological character of the wetland depends on its interaction with local communities or indigenous peoples

Description if applicable

The total Sundarban area south of the Dampier & Hodges line is 9630 sq. Km. comprising 102 islands. Out of these, 52 are inhabited where agriculture is being done and the rest 48 islands measuring 4262 sq. km. form the Reserved forests including the forest under 24-parganas (South) Division. The tidal flow is checked by construction of embankments and the land is reclaimed. The total length of embankment protecting the reclaimed land is approximately 3500 km. Since the reclamation was started before the completion of siltation process, therefore, most of such reclaimed lands are below the high tide level thus making them most vulnerable during the cyclones and there are frequent breaches in the embankments thus causing enormous damages to the villages. The reclaimed land outside Tiger Reserve yield only a single crop. During the dry months there exists hardly any irrigation facility. There are about 4.2 million people living in the north-west and the northern periphery of the Reserved Forest as per as 2001 census. There is no cultivation or grazing inside the forests. But the innumerable creeks and rivers provide spawning ground for shrimps, crabs and molluscs. No fishing is permitted within the National Park and Sanctuary areas, but in the rest of the Reserved Forest areas, fishing by permit-holders are allowed. As compared to the State average of 25.61%, nearly 36.5% of the population belong to SC?ST. 85% of people living in Sundarbans are dependent on agriculture on reclaimed land which bear mostly single crop of paddy. Besides agriculture, other occupations are fishing as well as pisciculture, honey collection and wood cutting. 50% of agricultural labourers are landless. As a result the level of literacy as well as per capita income is much lower in Sundarbans than in other parts of West Bengal and as such most of the people in Sundarbans fall below poverty line. The communication is also very poor and most of the areas are inaccessible. There is hardly any industrial activity in the Sundarban region and there are almost no organized large-scale employment opportunities except in the traditional sectors of agriculture, fisheries and forest. Honey collection is a seasonal activity and have created employment opportunities. Before entering the forest for fishing or honey/wood collection, the people worship the secular Goddess " Banabibi" irrespective of cast, creed or religion, as insurance against tiger attack.

iv) relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland

4.6 - Ecological processes

<no data available>

5 - How is the Site managed? (Conservation and management)

5.1 - Land tenure and responsibilities (Managers)

5.1.1 - Land tenure/ownership

Public ownership

Category	Within the Ramsar Site	In the surrounding area
Provincial/region/state government	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Provide further information on the land tenure / ownership regime (optional):

Total forest and reclaimed area of Indian Sundarbans now covers 9630 sq. km. Although by about 1879 a total area of about 4690 sq. km. of forests was declared as protected forests in 24-Parganas District, leasing of new areas, which included some of the notified protected forests, continued. This was followed by deforestation and reclamation. The whole area in 24-parganas District was declared first as protected forests under a notification dated 7th December 1878 and the boundaries of the remaining protected forests were fixed by the notification No-4457-For Dated 9th April 1926. The protected forests in the Basirhat Subdivision of the District (Basirhat Range-present Tiger Reserve Area) were constituted as Reserve forests as per Govt. Notification No- 15340-For Dated 2nd May. 1939. The residual protected forests (Namkhana Range) were finally declared as Reserve Forest under notification No-7737- For dated the 29th May, 1943.

5.1.2 - Management authority

Please list the local office / offices of any agency or organization responsible for managing the site: Bikash Bhawan, Office of Chief Wildlife Warden, Directorate of Forest, Government of West Bengal
Bikash Bhawan, Office of the Director of Sundarban Biosphere Reserve, Government of West Bengal
Canning Town, Office of Field Director, Sundarban Tiger Reserve, Government of West Bengal

Provide the name and title of the person or people with responsibility for the wetland: Dr. R.P Saini, IFS, A.P.C.C.F & Director Sundarban Biosphere Reserve

Postal address: Government Of West Bengal, Department of Forest; WildLife Wing.
Office of the Director, Sundarban Biosphere Reserve, 3rd Floor , North Block, Bikash Bhawan, Salt Lake City, Kolkata- 700091.
Telefax 2321-175/1529

E-mail address: sbrdir@gmail.com

5.2 - Ecological character threats and responses (Management)

5.2.1 - Factors (actual or likely) adversely affecting the Site's ecological character

Human settlements (non agricultural)

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Tourism and recreation areas	Low impact	Medium impact	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Water regulation

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Dredging	High impact	High impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Salinisation	Medium impact	High impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Energy production and mining

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Oil and gas drilling	High impact	High impact	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Transportation and service corridors

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Utility and service lines (e.g., pipelines)	Medium impact	High impact	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Biological resource use

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Fishing and harvesting aquatic resources	High impact	High impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hunting and collecting terrestrial animals	High impact	High impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Logging and wood harvesting	High impact	High impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Human intrusions and disturbance

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Recreational and tourism activities	Low impact	Medium impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Pollution

Factors adversely affecting site	Actual threat	Potential threat	Within the site	In the surrounding area
Air-borne pollutants	High impact	High impact	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Please describe any other threats (optional):

Exploitation of molluscan shells for lime manufacture. It disrupts and affects the Ecological balance. It prevents calcium recycling into the system. Uncontrolled collection of prawn seedlings. Collection of Shrimp/ Prawn seeds by crude method by the local villagers, of almost all age groups, for supplying to the commercial prawn culture firms has become an extremely attractive economic activity for the jobless people. They undertake a lot of risks and health hazards in the process. But in the process of such prawn seed collection, they destroy the seeds of many other fish species. There is also a large demand from across the border, which has compounded the danger. This activity is highly unsustainable. Reduced flow of Sweet water into Sundarban mangrove system. Due to shift in the fresh water flow from the Hooghly river system into Padma river, major fresh water rivers like Matla and Bidyadhari got cut off from its fresh water sources and are now mostly tidal rivers. As a result, less of freshwater flushing of the mangroves takes place during the low tide and the resultant increase in salinity level in the water western forest of Sundarban changes in the vegetation pattern and formation of saline banks inside the islands. Construction of barrages in the upper catchment has further stopped silt flow into the estuary. Chemical pollution through marine paints and hydrocarbons. A large number of mechanized boats and launches contribute to such pollution of the mangrove ecosystem. Due to pollution the ecological balance is disrupted. Many species are affected by the sound of the boats and the spills is affecting both aquatic and terrestrial ecosystem. A management plan addressing the threats has been drawn up and is being implemented with support of State Government and Government of India.

5.2.2 - Legal conservation status

Global legal designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site
UNESCO Biosphere Reserve	Sundarban Biosphere Reserve	http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?code=IND+03&mode=all	partly
World Heritage site	Sundarban National Park	https://en.wikipedia.org/wiki/Sundarbans_National_Park	whole

5.2.3 - IUCN protected areas categories (2008)

- Ia Strict Nature Reserve
- Ib Wilderness Area: protected area managed mainly for wilderness protection
- II National Park: protected area managed mainly for ecosystem protection and recreation
- III Natural Monument: protected area managed mainly for conservation of specific natural features
- IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention
- V Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation
- VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems

5.2.4 - Key conservation measures

Legal protection

Measures	Status
Legal protection	Implemented

Habitat

Measures	Status
Re-vegetation	Implemented

Species

Measures	Status
Threatened/rare species management programmes	Implemented
Reintroductions	Implemented

Human Activities

Measures	Status
Communication, education, and participation and awareness activities	Implemented
Harvest controls/poaching enforcement	Implemented

Other:

1.Sundarbans Tiger project in 1973-Implemented over an area of 2585.10 sq km of the south east part of the Indian Sundarban mangrove forest to protect this majestic species from poaching.

2. Bhagabatpur Crocodile project-Initiated since 1976 and dedicated to protect the estuarine crocodile by safeguarding its eggs and their nest areas.

3.Recovery programme of Batagur baska-It is also known as Northern River Terrapin which is critically endangered as stated by IUCN. Sundarban Tiger Reserve with the help of Madras Crocodile bank trust has taken initiative to save this species and successful breeding of Northern river Terrapin is now done in Sajnekhali to revive this species.

Introduction of Intelligence gathering which helps the field officers build up their intelligence network for collecting information on possible poaching and timber-smuggling cases to prevent their occurrences. A secret service fund is proposed to be placed with the DFO's for buying information, at the same time maintaining the secrecy of informers and sources. Mobile phones are provided to the senior officers , up to the rank of DFOs to facilitate communication and organizing raids against the mafia in the city.

Starting afforestation with fast growing and indigenous species so that the slopes and base of the embankments, away from the tidal action , are being planted up with indigenous and quick growing species to meet the local demand of fuel/fodder and small timber.

Eco-Development and JFM support activities-

No governmental efforts to conserve and create assets/resources can be successful and sustainable unless the people concerned actively participate in planning and management of the resources. Participatory or Joint Mangrove Management (JMM) is thus the basis of sustainable Conservation of Mangrove Ecosystem. On the basis of the experiences of people's participation in forest management in S.W. Bengal, W.B.Forest Department have issued government orders facilitating the formation of Forest protection Committees (FPC) around the Reserved/ Protected Forests, and Eco-Development Committees (EDC) around the National Park and Sanctuaries. Till now, 34 FPCs and 10 EDCs have been registered and functioning.

Members of the FPCs and EDCs participate in protection of the forests against exploitations. However, since large population in the fringe villages are intensively dependent on the resources of the mangrove eco-system, closure of the resource against exploitation will lead to further unemployment and starvation of the people BPL. Such actions are bound to alienate the people below PL and PPL, and will go against the concept of conservation. Therefore our effort to create "alternate livelihood options" for these target groups and dilute the biotic pressure on the ecologically fragile mangrove ecosystem. Whatever development funds are made available for the forest fringe villages, will be utilized for creating resources through the process of Micro-level Planning.

5.2.5 - Management planning

Is there a site-specific management plan for the site? Yes

Has a management effectiveness assessment been undertaken for the site? Yes No

If the site is a formal transboundary site as indicated in section Data and location > Site location, are there shared management planning processes with another Contracting Party? Yes No

Please indicate if a Ramsar centre, other educational or visitor facility, or an educational or visitor programme is associated with the site:

Wildlife institute of India is jointly working with Sundarban Tiger Reserve for monitoring of Tigers and national population census of tigers.

URL of site-related webpage (if relevant): https://www.wii.gov.in/tiger_reports

5.2.6 - Planning for restoration

Is there a site-specific restoration plan? Please select a value

5.2.7 - Monitoring implemented or proposed

Monitoring	Status
Water regime monitoring	Proposed
Animal community	Implemented
Plant community	Implemented

Monitoring is one of the most effective methods of gauging the efficacy of a process or a management intervention along with this it also serves as a regulatory tool as well as a means of detecting incipient change. One of the outcomes of a good monitoring program is that it generates good baseline data. It has been seen that in most of our Protected Areas we lack good baseline data collected in a scientific manner which often results in decisions being taken in an adhoc and piecemeal manner. In the Tiger Reserve the present system of monitoring involves data being collected in pre-designated formats by the field staff. The different field camps are involved in collection of data related to the following:

(i) tiger sighting direct and indirect evidences on a day to day basis.

(ii) wildlife sighting on a daily basis.

(iii) protection related data collected on a daily basis.

The monitoring of this data is carried in the form of Protection Monitoring Protocol (PMP) which reflects the duties performed by the field staff along with its outcome in the form of data generated with respect to the area where duties were carried out, number of night halts, number and nature of offence detected, etc has proved to be an effective tool for monitoring the protection regime. The same needs to be continued and monitored regularly and corrective action applied based on the basis of the monthly review meetings chaired by the Field Director. The present form of monitoring should continue however, most of the formats for data collection should be modified in such a way so that the some statistical analysis can be carried out using that data. All the monitoring data to be sent to the Research Range (except the protection related data which is to be compiled by an Assistant Field Director) where it should be collated for the entire Division and analysis carried out. The analysis of the field monitoring to be reviewed on a quarterly basis by the Field Director and subsequent action taken as per need. In addition to the existing monitoring Meteorological stations to be established in Haldibari, Baghmara, Netidhpani, Chamta, Khatuajhuri, Sajnekhali and Jingekhali. Data to be collected for rainfall, temperature, humidity, soil salinity, and tidal amplitude. This data shall also be sent to the Research Range for compilation and analysis.

6 - Additional material

6.1 - Additional reports and documents

6.1.1 - Bibliographical references

Several research articles have been consulted like:-
Chakraborty, S. K. (2013). Interactions of Environmental Variables Determining the Biodiversity of Coastal-Mangrove Ecosystem of. An International Quarterly Journal of Environmental Sciences.
Chowdhury, A., & Maiti, S. K. (2016). Identification of metal tolerant plant species in mangrove ecosystem by using community study and multivariate analysis: a case study from Indian Sunderban. Environmental Earth Sciences. <https://doi.org/10.1007/s12665-016-5391-1>
Das, K., & Ray, S. (2008). Effect of delay on nutrient cycling in phytoplankton-zooplankton interactions in estuarine system. Ecological Modelling. <https://doi.org/10.1016/j.ecolmodel.2008.02.019>
Ghosh, A., Schmidt, S., Fickert, T., & Nüsser, M. (2015). The Indian Sundarban mangrove forests: History, utilization, conservation strategies and local perception. Diversity. <https://doi.org/10.3390/d7020149>
Gopal, B., & Chauhan, M. (2006). Biodiversity and its conservation in the Sundarban mangrove ecosystem. Aquatic Sciences, 68(3), 338–354. <https://doi.org/10.1007/s00027-006-0868-8>
Panigrahy, S., Murthy, T. V. R., Patel, J. G., & Singh, T. S. (2012). Wetlands of India: inventory and assessment at 1: 50,000 scale using geospatial techniques. Current Science, 102(6), 852–856. <https://doi.org/10.2307/24084499>
Qiu, B., Li, H., Zhou, M., & Zhang, L. (2015). Vulnerability of ecosystem services provisioning to urbanization: A case of China. Ecological Indicators, 57, 505–513. <https://doi.org/10.1016/j.ecolind.2015.04.025>
Tiger Conservation Protocol, Sundarban Tiger Reserve
Working plan of 24 parganas(south), Sundarban Biosphere Reserve.

6.1.2 - Additional reports and documents

i. taxonomic lists of plant and animal species occurring in the site (see section 4.3)

<1 file(s) uploaded>

ii. a detailed Ecological Character Description (ECD) (in a national format)

<1 file(s) uploaded>

iii. a description of the site in a national or regional wetland inventory

<no file available>

iv. relevant Article 3.2 reports

<no file available>

v. site management plan

<1 file(s) uploaded>

vi. other published literature

<1 file(s) uploaded>

6.1.3 - Photograph(s) of the Site

Please provide at least one photograph of the site:



Sundarban Wetland (
Sundarban Biosphere
Reserve, 21-03-2017)



Mangrove Forest (
Sundarban Biosphere
Reserve, 21-03-2017)

6.1.4 - Designation letter and related data

Designation letter

<1 file(s) uploaded>

Date of Designation