

**REPORT ON THE MISSION TO THE SUNDARBANS WORLD HERITAGE SITE,
BANGLADESH,
FROM 22 TO 28 MARCH 2016**



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LIST OF ACRONYMS

BIFPCL	Bangladesh-India Friendship Power Company Ltd
BFD	Bangladesh Forest Department
BHEL	Bharat Heavy Electricals Limited
BPDP	Bangladesh Power Development Board
CEGIS	Center for Environmental and Geographic Information Services
DoE	Department of Environment
EIA	Environmental Impact Assessment
EPA	United States Environmental Protection Agency
ESIA	Environmental and Social Impact Assessment
IUCN	International Union for Conservation of Nature
MoEF	Ministry of Environment and Forests
MW	Mega Watt
NGO	Non-governmental organisation
NTCP	National Thermal Power Corporation
OUV	Outstanding Universal Value
PA(s)	Protected Area(s)
RAMSAR	Convention on Wetlands of International Importance
SEWS	Sundarbans East Wildlife Sanctuary
SRF	Sundarbans Reserved Forest
SSWS	Sundarbans South Wildlife Sanctuary
SWWS	Sundarbans West Wildlife Sanctuary
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHC	UNESCO World Heritage Centre

EXECUTIVE SUMMARY

The reactive monitoring mission was undertaken from 22 to 28 March 2016 following World Heritage Committee Decision **39 COM 7B.8**. The objective of the mission was to follow up on the concerns raised by the World Heritage Committee and assess the current state of conservation of the property.

The mission visited the eastern parts of the property and met with key representatives and staff from relevant government institutions at both local and national level. The mission visited the site where the Rampal power plant is being constructed and met with representatives from the Bangladesh India Friendship Power Company Ltd (BIFPCL). The mission also visited locations of several of the most recent ship accidents and met with staff from the Center for Environmental and Geographic Information Services (CEGIS) and the Mongla Port Authority. Issues pertaining to the conservation of the property and its Outstanding Universal Value (OUV) were discussed and raised with representatives from a number of non-governmental organisations (NGOs) and scientists both during and after the mission. The mission also consulted a wide range of scientific articles published in international peer reviewed journals relevant to the core conservation issues for the property and its surrounding mangrove forest upon which it is dependent for its integrity and survival.

The mission concludes that the Sundarbans World Heritage property continues to support the OUV for which it was inscribed. The property is iconic as part of the world's largest mangrove system and home to an important population of the Royal Bengal Tiger among other species. Ecological monitoring information being patchy, there is no clear indication with regards to the level of threat for species such as the Royal Bengal Tiger. There are some indications that illegal wildlife trade of this and other important species is increasing. The property appears to be in overall good condition but is currently undergoing changes due to high salinity and is damaged in its south eastern section from Cyclone Sidr that hit the coast of Bangladesh in 2007.

The mission affirms the threats to the OUV of the property raised in previous World Heritage Committee decisions. It concludes that the majority of concerns raised in Decision **39 COM 7B.8** are yet to be adequately addressed and minimal progress has been made to deal with these threats. The mission also identified additional threats to the OUV of the property that are of considerable concern and have not been previously raised by the World Heritage Committee. The most important of these relate to drastically reduced freshwater flows and the lack of integrated management of the property.

Based on the many consultations the mission team conducted during and after the visit, the mission concludes that the following three threats are of serious concern and require urgent, immediate attention:

First, the freshwater flow into the Sundarbans has been drastically reduced following the construction of the Farakka Barrage and increased water extraction, which is resulting in substantial increases in siltation and salinity that are threatening the overall balance of the ecosystem, its functioning and regeneration. Salt tolerant mangrove species are expanding and gradually displacing other species, while higher salinity is stimulating an increase in barren areas. In the absence of a comprehensive, multilateral and integrated freshwater inflow management plan it is unlikely the property's OUV can be maintained in the long term.

Second, the mission team identified four core potential threats related to the prospective construction and operation of the 1320 MW Maitree Super Thermal Power Plant (Rampal power

plant), the current site of which is located 65 km from the closest boundary of the World Heritage property. These include pollution from coal ash by air, pollution from wastewater and waste ash, increased shipping and dredging and the cumulative impact of industrial and related development infrastructure. The mission considers that air and water pollution have a high likelihood to irreversibly damage the OUV of the World Heritage property. The possible threats arising from the power plant on the OUV of the property are not addressed adequately in the EIA in line with IUCN's World Heritage Advice Note on Environmental Assessment, and the plant itself is not applying the best available technology or the highest international standards for preventing damage commensurate with its location in the near vicinity of a globally unique World Heritage property.

Third, the property is lacking a clear and comprehensive assessment of the overall combined effects expected to arise from increasing coastal developments and associated activities, a number of which are already in preparation. Increased port capacity and other coastal developments are expected to result in increased shipping and dredging but avoidance and/or mitigation of their effects are not planned for or managed in an integrated manner. Several recent ship accidents illustrate the difficulties and the need for a concerted and coordinated maritime traffic management and rapid response to mitigate and prevent impacts. Considering the OUV of the property is already undergoing impacts and changes and the area's vulnerability to the effects of climate change, the lack of an integrated management system to protect the OUV of the property is of considerable concern.

In addition to these key threats, the mission also concludes that the long-term effects from recent ship accidents could not be ruled out. Furthermore, enhanced support to monitor and control resource extraction, including poaching of high value wildlife species, would benefit the overall state of conservation of the property. There is a clear need for increased and secured resources for the management of the property, including surveillance and monitoring of resource extraction activities. The mission recommends the State Party to provide greater support and urgent attention to address this issue. The mission also considers that the overall pressure in the property and its surrounding areas should be kept to a minimum in view of increasing the ecosystem's resilience in the face of climate change, the effects of which the area is highly vulnerable to. Given the concern of the mission team in regards to potential impacts on the property, clarification is urgently needed on the current status of the Orion power plant, which is reportedly being planned adjacent to the Rampal power plant, as well as a proposed nuclear power plant in the vicinity of the Sundarbans, as they will all contribute towards the cumulative impact on the property and its overall integrity.

Finally, while the mission concludes that the property does not currently meet the requirements for inscription on the List of World Heritage in Danger, it notes that immediate implementation of the mission recommendations related to the freshwater flows, the Rampal power plant (and other similar developments in the vicinity of the property) and integrated management are imperative to prevent the OUV of the property from becoming irreversibly damaged. The mission recommends that the State Party report, as requested in Decision **39 COM 7B.8** to be submitted to the World Heritage Centre by 1 December 2016, clearly outlines the measures and steps the State Party is taking toward implementing the below recommendations. Should any of the most threatening developments proceed, the mission concludes that the World Heritage Committee should consider immediate listing of the property in the List of World Heritage in Danger at its 41st session in 2017.

The mission considers that the State Party should take urgent measures to immediately implement the following recommendations to prevent further erosion of the OUV and address important threats to the property:

R1. Considering the impact to the OUV of the property, the structural changes to the ecosystem and its functioning, resulting from higher salinity, in particular in the southern areas of the SRF where the World Heritage property is located, and the continued lack of sufficient provision to secure adequate freshwater flows into the area, it is recommended that as a matter of utmost urgency and without delay:

- a) The Ganges water sharing Treaty between India and Bangladesh is fully implemented in a coordinated effort by the States Parties of Bangladesh and India to ensure adequate freshwater inflow;
- b) A comprehensive, multilateral and integrated freshwater inflow management plan is designed and implemented, accompanied by the necessary monitoring to measure salinity and water quality, including groundwater, throughout the property. Future planning and management decisions should be informed by these monitoring results.

R2. In relation to the Rampal power plant, considering the high likelihood for: (i) contamination of the property and the surrounding Sundarbans forest from air and water pollution arising from both its location, in a wind risk zone, and its anticipated methods to minimise impacts; (ii) the substantial increase in shipping and dredging required in the immediate vicinity of the property for the plant's construction and operation; (iii) the additional removal of freshwater from an already increasingly saline environment that is starting to alter the functioning of the ecosystem; (iv) an EIA that does not address the effects on the OUV of the property nor provide convincing evidence that effects on the Sundarbans will be mitigated; and (v) the intrinsic connectivity between the property and the Sundarbans forest, it is recommended that the Rampal power plant project is cancelled and relocated to a more suitable location where it would not impact negatively on the Sundarbans Reserved Forest and the property.

R3. The mission recommends that the State Party halts all development of the site of the Orion Power Plant in Khulna, and any similar proposed development, until an independent, comprehensive and scientifically sound EIA has been conducted and provided to the World Heritage Centre and IUCN for their review and evaluation. If impacts on the OUV of the property or its immediate surroundings cannot be addressed in a scientifically sound manner, it is recommended that the projects be cancelled and relocated to more suitable locations.

R10. Considering the multiple activities outside the property that are impacting on its OUV, it is recommended that the State Party puts in place a system that allows management of the property in a more integrated manner. Such a system should ensure:

- a) Sufficient freshwater flows into the property to maintain its ecosystem health, balance and functioning;

- b) Decisions for further economic development and associated activities such as shipping and dredging are not taken in isolation but are subject to a Strategic Environmental Assessment (SEA) for the property and its surrounding areas upon which it is dependent;
- c) The economic and industrial carrying capacity of the areas surrounding and in close proximity to the property are defined in a transparent and scientifically sound manner and these limits reflected in decision making;
- d) Sufficient financial and human resources are made available to provide for the long-term management and patrolling of the area and resource extraction including control of illegal activities such as poaching of wildlife and non-compliance with existing regulations.

The mission considers that the following recommendations to further improve the conservation of the property and strengthen its management should be implemented as soon as possible:

R4. Considering the potential threats to the property from increased shipping and required dredging, the planned expansion and increase in use of the Mongla Port requires urgent clarification. It is recommended that the State Party halt all expansion activities until an independent, comprehensive and scientifically sound EIA that specifically considers the impacts on the OUV of the property has been conducted and provided to the World Heritage Centre and IUCN for their review and evaluation.

R5. Enforce the permanent closure of the Shela River to all vessel traffic, national and international, and apply speed limits and effective control measures for night and poor weather conditions for vessels navigating along the Pashur River.

R6. Develop an effective action plan and emergency response facility in consultation with all relevant stakeholders to react to any future shipping incidents in a timely and coordinated manner, and consistent with the recommendations made in the United Nations Development Programme (UNDP) oil spill assessment report.

R7. Develop, finalise and submit for review by the World Heritage Centre and IUCN, a detailed assessment of potential impacts of current and planned dredging and associated activities on the OUV and integrity of the property.

R8. Enhance and strengthen human and financial resources, capacity and inter-agency cooperation, including between local and national authorities, and law enforcement to adequately address wildlife trade, transportation, and sale, including actions and budget to facilitate increased staffing, patrolling and effective engagement with local communities to garner their support for the continued protection of the property and its OUV against poaching.

R9. Taking into account that climate change is a global problem requiring a concerted global solution, it is strongly recommended that, at the level of the property, the State Party reduce other threats in the property and its surrounding area to secure maximum resilience of the

property in the face of climate change impacts. Ecological monitoring for the property should include indicators that measure climate change impacts in view of identifying both short-term and long-term effects on the OUV of the property and the ways and means to effectively address them and the capacity of management staff to plan for impacts from climate change should be further developed.

1. BACKGROUND TO THE MISSION

1.1 Inscription history

Inscribed on the World Heritage List in 1997 The Sundarbans World Heritage Property (the property) covers a total of 139,700 ha and constitutes three management entities: Sundarbans West Wildlife Sanctuary (SWWS), Sundarbans South Wildlife Sanctuary (SSWS) and Sundarbans East Wildlife Sanctuary (SEWS). These three areas are located in the southern coastal zone of the larger 595,000 ha Sundarbans Reserve Forest (SRF) and are managed by the Bangladesh Forest Department (BFD) of the Ministry of Environment and Forests (MoEF). Combined with the Sundarbans National Park in India (inscribed separately on the World Heritage List in 1987), the property is part of the largest mangrove system in the world.

1.2 Inscription criteria and World Heritage values

The property was inscribed on the World Heritage List under the following criteria:

- *Criterion (ix): The Sundarbans provides a significant example of on-going ecological processes as it presents the process of delta formation and the subsequent colonisation of the newly formed deltaic islands and associated mangrove communities. These processes include monsoon rains, flooding, delta formation, tidal influence and plant colonisation. As part of the world's largest delta, formed from sediments deposited by three great rivers; the Ganges, Brahmaputra and Meghna, and covering the Bengal basin, the land has been moulded by tidal action, resulting in a distinctive physiology.*
- *Criterion (x): One of the largest remaining areas of mangroves in the world, the Sundarbans supports an exceptional level of biodiversity in both the terrestrial and marine environments, including significant populations of globally endangered cat species, such as the Royal Bengal Tiger. Population censuses of Royal Bengal Tigers estimate a population of between 400 to 450 individuals, a higher density than any other population of tigers in the world.*

The property supports exceptional biodiversity in its terrestrial, aquatic and marine habitats, ranging from micro to macro flora and fauna and is of universal importance for globally endangered species including the Royal Bengal Tiger (*Panthera tigris* ssp. *tigris*), Ganges River Dolphin (*Platanista gangetic*), Irrawaddy Dolphin (*Orcaella brevirostris*), and the critically endangered endemic river terrapin (*Batagur baska*).

1.3 Integrity issues raised in the IUCN evaluation report at the time of inscription

At the time of the IUCN evaluation in 1997, the wider Sundarbans region of Bangladesh and India had already been reduced to half its former size due to clearing and conversion of mangrove forest for agricultural use over the past 150 years. The evaluation also noted that freshwater inflow and water quality had also declined. Six animal species were considered to have gone extinct in the area over the past century including the Javan rhino, wild buffalo, swamp deer, hog deer, gaur and mugger crocodile.

At the time of inscription, the World Heritage Committee encouraged the States Parties of Bangladesh and India to discuss the possibility of creating a trans-boundary site between The Sundarbans (Bangladesh) and The Sundarbans National Park (India) World Heritage properties.

1.4 Examination of the State of Conservation by the World Heritage Committee

Decision 33 COM 7B.12 (Seville, 2009)

The Committee requested the State Party to develop a programme of ecological monitoring, also documenting the impact of climate change on the Outstanding Universal Value (OUV) of the property.

Decision 35 COM 7B.11 (UNESCO, 2011)

The Committee noted the initiation of the Sundarbans Environmental and Livelihoods Security project that included support for ecological monitoring and documenting the impacts of climate change on the OUV of the property. The Committee further noted that, in the absence of ecological monitoring data for the property, it was not possible to assess the status of its OUV, and requested the State Party to submit the results of the ecological monitoring programme to the World Heritage Centre (WHC) for review.

Decision 38 COM 7B.64 (Doha, 2014)

The Committee requested the State Party to urgently submit the results of the ecological monitoring programme to the WHC. The Committee noted with concern that the indirect impacts on the property of the construction of a coal fired power plant at Khulna (1320 MW Maitree Super Thermal Power Plant) appeared to have not been assessed, and considered that increased navigation on the Pashur River and the required dredging are likely to have a significant adverse impact on the property's OUV. The Committee requested the State Party to ensure that the Environmental Impact Assessment (EIA) for the dredging activities include a specific assessment of potential impacts on OUV.

The Committee also noted with concern the reports of further infrastructure and industrial development downstream of the power plant, and plans for the construction of an additional coal fired power plant in the same location. The State Party was therefore requested to undertake a comprehensive Strategic Environmental Assessment (SEA) to ensure that cumulative impacts of developments in the Sundarbans are adequately assessed, including in relation to the OUV of the property.

Decision 39 COM 7B.8 (Bonn, 2015)

Ecological monitoring data for the property had still not been provided, and the Committee urged the State Party to submit the results of the ecological monitoring programme for the property without delay.

The Committee noted that the EIA for the dredging of the Pashur River, adjacent to the property, did not include a specific assessment of the potential impacts on the property's OUV, and requested the State Party to submit this to the WHC. The Committee reiterated its request to the State Party to undertake a comprehensive SEA, also requesting that further details on the mitigation measures taken for the power plant project be provided, which should fully consider the findings of the SEA.

The Committee further requested the State Party to continue monitoring the effects of the December 2014 oil spill on the aquatic environment, and to take measures to prevent such accidents, drawing lessons learned so as to strengthen its oil spill preparedness and response capacity.

1.5 Justification for the mission

The World Heritage Committee in its Decision **39 COM 7B.8** requested the State Party to invite a joint WHC/IUCN reactive monitoring mission to the property to review the state of conservation of the property and the potential impacts of the thermal power plant development and dredging of the Pashur River. The WHC and IUCN undertook the mission from 22 March to 28 March 2016. The mission was tasked to assess the following specific issues:

1. Review potential impacts on the property's Outstanding Universal Value (OUV) from the 1320 MW Maitree Super Thermal Power Plant and the dredging of the Pashur River, including indirect and cumulative impacts;
2. Assess the current state of the property on the basis of the results of the ecological monitoring programme in place for the property, in particular in relation to impacts from climate change;
3. Assess the current management system of the property and the wider Sundarbans Reserved Forest (SRF), in particular in relation to the monitoring system, shipping safety, and measures in place to protect environmentally sensitive areas;
4. Assess any other relevant conservation issues that may negatively impact on the OUV of the property, consistent with paragraph 173 of the *Operational Guidelines*.

The mission was comprised of Dr Fanny Douvere representing the WHC and Dr Naomi Doak and Ms Mizuki Murai representing IUCN. A copy of the terms of reference of the mission and Committee Decision **39 COM 7B.8** are provided in Annexes I and II, respectively. In advance of the mission, the State Party submitted four documents to the WHC/IUCN for review, i.e.:

1. *A general overview of conservation measures in the Sundarbans;*
2. *A summary document from the UNDP oil spill assessment report on impacts on aquatic wildlife and environment;*
3. *The Integrated Resources Management Plan for the Sundarbans 2010–2020; and*
4. *The 2010 Initial Environmental Examination of the Rampal power plant.*

During the visit to Bangladesh, the mission met with key Ministries and their representatives, industry representatives, port authorities, a small number of researchers and a local community encounter coordinated by the Bangladesh-India Friendship Power Company Ltd (BIFPCL) and relevant ministries. The mission undertook a field visit through the SRF and parts of the SEWS, including stops at Hiron Point and Kotka. A meeting with BIFPCL representatives was held at the site of the Rampal power plant, allowing the mission to see the current status of development. The mission further travelled to Akram Point, Harbaria and Mongla Fuel Jetty, all important vessel navigation points along the Pashur River. The mission also visited the location of the cargo vessel incident site of May 2015 in which 200 tonnes of potash fertiliser was leaked into the Bhola River and the oil spill accident site of 19 March 2016. A full programme of the mission and a list of people met during the mission is included in Annexes III and IV of this report.

Apart from representatives from WINROCK International and IUCN Bangladesh, the mission was unable to meet with NGOs and civil society groups during its visit to Bangladesh. Following the visit, the mission team consulted a wide range of national and international experts and several NGOs with regard to the state of conservation of the property and the threats or impacts that have the potential to threaten the OUV of the property.

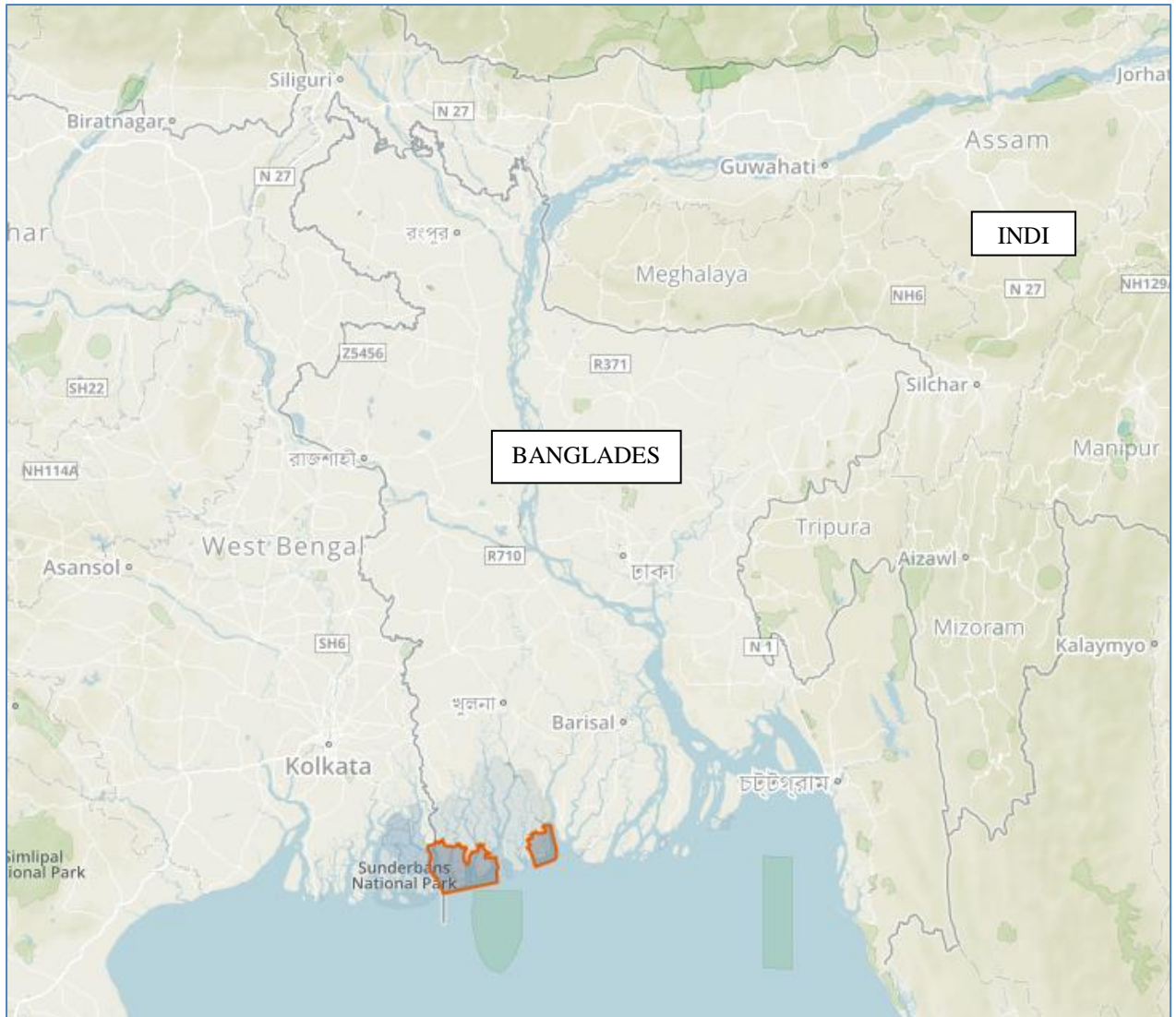


Figure 1. Location of The Sundarbans World Heritage property (see Figure 2 for detailed boundary map) (source: Protected Planet 2014-2015).

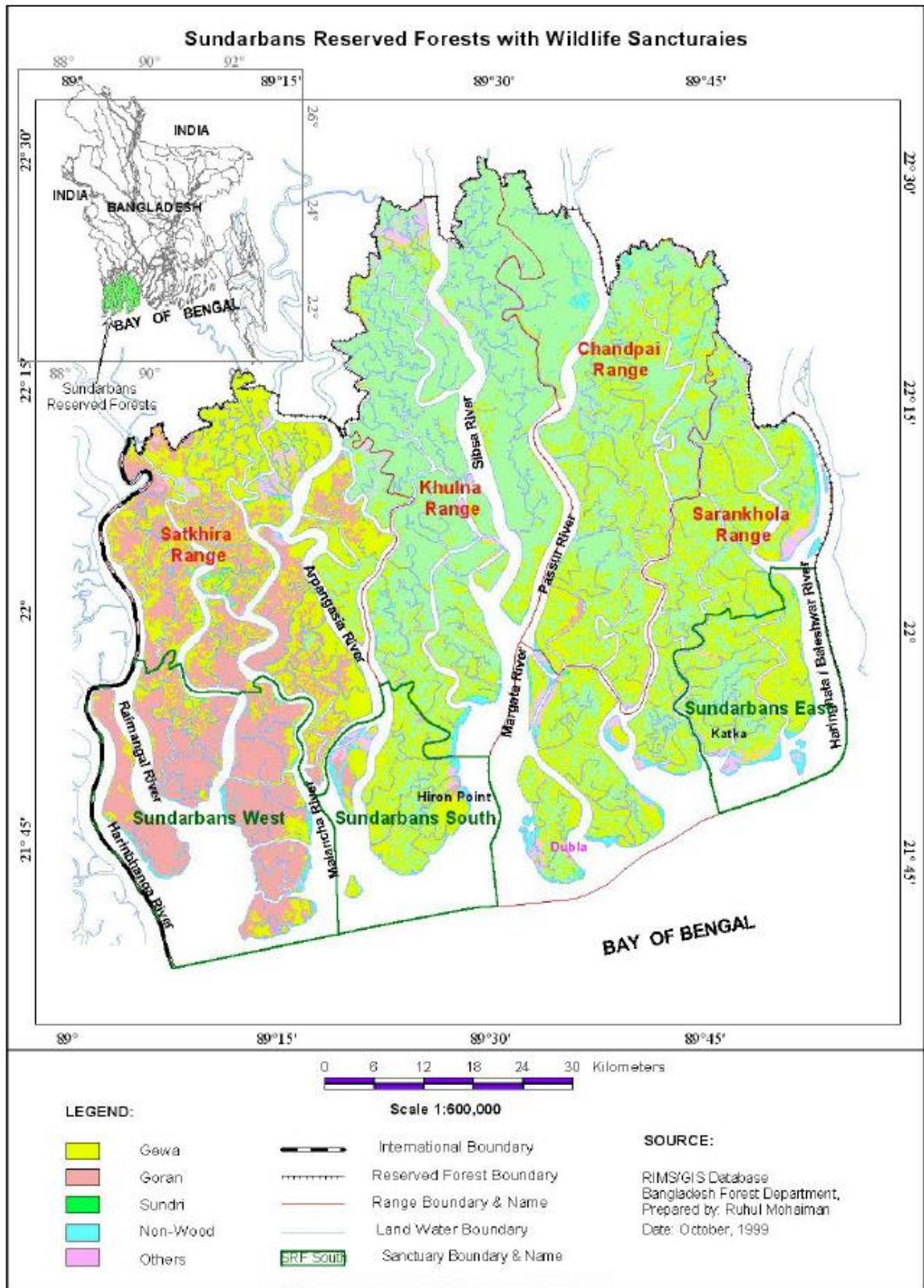


Figure 2. Location of the three components of the property (the Sundarbans West Wildlife Sanctuary, Sundarbans South Wildlife Sanctuary and Sundarbans East Wildlife Sanctuary) and their boundaries, in relation to the greater SRF boundary (source: Ramsar).

2. NATIONAL POLICY FOR THE PRESERVATION AND MANAGEMENT OF THE WORLD HERITAGE PROPERTY

2.1 Protected area legislation

The three wildlife sanctuaries that make up the property were established in 1977 under the Bangladesh Wildlife Preservation Order 1973 amended by Bangladesh Wildlife (Preservation) Amendment Act 1974, having first been gazetted as forest reserves in 1878. In 1999, a 10 km boundary around the periphery of the SRF was declared an Ecologically Critical Area (ECA) under section 5 of the Conservation Act 1995.

The Bangladesh Constitution was amended in 2011 to include a constitutional directive to the State to protect the environment and natural resources. Additional laws and regulations relevant to the management of the property include:

- *The Wildlife (Conservation and Security) Act 2012*
- *Forest Act 1927*
- *The Bangladesh Environment Conservation Act 1995*
- *The Bangladesh Environment Conservation (Amendment) Act 2010*
- *The Environment Conservation Rules 1997*
- *Protection and Conservation of Fish Rules 1985*
- *Marine Fisheries Rules 1983*
- *Marine Environment Conservation Act 2004*
- *Ports Act 1908*
- *Mongla Port Authority Ordinance 1976*

2.2 Institutional framework and management structure

The Ministry of Environment and Forests (MoEF) is comprised of two departments: the Bangladesh Forest Department (BFD), and the Department of Environment (DoE). The responsibility for the management of forested areas in Bangladesh lies with the BFD and it is this department that is responsible for the field-level presence within the SRF and the property to patrol and monitor the site. The DoE was established under the Bangladesh Environment Conservation Act 1995 to implement the Act, and its mandate includes approval of EIAs and mitigation of environmental degradation and pollution.

The property is managed by the BFD through the Chief Conservator of Forests, Conservator of Forests Khulna Circle and staff, who report to the BFD. The Conservator of Forests, Khulna Circle appears to hold primary responsibility for implementation of the Management Plan for the property, along with other key responsibilities for the day-to-day management including tourism and staff management through the Sundarbans East and West Forest Divisions, the stations and field camps.

The Mongla Port Authority is responsible for the maintenance of the navigational routes, which includes the Pashur River and any other adjacent navigational routes. Any dredging of the Pashur River is additionally managed by the Mongla Port Authority, which also assists with and provides input to the development of contingency plans for any accidents involving vessels on the Pashur River.

There is currently no integrated management system in place that comprehensively addresses all threats to the property.

2.3 Other International designations and programmes

The SRF, covering an area of 601,700 ha, was designated a Ramsar site in 1992. On 29 January 2012, three marine dolphin sanctuaries were established under the 1973 Wildlife (Preservation) Order 1973, Article 23(3) and as amended by the Wildlife Preservation Amendment Act 1974 in the eastern SRF (Dhangmari, Chandpai and Dudhmukhi) covering 31.4 km of channels, in order to protect two freshwater dolphin species, the Irrawaddy and Ganges River dolphins.

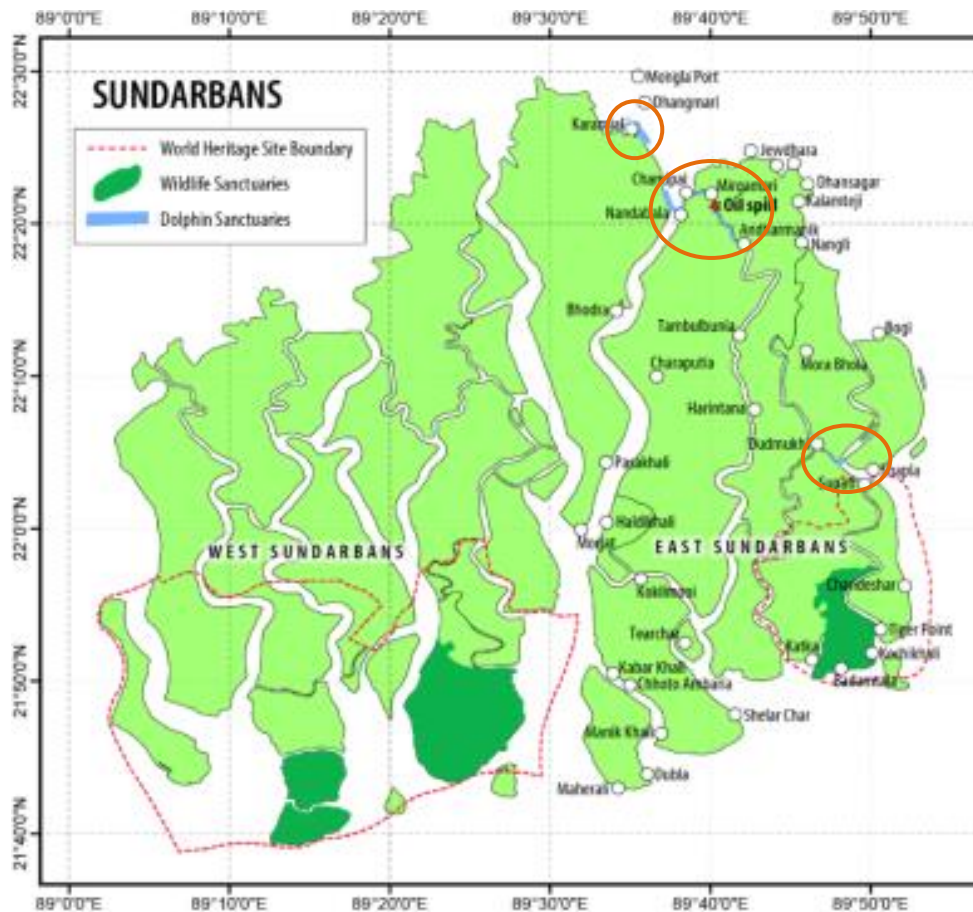


Figure 3. Location of the three dolphin sanctuaries, circled in orange (source: BFD, MoEF).

In October 2014, Bangladesh established its first marine protected area – *the Swatch of No Ground Marine Protected Area* – located in the Bay of Bengal and 45 km off the coast of the SRF and the southern boundary of the property, primarily for the protection of cetaceans (Figure 1). The area, which includes the deep Swatch-of-No-Ground submarine canyon and its adjacent coastal waters, is an important breeding and spawning ground for several key cetaceans and fish, as well as other marine species, including a number of species for which the property was inscribed.

3. IDENTIFICATION AND ASSESSMENT OF ISSUES/THREATS

3.1 Inadequate water flows affecting the integrity of the property

The Sundarbans ecosystem is dependent on adequate freshwater flow from the Ganges basin and Brahmaputra and Meghna Rivers. Increased water extraction for agricultural irrigation and industrial activity since the 19th century, and in particular the diversion of Ganges water following the construction of the Farakka Barrage (India, roughly 15 km upstream of the Bangladesh border) in 1975, has resulted in drastically reduced freshwater flows into the Sundarbans ecosystem. Freshwater flow reductions are particularly critical in the dry season. As a result, siltation and salinity have increased substantially in the waterways of the Sundarbans and are threatening the overall balance of the ecosystem and its functioning^{1,2}.

Silt deposition causes a rise in the forest floor and when combined with the effect from irregular tidal water flow, mangrove regeneration can be reduced or inhibited³. Increased salinity is considered a major threat because it negatively affects the soil, water, vegetation and wildlife and reduces the growth and regeneration of the mangrove ecosystem. Biodiversity is higher in the low salinity areas of the SRF and increased salinity is expected to result in changes to the composition, dominance and number of species in those previously less saline areas. Research conducted in 2009 indicates that due to increased salinity, salt tolerant mangrove species are expanding and gradually displacing other species. Increased salinity simultaneously stimulates an increase in barren areas. It is estimated that several mangrove species are likely to disappear in the next few decades due to this process thereby changing the structural and functional characteristics that make up the property's OUV⁴. Scientific research comparing vegetation changes in the eastern and western part of the Sundarbans in Bangladesh between 1985 and 1995 confirms a general reduction of commercially valuable species such as Sundri (*Heritiera fomes*) and Gewa (*Excoecaria agallocha*) and an increase in less valued smaller tree species⁵. Further research conducted in 2011, illustrates that the central longitudinal belt of the forest is now rapidly turning into a high salinity zone and changes already observed in the western region are alarming. Scientists consider the top-dying disease affecting *Heritiera fomes* – the most common mangrove tree species in the Sundarbans ecosystem – as the most serious of all diseases and disorders of tree species in Bangladesh and this disease has been detected within the boundaries of the property⁶. Although the exact cause of the disease is still unknown, research has shown that heavy metals may be a contributing factor^{7,8}.

¹ Islam S.N. and Gnauck G. (2009). Threats to the Sundarbans Mangrove Wetland Ecosystems from Transboundary Water Allocation in the Ganges Basin : A Preliminary Problem Analysis. International Journal of Ecological Economics and Statistics. Threats. 299, vol. 13, pp. 64-78.

² Islam S.N. and Gnauck G. (2011). Water salinity investigation in the Sundarbans Rivers in Bangladesh. Int. J. Water, vol. 6. Nos 1/2, pp. 74-91.

³ De Lacerda L. D. (ed.) (2002). Mangrove Ecosystems. Springer. 298 p.

⁴ Islam and Gnauck. (2009). Threats to the Sundarbans Mangrove Wetland Ecosystems from Transboundary Water Allocation in the Ganges Basin: A Preliminary Problem Analysis. International Journal of Ecological Economics and Statistics. Threats. 299, vol. 13, pp. 64-78.

⁵ Mirza M. Q. The Ganges Water Diversion : Environmental Effects and Implications. Springer. 2004

⁶ Islam S.N. and Gnauck G. (2011). Water salinity investigation in the Sundarbans Rivers in Bangladesh. Int. J. Water, vol. 6. Nos 1/2, pp. 74-91.

⁷ Awal, M. A. (2014) Invention on correlation between the chemical composition of the surface sediment and water in the mangrove forest of the Sundarbans, Bangladesh, and the regeneration, growth and dieback of the forest trees and people health. Science Innovation, 2(2), 11-21.

The governments of Bangladesh and India have signed a Treaty in 1996 for sharing the Ganges waters at Farakka from January to May annually for a period of 30 years. Measures are being taken with neighbouring countries to increase influx of freshwater in the property and surrounding area.

Experts who accompanied the mission during the visit to the property confirmed however that reduced freshwater flows into the SRF are of significant concern. While water sharing issues with neighbouring countries are not new and multilateral cooperation is ongoing, current efforts to maintain adequate freshwater flows are deemed largely insufficient to address the issue. Experts further highlighted that due to the southern location of the property the influence of seawater from the Bay of Bengal exacerbates the situation. Considering the present situation, better integrated, long-term, basin-wide cooperation across and between the different countries involved leading to concerted decisions and practical actions is urgently needed. It was also clear that comprehensive data on water quality is lacking and more systematic research is required to document the changes occurring in the ecosystem across both the SRF and the property.

The mission concluded that without adequate freshwater influx from the Ganges basin, especially in the dry season, the OUV of the property cannot be adequately protected and maintained in the long term. A more robust water allocation policy is therefore of crucial and strategic importance to safeguard the future of this fragile ecosystem.

Recommendation R1

Considering the impact to the OUV of the property, the structural changes to the ecosystem and its functioning, resulting from higher salinity, in particular in the southern areas of the SRF where the World Heritage property is located, and the continued lack of sufficient provision to secure adequate water flows into the area, it is recommended that, as a matter of utmost urgency, and without delay:

- a) The Ganges water sharing Treaty between India and Bangladesh is fully implemented in a coordinated effort by the States Parties of Bangladesh and India to ensure adequate freshwater inflow;*
- b) A comprehensive, multilateral and integrated freshwater inflow management plan is designed and implemented, accompanied by the necessary monitoring to measure salinity and water quality, including groundwater, throughout the property. Future planning and management decisions should be informed by these monitoring results.*

Additional recommendations to address increased salinity and ensure hydrological connectivity of the rivers involved are also provided in the 2014 IUCN report that resulted from consultations between Bangladesh and India in the context of the International Symposium on River Biodiversity⁹.

3.2 Coastal development

3.2.1 The 1320 MW Maitree Super Thermal Power Plant (Rampal Power Plant)

In 2013, the government of Bangladesh approved the construction of a 1320 megawatt coal-fired power station, the Maitree Super Thermal Power Plant (Rampal power plant), at Rampal Upazila

⁸ Awal, M. A. (2014) Relationship between elemental concentrations and top-dying disease in mangrove forest trees in the Sundarbans in Bangladesh. *Science Innovation*, 2(4), 41-53.

⁹ Sinha, R.K. and Ahmed, B. (eds.) (2014) *Rivers for Life – Proceedings for the International Symposium on River Biodiversity: Ganges-Brahmaputra-Meghna River System, Ecosystems for Life, A Bangladesh- India Initiative*, IUCN, International Union for Conservation of Nature, 340 pp.

of Bagerhat District in Khulna, Bangladesh. According to information of the Government of Bangladesh, the power station will be constructed, owned and operated by the Bangladesh India Friendship Power Company Ltd (BIFPCL). It is promoted by Bangladesh Power Development Board (BPDB) and India's state owned National Thermal Power Corporation (NTCP).

At the time of the mission's visit, preparations of the site were well underway.

The plant is predicted to be the largest in the country and aims to significantly contribute to the Bangladesh government's 2020 goal of providing electricity to all. The mission was informed that alternatives to coal were considered, but that the environmental and economic conditions of Bangladesh were considered unsuitable for renewable energy (e.g. high cloud cover, very low wind speeds, unviable economic return). However, a recent report published by the Institute for Energy Economics and Financial Analysis, reports that the BPDB has set a 2021 wind energy target of 1.3 gigawatts and is now in the process of scoping wind capacity and installing wind monitoring stations to assess its potential as an energy source¹⁰.

The Rampal power plant is being built approximately 14 km from the boundary of the SRF, 4 km from the boundary of the ECA and about 65 km from the closest boundary of the property. A 2012 report from the National Committee to Protect Oil, Gas, Mineral Resources, Power and Ports concluded that the location for the power plant had not been subject to an environmental assessment and was chosen contrary to the advice of experts. A 2015 Rampal fact-finding mission by the group South Asians for Human Rights¹¹ concluded that land acquisitions for the power plant commenced two years before the EIA was approved..

The 2013 EIA for the Rampal power plant, completed by the Center for Environmental and Geographical Information Services (CEGIS), a body residing under the Bangladesh Ministry of Water Resources, was approved by the Bangladesh DoE, and sets 59 specific conditions to be fulfilled by the project for the construction and operation of the power plant¹². These conditions were submitted to BIFPCL, the project proponent. At the time of the mission, authorities considered all conditions relevant to the current stage of construction were being met. The mission concludes that the EIA was conducted with limited stakeholder consultation, uses a process that is inconsistent with globally accepted EIA practices, does not address effects of the plant on the OUV of the property and does not seem to reflect key concerns raised by national and international experts and scientists.

The mission had access to the publically available terms of reference for the tender and the EIA document, but was not provided with any information stipulating the details of what will be constructed by Bharat Heavy Electricals Limited (BHEL), the Indian company reportedly scheduled to undertake the construction work for the power plant. The EIA might therefore be conceptual and not necessarily include the full detail of the actual construction package and mitigation measures that will be put in place.

Based on the information provided, the mission identifies four core concerns related to the Rampal power plant that could seriously affect the World Heritage property and its OUV. The mission considers that none of these concerns are adequately addressed by the current EIA.

¹⁰ IEEFA (2016) Risky and over-subsidised: A financial analysis of the Rampal Power Plant.

¹¹ South Asians for Human Rights (2015). Report of the fact finding mission to Rampal, Bangladesh.

¹² <http://bifpcl.com/new/wp-content/uploads/2014/06/Approval-of-EIA.pdf>

a) Air pollution:

Burning coal emits large quantities of air pollutants, including sulphur dioxide (SO₂), carbon dioxide (CO₂), nitrous oxides (NO_x), and mercury. Sulphur dioxide and nitrous oxides can mix with rain to form acid rain. The effect of acid rain is particularly noticeable in aquatic environments, causing acidification of waterways and leaching aluminium from the soil, thereby harming or killing fauna and flora. It is estimated that the power plant will generate over one million tonnes of coal ash per year and this ash has a high risk of containing various toxic metals including arsenic, lead, mercury, nickel, vanadium, beryllium, barium, cadmium, chromium, selenium and radium, all of which may cause serious damage to humans and the environment. Mercury is a potent neurotoxin that reduces intelligence and otherwise impairs the brain development of infants and children, and has been linked to heart problems. After leaving the smokestack, the mercury falls to earth and accumulates in water bodies and subsequently in the tissues of fish and of people and wildlife that consume those fish.

International practice as well as expert opinion provided to the mission emphasised that mercury contamination is of particular concern and current projected control mechanisms and technology are insufficient to prevent contamination and are not consistent with international practice and standards. While the EIA highlighted the toxicity of mercury emission from coal burning, it falls short of requesting adequate mercury-specific control mechanisms and technology needed to minimise risks.

The mission was informed that the height of the plant's smoke stack is expected to limit impacts from emissions. The height of the Rampal power plant smokestack is planned to be 275 metres (900 feet). Tall smokestacks – stacks of 150 metres (500 feet) or higher, primarily used at coal-fired power plants – release air pollutants such as SO₂ and NO_x high into the atmosphere to help limit the effects of these emissions on local air quality. While a tall stack can reduce pollution concentrations locally, they do not actually reduce total emissions. Tall stacks increase the distance pollutants that contribute to acid rain and ozone pollution and particulate matter, travel in the atmosphere and harm air quality and the environment in downwind areas. Tall stacks generally disperse pollutants over greater distances than shorter stacks and provide pollutants greater time to react in the atmosphere.

During the January-March period, prevailing winds in Bangladesh flow from the north or northwest. Based on conclusions with respect to air pollution from coal-fired power plant discharges in other countries, it is expected that the aforementioned pollutants could easily reach the property – located 65 km from the plant – with negative impacts on its OUV. The EIA also indicates that the project site is located in the country's "wind risk zone" which is prone to cyclones and storm surges, thereby exacerbating the risks for air and water pollution to the property.¹³

None of these potential issues or likely effects have been considered adequately in the EIA. There are also no mechanisms in place to provide for independent monitoring of air pollution, despite public reporting of the current monitoring results, nor does the EIA specify any consequences if the power plant fails to comply with maximum emissions and there appears to be no contingency plan or strategy in place in case of an emergency or accident.

¹³ CEGIS (2013) Final report on Environmental Impact Assessment of 2 x (500-660) MW coal based thermal power plant to be constructed at the location of Khulna, page 190.

b) Water pollution

The power plant is expected to discharge over 5,000 cubic metres per hour of cooling wastewater into the Pashur River. This volume does not include wastewater discharges from associated infrastructure surrounding the power plant or spills from the proposed cooling ponds or other ash storage facilities. It is well documented that coal-fired power plants cause significant impacts on water quality and quantity.¹⁴ It is commonly accepted that discharged water from coal-based power plants contains pollutants. There have been numerous studies focusing on optimising water usage within a given plant through internal recycling and reuse of effluent within certain plant areas. Many power plants now use wastewater for scrubbing and dust suppression applications, thereby significantly cutting their dependence on freshwater.¹⁵ This practice alone has nearly halved the water consumption of such plants from 5 litres per unit of power produced to less than 3 litres.¹⁶ This option does not seem to have been considered by the EIA despite its close vicinity to a natural World Heritage property.

The mission was informed that all ash waste will be collected in cooling ponds and ash will subsequently be re-used as a component of concrete for construction. The EIA suggests it will be collected in ash storage silos. Keeping the ash contained is crucially important to prevent contamination of waterways with heavy metals or other pollutants. The mechanisms proposed to collect and contain the ash and prevent any contact with water are poor and seem highly theoretical. In addition, the size, extent and method for construction of the ash storage facilities remains unclear with numerous contradictions between the details contained in the EIA, discussions during the mission and the tender documents released for construction.

In recognition of the high environmental risks associated with coal-fired power plants and in particular the resulting coal ash, in 2015, the United States Environmental Protection Agency (EPA) promulgated national regulations that provide a comprehensive set of requirements for the safe disposal of coal ash from coal-fired power plants. The EPA coal ash regulations address the risks from coal ash disposal – leaking of contaminants into groundwater, blowing of contaminants into the air as dust, and catastrophic failure of coal ash surface impoundments¹⁷. The 2015 EPA regulation, which was put in place following several disastrous leakages from ash ponds in the United States, essentially prevents ash ponds from being built in sensitive areas such as wetlands¹⁸. The EPA regulation also prohibits the construction of coal ash impoundments on unstable land, e.g. reclaimed or filled land. The mission considers that the United States EPA regulation provides a useful reference for the identification of measures that should be implemented to avoid and reduce risks associated with the production and management of coal ash waste at the Rampal power plant. While the EIA suggests elevating the plant by 5 metres, it remains unclear how core risks, in particular regarding the ash waste, will be avoided.

¹⁴ Union of Concerned Scientists. http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-coal.html#.V6LvJWVBu7Y

¹⁵ Kachru, D. (undated). Cooling tower blowdown treatment and reuse in a coal fired power plant in India – reducing the water footprint in coal fired power plants. Available at: <http://pennwell.sds06.websds.net//2013/bangkok/pga/papers/T5S5O1-paper.pdf>

¹⁶ Power Engineering International (2012).

<http://www.powerengineeringint.com/articles/print/volume-20/issue-5/features/rethinking-coal-fired-power-plants-water-reuse.html>

¹⁷ <https://www.gpo.gov/fdsys/pkg/FR-2015-04-17/pdf/2015-00257.pdf>

¹⁸ <https://www.gpo.gov/fdsys/pkg/FR-2015-04-17/pdf/2015-00257.pdf>

The power plant is built on a land reclamation area that has been constructed from dredge spoil and is located in a tidal delta that is vulnerable to flooding and situated in the country's "wind risk zone." The area witnessed 16 cyclones in 25 years.¹⁹ Contaminated water would be released into the main waterway that is intricately connected to the SRF and property through the myriad of rivers and tidal flats that contribute to its OUV. Any flooding, spills or leakages from the waste ash ponds are a major risk factor and could cause serious and long-term harm to the OUV of the property.

c) Cumulative impact of industrial and related infrastructure and development

The Rampal power plant is expected to extract water from the Pashur River for its operation. This does not include any water extraction needed for associated infrastructure and the expected neighbouring developments. The temporary settlement of power plant workers during construction and operation phases will also contribute towards the air and water pollution through solid and liquid waste. The mission was informed that housing, schools, hospitals, and a sports facility with swimming pool are to be built as part of the power plant and the mission team saw evidence of property sales for development adjacent to the power plant site.

The mission was further informed that an expansion of the power plant is expected in a second phase, to increase capacity once the first phase is operational. Combined with the already drastic reductions of freshwater inflow to the Sundarbans and the degradation of the ecosystem that is already apparent as a result thereof, any further extraction of freshwater should be avoided.

d) Increased shipping, ship pollution and dredging

The Rampal power plant is expected to operate with imported coal. Both coal and other materials needed for the construction and operation of the power plant will be shipped through the SRF, mainly through the Pashur River, which borders the property. The anchorage and transshipping area, Akram Point, where coal will be loaded onto smaller ships, is in the immediate vicinity of the property.

To ensure navigation from the transshipping point to the power plant can take place, approximately 35 km along the northern stretch of the Pashur River will need to be dredged. An estimated 32.1 million cubic metres of dredged material will subsequently need to be disposed of in the vicinity of the SRF and the property. Maintenance dredging will be required annually. The location for disposal of the dredged material remains unclear and initial indications from discussions during the mission and the relevant EIA²⁰ indicated this would be within the recently gazetted Marine Protected Area – the Swatch of No Ground – that is an important spawning and feeding ground for cetacean biodiversity near the property. Recalling the justification for the inscription of the property on the World Heritage List included the presence of the endangered Ganges and Irrawaddy dolphin, and noting the contiguity of the aquatic ecosystem, any impact on the cetacean population outside of the property boundaries will affect the OUV of the property.

In addition, the associated increase in ship traffic is of considerable concern given the previous shipping accidents recorded in the past few years including coal and oil spills (see section 3.3.1). During the visit the mission was informed of progress being made to develop a national oil spillage contingency plan and the strengthening of the compensation scheme, but further efforts

¹⁹ CEGIS (2013) Final report on Environmental Impact Assessment of 2 x (500-660) MW coal based thermal power plant to be constructed at the location of Khulna, page 190.

²⁰ Institute of Water Modelling (2015) Environmental Impact Assessment (EIA) of the proposed dredging project at the Outer Bar area of Pussur Channel.

are still required to ensure that a comprehensive contingency or reaction plan is in place in case of accidents or emergencies. The mission considers that the increase in shipping activity and required dredging for initial development as well as ongoing maintenance, immediately adjacent to the property, poses an immediate threat to its ecological values and OUV including its conditions of integrity.

Recommendation R2

In relation to the Rampal power plant, considering the high likelihood for: (i) contamination of the property and the surrounding Sundarbans forest from air and water pollution arising from both its location, in a wind risk zone, and its anticipated methods to minimise impacts; (ii) the substantial increase in shipping and dredging required in the immediate vicinity of the property for the plant's construction and operation; (iii) the additional removal of freshwater from an already increasingly saline environment that is starting to alter the functioning of the ecosystem; (iv) an EIA that does not address the effects on the OUV of the property nor provide convincing evidence that effects on the Sundarbans will be mitigated; and (v) the intrinsic connectivity between the property and the Sundarbans forest, it is recommended that the Rampal power plant project is cancelled and relocated to a more suitable location, where it would not impact negatively on the Sundarbans Reserved Forest and the property.

3.2.2 Other Power Plant developments

Inconsistencies exist with information regarding the current status of a second coal-fired power plant, the Orion power plant, scheduled for construction at a location near to the Rampal power plant (Figure 4). This is also the case with regards to the supposed construction of a proposed nuclear power plant²¹.

The mission received information from government officials that a decision to cancel the Orion power plant was taken in early 2016. However, in contrast to this, the Orion Group website²² states that Orion Power Khulna Ltd has already started implementation of the project at the site. The website's latest update states that an Environmental and Social Impact Assessment (ESIA) was submitted to the DoE, and clearance was expected by December 2014. The plant's website does not mention any plans to cancel construction of the plant. Furthermore, the mission was informed by a local stakeholder that the project received a recent allocation of funding that would allow the project to proceed.

The unclear status of these and other development projects is of high concern considering the equally important potential impacts on the OUV of the property as those to the Rampal power plant. The ambiguous status of these developments, the Orion Power Plant and the supposedly envisioned nuclear power plant, should be resolved as a matter of urgency. EIAs for developments in the vicinity of the Sundarbans should be provided for review by the World Heritage Centre and IUCN, prior to any decision that could be difficult to reverse, in accordance with Paragraph 172 of the *Operational Guidelines* and in line with IUCN's World Heritage Advice Note on Environmental Assessment²³..

²¹ <http://pressinform.porta.gov.bd/sites/default/files/files/pressinform.portal.gov.bd/allnotes/a>

f5cbb64_a129_4c73_be8d_0efc77e64701/News%20brief.pdf

²² <http://www.orion-group.net/concern/27/61/orion-power-khulna-ltd>.

²³

https://cmsdata.iucn.org/downloads/iucn_advice_note_environmental_assessment_18_11_13_iucn_template.pdf

Recommendation R3

The mission recommends that the State Party halts all development of the site of the Orion Power Plant in Khulna, and any similar proposed development, until an independent, comprehensive and scientifically sound EIA has been conducted and provided to the World Heritage Centre and IUCN for their review and evaluation. If impacts on the OUV of the property or its immediate surroundings cannot be properly addressed, it is recommended that the projects be cancelled and relocated to more suitable locations.



Figure 4. Locations of the Rampal and Orion Power Plants in relation to each other and the Sundarbans Reserved Forest (source: Google Earth).

3.2.3 The Mongla Port Development

Mongla is the main seaport in the Bagerhat District of south-western Bangladesh. The port is located at the confluence of the Pashur River and Mongla Nulla. The port currently handles vessels of up to 225 metres in length according to the Mongla Port Authority website and from discussions with the Port Authority there is a clear plan to substantially increase the number of vessels using the port as part of the economic growth objectives of Bangladesh.

The planned construction of Padma Bridge by 2018 to the northeast of the SRF is also likely to significantly increase the activities at Mongla Port. Port automation is already underway and is expected to accelerate the billing system, customs and bank formalities for the users thereby encouraging use of the port. The mission notes that this automated system may have the potential to benefit the protection of the SRF and the property, by improving the monitoring and management of shipping traffic through the port. On the other hand, increased ship capacity and associated infrastructure at Mongla Port has direct impacts on the SRF and property as ship traffic increases and dredging is required to facilitate the larger vessels anticipated that would use the waterways alongside the property. Both dredging and shipping occur immediately adjacent to the property.

The mission team noted the conflicting messages with regards to plans for port expansion and associated impacts including anticipated increases in shipping traffic and dredging, as well as the EIA requirements to undertake these activities.

Recommendation R4

Considering the potential threats to the property from increased shipping and required dredging the planned expansion and increase in use of the Mongla Port requires urgent clarification. It is recommended that the State Party halt all expansion activities until an independent, comprehensive and scientifically sound EIA has been conducted and provided to the World Heritage Centre and IUCN for their review and evaluation.

3.3 Shipping and Dredging

3.3.1 Effects of the 2014 oil spill and other shipping accidents

Several shipping accidents have occurred in the areas and waterways within the SRF in rapid succession in recent times. In December 2014, an oil tanker capsized in Chandpai Wildlife Sanctuary on the Shela River, spilling and spreading 350 m³ of fuel oil across at least 40 km of the waterway. Five months later in May 2015, a cargo vessel capsized, leaking 200 tonnes of potash fertilizer into the Bhola River. Subsequently in October 2015, a barge transporting 570 tonnes of coal capsized in the Pashur River. In March 2016, a cargo vessel transporting 1,245 tonnes of coal sank in the Shela River. The mission visited the locations of the fertiliser accident and the most recent oil spill site.

Following the March 2016 incident, the authorities announced the closure of the Shela River for all navigation in March 2016. Contrasting information received by the mission poses uncertainty about both the duration and the compliance of the closure. First, the Shela River has been closed before but reopened in April 2011 due to the heavy siltation along the alternative Mongla-Ghoshiakhali route, which rendered its closure. This issue persists to date and results in pressure to reopen the Shela River. The mission did encounter ships in the Shela River at the time of the mission despite confirmation that it was already closed to ship traffic at that time. In the aftermath of the mission, local sources indicated that, in a given week, over 20 ships travelled through the Shela River and ships are often seen using this route at night, further increasing the likelihood of accidents. Second, it is suggested that the closure might not be applicable to all vessels, and may exclude vessels that operate under existing international agreements.

The impacts from the accidents seem to have remained restricted to the immediate areas surrounding the incidents. But third parties consulted by the mission have indicated that long-term impacts of the oil and coal spills on the Sundarbans ecosystem cannot be excluded. Considering the ecosystem's tidal system and close linkages of the property with the surrounding area, any impacts from spills of oil or other dangerous cargo may have significant implications for the maintenance of the OUV of the property. Considering the Shela River's proximity to the property and its vulnerability to accidents, it is highly recommended its closure be permanent and strictly enforced for all vessels, and alternative routes with less likelihood for damage to the Sundarbans ecosystem are used for navigation.

Given the expected increases in traffic as a result of the various industrial activities already underway in and surrounding the SRF and the property, the probability of a greater number of ship accidents is apparent. Ship movements are scheduled to intensify in rivers immediately adjacent to the property in part due to increasing capacity at Mongla Port and related industrial activity. Although improvements have been made to contingency responses with the aid of the United Nations Development Programme (UNDP) following the oil spill accident in December

2014, the full implementation of the UNDP recommendations²⁴ and the introduction of an emergency response facility have not been completed. In the absence of a stringent action plan and the necessary resources to respond to any emergency, increased shipping and the associated risks are of serious concern.

The mission was also alerted to the increasing evidence that intensification of noise from more frequent ship movements affects the wildlife in the property and SRF including the Bengal tiger, deer and dolphins. Speed limits for all vessels travelling along the Pashur River and other rivers within or adjacent to the property should be put in place to minimise accidents and reduce the risk of collisions and noise pollution to wildlife in and surrounding the property. Access control measures should be considered to prevent vessel movements at night and in poor weather conditions.

Recommendation R5

Enforce the permanent closure of the Shela River to all vessel traffic, national and international, and apply speed limits and effective control measures for night and poor weather conditions for vessels navigating along the Pashur River.

Recommendation R6

Develop an effective action plan and emergency response facility in consultation with all relevant stakeholders to react to any future shipping incidents in a timely and coordinated manner, and consistent with the recommendations made in the United Nations Development Programme (UNDP) oil spill assessment report.

3.3.2 Dredging of the Pashur River

In its Decision **39 COM 7B.8** the World Heritage Committee noted that the EIA for the dredging of the Pashur River, adjacent to the property, did not include an assessment of the potential impacts on the property's OUV and requested the State Party to submit to the WHC an assessment of potential impacts on OUV. Despite repeated requests for activities not to be conducted before the revised EIA was submitted and reviewed by IUCN, maintenance dredging in the area adjacent to the World Heritage property was underway and observed by the mission during the visit to the site.

The Ganges River has one of the highest sedimentation rates globally, and is reportedly the third fastest flowing river in the world. As a result there is frequent need for dredging of the Pashur River as one of the main shipping routes in Bangladesh. The Pashur River is immediately adjacent to the property. It is anticipated that approximately 3.8 million m³ will be dredged by 2020 as part of the government's efforts to better connect the hinterland with Mongla Port. An additional stretch of 36 km in the northern part of the Pashur River is scheduled to be dredged as part of the proposed Rampal power plant development and to facilitate the planned expansion and development of the Mongla Port. Following the initial capital dredging annual maintenance dredging will be needed. None of the information provided to the mission addressed the issue of dumping of dredged material although several sources, including the EIA of the proposed dredging along the Pashur channel, indicated dredge spoil was to be dumped within the ecologically sensitive area represented by the Swatch of No Ground, which was recently gazetted as a Marine Protected Area.

²⁴ http://www.bd.undp.org/content/bangladesh/en/home/library/environment_energy/sunderbans-oil-spill-assessment.html

It is of critical importance that impacts of the proposed dredging on the OUV of the property are assessed prior to implementation of activities. Possible implications of increased sedimentation on aquatic species, the combined effects from capital dredging and continued maintenance dredging proposed in support of the Mongla Port expansion and other activities, as well as the dumping of dredged material all need clarification with regard to their impacts on the OUV of the property. The assessment of possible impacts on the OUV of the property from the dredging currently taking place in areas immediately adjacent to the boundaries of the property should be completed taking into account the most recent scientific information.

Recommendation R7

Develop, finalise and submit for review by the World Heritage Centre and IUCN, a detailed assessment of potential impacts of current and planned dredging and associated activities on the OUV and integrity of the property.

3.4 Resource extraction and illegal wildlife trade

It is estimated that about 6.5 million people depend on the wider Sundarbans ecosystem for their livelihoods, either directly or indirectly. The Sundarbans mangrove forest is exploited for a range of forest products, including timber, thatching materials, honey, wax, medicinal plants and fuel. More than one million people are involved in various types of resource collection from the Sundarbans, a large majority of whom are fishermen and women²⁵. Estimates suggest that about 600,000 people are directly employed in the SRF for about six months per year.

The property itself is not permanently inhabited and extraction of resources is prohibited within the property boundaries. It is difficult however to confirm whether this regulation is fully respected but the mission did not encounter any of these activities within the boundaries of the property during its visit. The mission did view local communities undertaking fishing activities and collection of other resources in the immediate vicinity of the property. Considering the property's high level of interconnectivity with the wider SRF and ecosystem, resource extraction in other parts of the SRF can affect the OUV of the property over time.

Discussions held during the mission, as well as previous reports received by WHC and IUCN, highlight concerns about illegal wildlife trade, in particular regarding the population of the Royal Bengal Tiger within the property and the wider Sundarbans. Experts consulted during the mission expressed concern about an increase in the number of seizures involving this endangered species and also highlighted the discrepancy between earlier and current population estimates, once again highlighting the need for an assessment of the ecological status of the property and the need for regular monitoring. While these discrepancies and the recognised difference in survey methods make it difficult to confirm whether the population is declining or not, various experts indicated, during discussions after the mission, that there was a growing level of poaching, increasing cause for concern for the tiger population and regular encounters between field staff and poachers. Poaching of tigers as well as their prey species has been identified by NGOs and project staff working in the area as a high priority threat to the tiger population in the

²⁵ Bangladesh Forest Department (2010) Integrated Resources Management Plans for the Sundarbans 2010-2020. Forest Department, Ministry of Environment and Forests.

Sundarbans, ranking it as widespread in its scope, affecting tigers across all or most of the Sundarbans population²⁶.

Recent activities undertaken to strengthen the response to poaching of tigers and the illegal wildlife trade include increased inspections and adoption of the Spatial Monitoring and Reporting Tool (SMART) for patrolling. Rangers conduct monitoring patrols throughout the Sundarbans in an effort to ensure that there is no poaching. Experts consulted both on this mission and after the visit have repeatedly stressed the need for increased enforcement, resources and capacity to maintain the Royal Bengal Tiger population that is a core component of the property's OUV.

Recommendation R8

Enhance and strengthen human and financial resources, capacity and inter-agency cooperation, including between local and national authorities, and law enforcement to adequately address wildlife trade, transportation, and sale, including actions and budget to facilitate increased staffing, patrolling and engagement with local communities to garner their support for the continued protection of the property and its OUV against poaching.

3.5 The effects of climate change

Despite the relatively low levels of carbon emissions from Bangladesh, its vulnerability to climate change is very high. A sea rise of 1–2 metre would inundate a substantial area of the country, including the Sundarbans, thereby adversely affecting coastal ecosystems and a large part of the coastal population. It is widely acknowledged that conservation of the Sundarbans by protecting its comprising forests (green carbon sink) and wetlands (blue carbon sink) will help ameliorate climate change impacts as both mangroves and wetlands act as carbon sinks by sequestering CO₂ from the atmosphere.

Possible impacts on the property as a result of climate change include not only an increase in the frequency and severity of storms and inundation resulting from sea level rise but also shifts in forests and wetland boundaries, changes in species assemblages or types in forests and wetlands, changes in net productivity, forest die back and loss of biodiversity.

During its visit, the mission observed destruction of the property in its southern parts (bordering the Bay of Bengal) resulting from the most recent cyclone in 2007. The effects of climate change on the property are expected to increase and require effective monitoring. Climate change is a global problem requiring a global solution consistent with measures outlined in the 2015 COP21 Climate Agreement. At the scale of the property, it is recommended that other pressures on the ecosystem (freshwater inflow, effects from coastal developments, shipping and dredging, etc.) are reduced to the minimal in view of maximising the resilience of the property in the face of climate change.

Capacity should be developed within management staff to understand and plan for climate change impacts. This is particularly important given the high number of people dependant on the wider Sundarbans ecosystem.

²⁶ Aziz, A., Barlow, A. C. D., Greenwood, C. C., and Islam, A. (2013) Prioritizing threats to improve conservation strategy for the tiger *Panthera tigris* in the Sundarbans Reserve Forest of Bangladesh. *Oryx*, 47 (4) 510-518.

Recommendation R9

Taking into account that climate change is a global problem requiring a concerted global solution at the level of the property, it is strongly recommended that the State Party reduce other threats in the property and its surrounding area to secure maximum resilience of the property in the face of climate change impacts. Ecological monitoring for the property should include indicators that measure climate change impacts in view of identifying both short-term and long-term effects on the OUV of the property and the ways and means to effectively address them and the capacity of management staff to plan for impacts from climate change should be further developed.

3.6 Cumulative impacts, ecological monitoring and management of the property

As described above, the property and its surrounding mangrove forest – upon which it is dependent for its survival – is subject to multiple stressors. The stressors arise mainly from sources outside the boundaries of the property and in some cases from sources outside Bangladesh.

At present a comprehensive picture of the combined impacts from coastal developments and associated activities in and surrounding the Sundarbans is lacking. The construction, operation and activities related to coastal developments such as the Mongla Port expansion and the Rampal power plant all come with their individual potential impacts on the Sundarbans ecosystem. None of the relevant EIAs for these coastal developments take into account the cumulative effects of associated activities that come with the actual development. In addition, each development is assessed independently without consideration of the accumulated effects. For example, several coastal developments (Mongla, Rampal, etc.) and management measures (closure of the Shela River) have implications on shipping and dredging but as yet they have not been assessed in relation to one another nor has the combined impact on the Sundarbans ecosystem been assessed as a whole.

The mission notes that the Committee requested the State Party to undertake a comprehensive Strategic Environmental Assessment (SEA) in its Decision **38 COM 7B.64** and **39 COM 7B.8**. The purpose of an SEA is to assess the cumulative impacts at a landscape and regional scale before individual projects are decided upon, and it can serve to identify economically viable alternatives so as to avoid negative impacts on a World Heritage property. The SEA should be conducted in line with the eight principles as outlined in the IUCN World Heritage Advice Note on Environmental Assessment²⁷, which should aid decision-makers in identifying the most sustainable option.

Although the BFD is responsible for forest protection including resource extraction, the overall health of the property and its surrounding areas is dependent on several other national and international entities. For example, shipping, dredging and dumping of dredged material are currently under the regulation and jurisdiction of other government ministries and all three activities are poorly controlled and likely to increase significantly in coming years. As noted above, adequate influx of freshwater into the Sundarbans is a serious threat to the health and overall integrity of the ecosystem. Addressing this threat however, lies in robust international and river-basin wide cooperation, but no integrated management plan that addresses this issue is currently in place to secure adequate freshwater inflow. The combined pressures from these

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https://cmsdata.iucn.org/downloads/iucn_advice_note_environmental_assessment_18_11_13_iucn_template.pdf

threats come in addition to the overall uncertainty of the impacts of climate change. The Sundarbans ecosystem itself is highly vulnerable to cyclones and is expected to see further damage to its ecosystem in coming years.

Simultaneously, and despite repeated requests by the World Heritage Committee, the results from current ecological monitoring are yet to be submitted and while a detailed ecological monitoring system appears to have been developed, discussions during the mission indicated the implementation of this system was budget-dependent and awaiting approval. Despite repeated requests from the mission no updated data on the ecological status of the property was made available. It appears that current monitoring is patchy at best and there is no adequate system in place to ensure the monitoring results are used to inform management planning and decision-making.

Current capacity building activities appear to be dependent on project specific funding, many of which highlight an urgent need for increased resources including staffing and training. For example, the United States Agency for International Development (USAID) Bengal Tiger Conservation Activity (Bagh) has been working in the Sundarbans with local organisations to provide funding and support for capacity building including assessments of frontline staff capacity. The Wildlife Conservation Society (WCS) has also been providing training activities to ensure staff has the best capacity to address threats posed from illegal wildlife trade. However, such activities appear to be carried out only through external project funding and do not appear to be included or integrated in the overall management of the property.

The mission team considers that the current management system for the property and its immediate surroundings does not take into account the mounting pressures from a number of important external influences in an effective manner. There is currently no integrated management in place to adequately address the combination of threats and issues. There is also no planning mechanism in place that can help define the carrying capacity of economic and industrial activity of the ecosystem. Considering the OUV of the property and the surrounding Sundarbans ecosystem is already undergoing changes due to drastic reductions in freshwater flow, the high likelihood of further damage due to increasing frequency and intensity of cyclones and the overall uncertainty of climate change that could well have a far-reaching effect on the ecosystem, there is high concern for the future preservation of the OUV of the property.

Recommendation R10

Considering the multiple activities outside the property that are impacting on its OUV, it is recommended that the State Party puts in place a system that allows to manage the property in an integrated manner. Such system should ensure:

- a) *Sufficient freshwater flows into the property to maintain its ecosystem health, balance and functioning;*
- b) *Decisions for further economic development and associated activities such as shipping and dredging are not taken in isolation but are subject to a Strategic Environmental Assessment (SEA) for the property and its surrounding areas upon which it is dependent;*
- c) *The economic and industrial carrying capacity of the areas surrounding and in close proximity to the property are defined in a transparent and scientifically sound manner and its limits reflected in decision making;*
- d) *Sufficient financial and human resources are made available to provide for the long-term management and patrolling of the area and resource extraction including control of illegal activities such as poaching of wildlife and non-compliance with existing regulations.*

4. ASSESSMENT OF THE STATE OF CONSERVATION OF THE PROPERTY

Based on the observations during the visit, the mission considers that the OUV of the property, as defined at the time of inscription on the World Heritage List, remains present. However, considering the combination of changes the ecosystem is already undergoing, the substantial rise in economic and industrial development with high likelihood of damage to the property and its vulnerability to climate change, the property is clearly at a tipping point with regards to the conservation of its OUV. Immediate and decisive action is therefore required to secure the protection of the OUV and the overall integrity of the property in coming years.

Due to the drastic reductions in freshwater inflow since the construction of the Farakka Barrage roughly 15 km upstream of the India-Bangladesh border in 1975 and the lack of sufficiently robust alternative solutions for freshwater influx, the Sundarbans forest has seen a substantial increase in salinity. Due to the southern location of the property, bordering the Bay of Bengal, the property is particularly vulnerable to increased salinity. Information obtained by the mission illustrates that the increasing salinity in the waterways of the property and its surrounding area is already starting to displace some mangrove species with more saline resistant trees thereby altering the composition of the forest and potentially reducing the biodiversity of the Sundarbans. A scientific study conducted in 2011, illustrates that the central longitudinal forest belt of the SRF is now rapidly turning into high saline zones and the western area of the Sundarbans has reached alarming salinity levels. Experts who accompanied the mission reported that the eastern part of the property is also now being affected. Expert opinion indicates that top-dying of *Heritiera fomes*, considered by scientists as the most serious of all diseases and disorders of tree species in Bangladesh, appear to have been detected within the property.²⁸ Without adequate freshwater influx from the Ganges basin, especially in the dry season, the State Party of Bangladesh is unable to properly protect the OUV of the property. A more robust water allocation policy is of crucial and strategic importance to secure the future health and ecosystem functioning of the property.

The impacts from the recent ship accidents seem to have remained local and appear to not have had an effect on the wider Sundarbans area as of yet. However possible long-term impacts cannot be excluded and require further assessments. The most pressing issue is the high likelihood for future accidents due to rapidly increasing ship traffic in the continued absence of control measures. Both the non-compliance with the closure of the Shela River as well as augmented ship traffic resulting from increased coastal development is of concern. Additionally of concern is the extensive dredging that will be required to accommodate the increases in ship traffic, in particular as most of the dredging does not appear to be subject to an EIA.

Furthermore, despite repeated requests by the World Heritage Committee, no comprehensive ecological monitoring system has been put in place that could adequately measure the current state of conservation of the OUV of the property. Current monitoring is patchy at best. The absence of clear data makes it impossible to make a quantified estimate of the state of conservation of the criteria that make up the property's World Heritage status, including for top predators and iconic species such as the Royal Bengal Tiger. The limited data that do exist are not suitable to make reliable comparisons against the baseline (1997, inscription of the property on the World Heritage List). Experts consulted by the mission gave varying accounts of the current state of the Bengal Tiger population, but all indicated concern over increasing levels of

²⁸ Islam S.N. and Gnauck G. (2011). Water salinity investigation in the Sundarbans Rivers in Bangladesh. Int. J. Water, vol. 6. Nos ½, pp. 74-91.

poaching and illegal wildlife trade. Local communities do extract resources from the SRF but no such activities are allowed in the World Heritage area. The mission did not encounter any infringements on this policy during its mission.

The mission observed loss of mangrove forests in the property's most southern coastal area bordering the Bay of Bengal that resulted from Cyclone Sidr in 2007. The property is known to be vulnerable to climate change and destruction from extreme weather events is already clearly apparent.

Finally, while a management plan is in place for the SRF including the property it does not take into account the mounting pressures on the Sundarbans in an integrated manner. There is currently no plan or management system in place that could adequately address the cumulative effects the property and its surrounding area are facing and that could help define the carrying capacity for economic and industrial activity of the ecosystem. Considering that the OUV of the property and the surrounding Sundarbans ecosystem is already undergoing changes due to drastic reductions of freshwater flow, the high likelihood for damaging cyclones and the overall uncertainty of climate change, the lack of integrated system is of high concern for the conservation of the OUV and the overall integrity of the property.

5. CONCLUSIONS AND RECOMMENDATIONS

The mission concludes that at present the property continues to demonstrate the values for which it was inscribed on the World Heritage List. The property is iconic as part of the world's largest mangrove system and home to the Royal Bengal Tiger among other species. However, the mission reaffirmed the serious threats to the OUV of the property that were raised in previous World Heritage Committee Decisions and also identified additional existing and potential threats that are of concern for the protection of the property and have not previously been raised by the World Heritage Committee.

Based on the many consultations the mission conducted during and after the visit, it concludes that the following three threats are of outmost concern and require urgent, immediate attention:

First, the freshwater flow into the Sundarbans has been drastically reduced by increased water extraction and the Farakka Barrage, which is resulting in substantially increased siltation and salinity that are threatening the overall balance of the ecosystem, its functioning and regeneration. Salt tolerant mangrove species are expanding and gradually displacing other species, while higher salinity is stimulating an increase in barren areas. In the absence of a comprehensive, multilateral and integrated freshwater inflow management plan it is unlikely the property's OUV can be maintained in the long term.

Second, the mission team identified four core concerns related to the prospective construction and operation of the 1320 MW Maitree Super Thermal Power Plant (Rampal power plant), the current site of which is located 65 km from the closest boundary of the World Heritage property. These include pollution from coal ash by air, pollution from wastewater and waste ash, increased shipping and dredging and the cumulative impact of industrial and related development infrastructure. The mission considers that air and water pollution have a high likelihood to irreversibly damage the OUV of the World Heritage property. The possible threats arising from the power plant on the OUV of the property are not addressed adequately in the EIA and the plant itself is not applying the best available technology or the highest international standards for preventing damage commensurate with its location in the near vicinity of a World Heritage property.

Third, the property is lacking a clear and comprehensive assessment of the overall combined effects expected to arise from increasing coastal developments and associated activities, a number of which are already in preparation. Increased port capacity and other coastal developments are expected to result in increased shipping and dredging but their effects are not planned for or managed in an integrated manner. Several recent ship accidents illustrate the difficulties and the need for a concerted and coordinated rapid response to mitigate and prevent impacts. Considering the OUV of the property is already undergoing impacts and changes and the area's vulnerability to the effects of climate change, the lack of an integrated management system to protect the OUV of the property is of considerable concern.

In addition to these key threats, the mission also concludes that the long-term effects from recent ship accidents could not be ruled out. Furthermore, enhanced support to monitor and control resource extraction, including poaching of high value wildlife species, would benefit the overall state of conservation of the property. There is a clear need for increased and secured resources for the management of the property, including surveillance and monitoring of resource extraction activities. The mission recommends the State Party to provide greater support and attention to address this issue. The mission also considers that the overall pressure in the property and its surrounding areas should be kept to a minimum in view of increasing the ecosystem's resilience in the face of climate change, the effects of which the area is highly vulnerable to. Clarification is therefore needed on the current status of the Orion power plant, which is reportedly being

planned adjacent to the Rampal power plant, as well as a proposed nuclear power plant in the vicinity of the Sundarbans. These developments contribute towards the cumulative impacts on the property and its overall integrity.

Finally, while the mission concludes that at present the property does not currently fully meet the requirements for inscription on the List of World Heritage in Danger, it notes that immediate implementation of the mission recommendations related to the freshwater flows, the Rampal power plant (and other similar developments in the vicinity of the property) and integrated management are imperative to prevent the OUV of the property becoming irreversibly damaged. The mission recommends that the State Party report, as requested in Decision **39 COM 7B.8** to be submitted to the World Heritage Centre by 1 December 2016, clearly outlines the measures and steps the State Party is taking toward implementing the below recommendations. Should any of the most threatening developments proceed, the mission concludes that the World Heritage Committee should consider immediate listing of the property in the List of World Heritage in Danger at its 41st session in 2017.

The mission considers that the State Party should take urgent measures to immediately implement the following recommendations to prevent further erosion of the OUV and address important threats to the property:

R1. Considering the impact to the OUV of the property, the structural changes to the ecosystem and its functioning, resulting from higher salinity, in particular in the southern areas of the SRF where the World Heritage property is located, and the continued lack of sufficient provision to secure adequate freshwater flows into the area, it is recommended that as a matter of utmost urgency and without delay:

- a) The Ganges water sharing Treaty between India and Bangladesh is fully implemented in a coordinated effort by the States Parties of Bangladesh and India to ensure adequate freshwater inflow;
- b) A comprehensive, multilateral and integrated freshwater inflow management plan is designed and implemented, accompanied by the necessary monitoring to measure salinity and water quality, including groundwater, throughout the property. Future management decisions should be informed by these monitoring results.

R2. In relation to the Rampal power plant, considering the high likelihood for: (i) contamination of the property and the surrounding Sundarbans forest from air and water pollution arising from both its location, in a wind risk zone, and its anticipated methods to minimise impacts; (ii) the substantial increase in shipping and dredging required in the immediate vicinity of the property for the plant's construction and operation; (iii) the additional removal of freshwater from an already increasingly saline environment that is starting to alter the functioning of the ecosystem; (iv) an EIA that does not address the effects on the OUV of the property nor provide convincing evidence that effects on the Sundarbans will be mitigated; and (v) the intrinsic connectivity between the property and the Sundarbans forest, it is recommended that the Rampal power plant project is cancelled and relocated to a more suitable location, where it would not impact negatively on the Sundarbans Reserved Forest and the property.

R3. The mission recommends that the State Party halts all development of the site of the Orion Power Plant in Khulna, and any similar proposed development, until an independent, comprehensive and scientifically sound EIA has been conducted and provided to the World Heritage Centre and IUCN for their review and evaluation. If impacts on the OUV of the property or its immediate surroundings cannot be addressed in a scientifically sound manner, it is recommended that the projects be cancelled and relocated to more suitable locations.

R10. Considering the multiple activities outside the property that are impacting on its OUV, it is recommended that the State Party puts in place a system that allows management of the property in a more integrated manner. Such a system should ensure:

- a) Sufficient freshwater flows into the property to maintain its ecosystem health, balance and functioning;
- b) Decisions for further economic development and associated activities such as shipping and dredging are not taken in isolation but are subject to a Strategic Environmental Assessment (SEA) for the property and its surrounding areas upon which it is dependent;
- c) The economic and industrial carrying capacity of the areas surrounding and in close proximity to the property are defined in a transparent and scientifically sound manner and its limits reflected in decision making;
- d) Sufficient financial and human resources are made available to provide for the long-term management and patrolling of the area and resource extraction including control of illegal activities such as poaching of wildlife and non-compliance with existing regulations.

The mission considers that the following recommendations to further improve the conservation of the property and strengthen its management should be implemented as soon as possible:

R4. Considering the potential threats to the property from increased shipping and required dredging, the planned expansion and increase in use of the Mongla Port requires urgent clarification. It is recommended that the State Party halt all expansion activities until an independent, comprehensive and scientifically sound EIA that specifically considers the impacts on the OUV of the property has been conducted and provided to the World Heritage Centre and IUCN for their review and evaluation.

R5. Enforce the permanent closure of the Shela River to all vessel traffic, national and international, and apply speed limits and effective control measures for night and poor weather conditions for vessels navigating along the Pashur River.

R6. Develop an effective action plan and emergency response facility in consultation with all relevant stakeholders to react to any future shipping incidents in a timely and coordinated manner, and consistent with the recommendations made in the United Nations Development Programme (UNDP) oil spill assessment report.

R7. Develop, finalise and submit for review by the World Heritage Centre and IUCN, a detailed assessment of potential impacts of current and planned dredging and associated activities on the OUV and integrity of the property.

R8. Enhance and strengthen human and financial resources, capacity and inter-agency cooperation, including between local and national authorities, and law enforcement to adequately address wildlife trade, transportation, and sale, including actions and budget to facilitate increased staffing, patrolling and engagement with local communities to garner their support for the continued protection of the property and its OUV against poaching.

R9. Taking into account that climate change is a global problem requiring a concerted global solution, it is strongly recommended that, at the level of the property, the State Party reduce other threats in the property and its surrounding area to secure maximum resilience of the property in the face of climate change impacts. Ecological monitoring for the property should include indicators that measure climate change impacts in view of identifying both short-term and long-term effects on the OUV of the property and the ways and means to effectively address them and the capacity of management staff to plan for impacts from climate change should be further developed.