

Jaltarang, 2014

7th Consecutive World Wetlands Day Celebration
by
TERI-Western Regional Centre

Informative trail to Wetlands of Navi Mumbai



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Project Advisor

- Dr. Anjali Parasnis,
Associate Director, TERI-WRC

Principal Investigator

- Mr. Prathmesh Chourey,
Associate Fellow, TERI, Mumbai

Team Members

- Ar. Namrata Kaur Mahal, *Research Associate, TERI*
- Ms. Swati Tomar, *Research Associate, TERI*
- Ms. Prutha Lanjekar, *Research Associate, TERI*
- Ms. Aditi Phansalkar, *Research Associate, TERI*
- Mr. Chinmay Kinjavdekar, *Research Associate, TERI*
- Ms. Pallavi Barua, *Research Associate, TERI*
- Mr. Amol Handore, *Project Consultant, TERI*
- Mr. Pradeep Desai, *Project Consultant, TERI*
- Mr. Yatish Lele, *Project Consultant, TERI*
- Mr. Prakash Joshi, *Support Staff, TERI*
- Mr. Lalit Joshi, *Support Staff, TERI*

For more information

Mr. Prathmesh Chourey
Associate Fellow
The Energy and Resources Institute
318, Raheja Arcade,
Navi Mumbai - 400614
India

Tel: 022 27580021 / 40241615
E-mail: prathmesh.chourey@teri.res.in
Fax: 022-27580022
Web: www.teriin.org



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Table of Contents

ACKNOWLEDGEMENT	V
LIST OF PICTURES	VIII
LIST OF TABLES	IX
SUMMARY	1
BACKGROUND	2
OBJECTIVE	3
THE EVENT	5
Session I: Welcome and introduction	6
Session II: The Informative Trail	8
Session III: Experience sharing and concluding session	23
Feedback of the visit.....	25
ANNEXURE 1: LIST OF PARTICIPANTS	27
ANNEXURE 2: WATER SAMPLING & TEST RESULTS	29
ANNEXURE 3: AGENDA OF THE PROGRAMME	37
ANNEXURE 4: CHECKLIST OF BIRDS	39
ANNEXURE 5: WETLAND BASED JUMBLE WORD PUZZLE	45
ANNEXURE 6: PHOTO GALLERY	47
APPENDIX A	51
Wetlands.....	51
World Wetland Day.....	51
TERI.....	52
Jaltarang.....	52

List of Pictures

Picture No.1: Age group of the participants at Jaltarang-2014.....	3
Picture No. 2: Members of TERI team delivering the briefing session.....	6
Picture No. 3: Route map of Team Lonar and Team Bhigwan.....	7
Picture No. 4: Owe Dam	8
Picture No. 5: Washing of clothes on the banks of Owe dam.....	9
Picture No. 6: Quarrying activity near the dam	9
Picture No. 7: Water Body at Central Park.....	11
Picture No. 8: Mangrove trail	14
Picture No. 9: Dumping of debris at mangrove patch.....	15
Picture No. 10: Construction activity just besides the mangrove habitat.	15
Picture No. 11: Ballaleshwar Lake	17
Picture No. 12: Eutrophication and dumping of solid waste directly in the Ballaleshwar Lake	18
Picture No. 13: Release of floral offerings, <i>Nirmalaya</i> , from the temple	18
Picture No. 14: Holding pond at Khandeshwar, Navi Mumbai.....	20
Picture No. 15: Marshy area behind Khandeshwar temple	22
Picture No. 16: Children solving “Find the words” and participants preparing the presentations (From left to right)	23
Picture No. 17: Mr. Sontakke interacting with participants along with Dr. Anjali Parasnis, Mr. Lele and Mr. Nayak.	23
Picture No. 18: Presentations presented by participants: Team Lonar (Left) and Team Bhigwan (Right).....	24
Picture No. 19: Collection of water sample at Ballaleshwar Lake.....	29
Picture No. 20: Collection of water sample under supervision of MPCB’s field officer	29
Picture No. 21: Scientific sampling of the water samples by experts from TERI	30
Picture No. 22: Appropriate labeling of water sample collected under guidance of MPCB’s field officer.....	30
Picture No. 23: Participants walking through mangroves	47
Picture No. 24: Participants being explained about quarrying activities affecting wetlands .	47
Picture No. 25: Participants observing the dyke at holding pond.	48
Picture No. 26: Participants collecting water samples	48
Picture No. 27: Participants from both team presenting their respective presentations (Top - Lonar team and Bottom - Bhigwan team).....	49
Picture No. 28: Both teams group photographs (Top - Lonar team and Bottom - Bhigwan team).....	50

List of Tables

Table No. 1: Wetlands selected for the trail.....	5
Table No. 2: Locations visited by both the teams (Duration of the trail- 2-3 hours)	7
Table No. 3: Water Quality Parameters at Owe dam.....	10
Table No. 4: Water Quality Parameters at Central Park Lake	13
Table No. 5: Water Quality Parameters at mangrove patch	16
Table No. 6: Water Quality Parameters at Ballaleshwar Lake.....	19
Table No. 7: Water Quality Parameters at holding pond	21

Summary

TERI's Western Regional Centre (WRC) had successfully organized the seventh edition of its annual event 'Jaltarang' to commemorate World Wetlands Day (WWD) on February 2, 2014 in collaboration with its project partners - Deepak Fertilizers & Petrochemicals Corporation Limited, Fugro Survey (India) Pvt. Ltd., Maharashtra Pollution Control Board (MPCB), Government of Maharashtra (GoM), CIDCO and Ramsar Convention, Switzerland. Since 2007, under its umbrella initiative Wetland Management Programme (WeMaP), the centre has been engaging various stakeholders to undertake concrete action-oriented programmes for wetland conservation.

Professionals in urban areas are often too busy to explore the resource potential of local ecosystems, which provide us with various unique services. Hence, this year, the centre organized an 'informative trail' for more than 75 industrial professionals and their families from the partner institutions to highlight different urban wetland ecosystems of Navi Mumbai. Students from National Institute of Industrial Engineering (NIIE) and Rajiv Gandhi College of Arts, Commerce and Science, Navi Mumbai also actively participated in the programmes. The participants were divided into two groups, named after lakes Bhigwan and Lonar. These lakes are significant wetlands in Maharashtra. The state government has recommended them as Ramsar sites. The informative wetland trail covered the sites belonging to various categories, namely mangrove habitat, holding ponds, man-made and natural lakes of historical significance.

The significance of the city's riparian zones, holding ponds and the unique mangrove wetlands ecosystem was explained to the teams. Around 34 species of birds, including Purple Moorhen (*Porphyrio porphyrio*), White Wagtail (*Motacilla alba*) and Bronze-winged Jacana (*Metopidius indicus*), which are un-common species for the region, were sighted during the trails. Also, the participants collected water samples from these wetlands to analyze the water quality in collaboration with MPCB. It was observed that the samples collected from the holding ponds and mangrove patches were the most polluted, whereas the water collected from Owe dam, Central Park, Ballaleshwar Lake and Khandeshwar Lake were of the acceptable quality, as per the MPCB norms.

Very low D.O. (Dissolved oxygen) levels were recorded at holding pond and mangrove wetland, which indicated high level of stress and threat for the aquatic faunal diversity. Total coliform and fecal coliform levels were high in the mangrove wetland, which clearly indicated pollution caused by release of domestic waste. The level of ammonical nitrogen was found to be very high (27.5mg/l) compared to the permissible limit (3mg/l), which indicated high growth of algae and other flora. This may lead to septic and eutrophication in the holding pond. Also, mangrove patch was found to be having very high B.O.D (Biochemical oxygen demand) of 320 mg/l against standard limit of 3 mg/l. Both the polluted sites also recorded high C.O.D (Chemical Oxygen Demand) level indicating pollution due to the chemical effluents released from industries located nearby.

All the participants were amazed to learn about the functional diversity and resource potential of various wetlands. Since many of the participants are citizens of Navi Mumbai, witnessing the impacts of urbanization and industrialization on local wetlands triggered their thought process about wetland conservation. Upon returning from the informative trail, both the groups shared their experiences in the form of an interactive presentation.

Background

As defined by Ramsar convention, wetlands are areas that are seasonally or perennially covered by water¹. Wetlands usually consist of water bodies like lakes, rivers, mangroves, coral reefs and so on. Artificial man-made wetlands consist of paddy fields, dams, saltpans and so on.

Wetlands play a significant role in conservation of water and recharging the ground water table. They are among the world's most productive environments and are regarded as cradles of biological diversity, which may include countless species of plants and animals for survival. Unfortunately, wetlands continue to be among the world's most threatened ecosystems, owing to stress from dumping of solid waste and debris, release of drainage, reclamation and over-exploitation of their resources. Major urban cities across the globe often tend to ignore the wetlands present in and around them.

Navi Mumbai is undergoing planned development and is spread over a vast area of 344 sq. km². Being a coastal city, it is blessed with various types of wetlands like fresh water ponds, creeks, rivers, mangroves, dams, holding ponds and so on. However, the ecological and functional significance of these wetlands is often not realized and is neglected by the citizens. The impact of industrialization and rapid urbanization poses great threat to these fragile ecosystems. However, since the city is still in transition/developmental stage, there is still hope. We can save these entities by creating awareness, especially among industrial professionals, citizens and youth.

Hence, TERI's Western Regional Centre (WRC) organized Jaltarang-2014 - '**An informative trail to wetlands of Navi Mumbai**'. It is an annual event to commemorate World Wetlands Day (WWD) on February 2, 2014. It was the seventh consecutive WWD commemoration, under the banner of '*Jaltarang*'. TERI's WRC has been taking efforts to encourage active participation of various stakeholders through its initiative Wetland Management Programme (WeMaP) to not only sensitize them about the significance of wetlands but also to derive sustainable solutions through community participation. More information on TERI's initiatives Jaltarang and WeMap has been elaborated in Appendix A of this report.

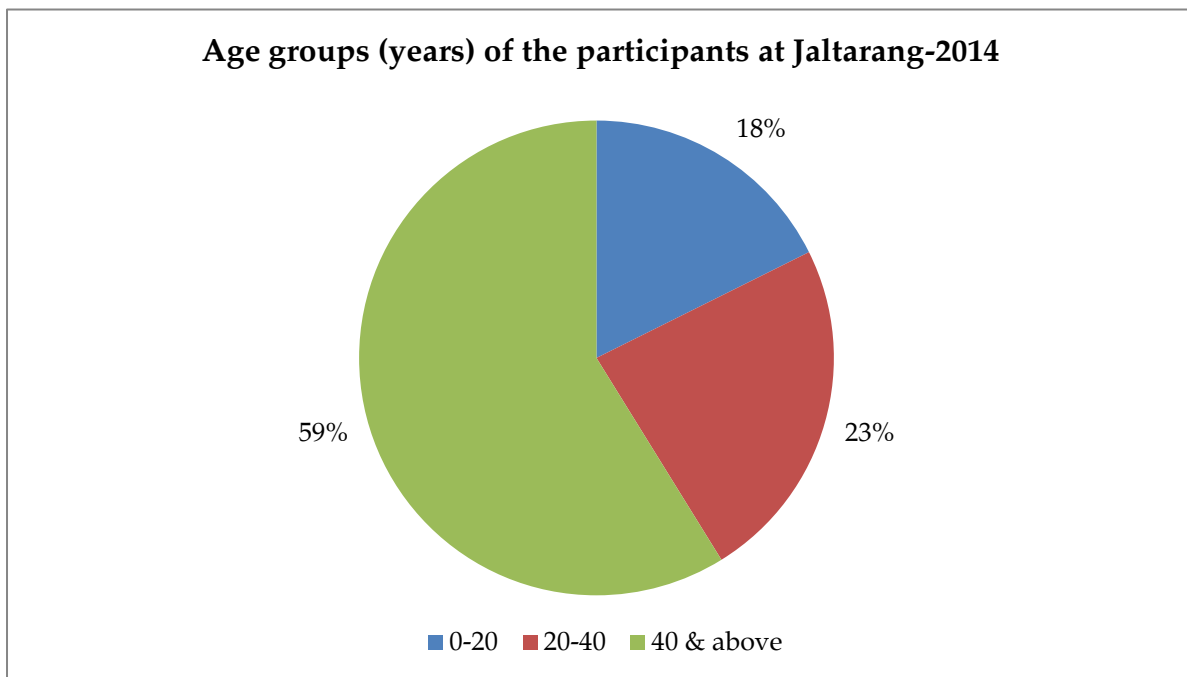
¹ [Ramsar Convention](#)

² [City and Industrial Development Corporation of Maharashtra Ltd](#)

Objective

The objective behind Jaltarang 2014 was to sensitize and actively involve the industry professionals and local citizens about the significance of wetlands in the city and their corresponding issues. The event provided them an opportunity to explore various wetlands and acquire knowledge through interactive activities.

More than 75 participants of diverse groups, including employees and their family members (Picture No.1) from two prominent industries in Navi Mumbai - Deepak Fertilizers & Petrochemicals Corporation Limited and Fugro Survey (India) Pvt. Ltd. actively participated in the trail. Youth from educational institutes of Rajiv Gandhi College, Vashi, Navi Mumbai and NITIE (National Institute of Industrial Engineering), Powai, Mumbai also participated (Annexure 1).



Picture No.1: Age group of the participants at Jaltarang-2014

The Event

TERI's team conducted several pilot surveys, prior to the main event, in order to map the status of the wetlands present in Navi Mumbai and shortlisted six locations, enlisted in Table No. 1 for the informative trail. The wetlands were selected based on their significance, natural features and ease of access.

TERI, in collaboration with MPCB, collected water samples from the wetlands to conduct water quality assessment for various parameters like pH, BOD (Biochemical Oxygen Demand), COD (Chemical Oxygen Demand), Ammonical Nitrogen, Salinity, Total and Faecal coliform. The results of the water quality have also been discussed in this report (Annexure 2) and the highlights are presented in Table No. 1.

The over-all event was divided into three sessions:

- Session I : Welcome and introduction
- Session II : Informative trail
- Session III : Experience sharing and concluding session

The highlights of each session have been elaborated subsequently.

Table No. 1: Wetlands selected for the trail

Sr. No.	Wetland	Geo Location	Category	Significance	Level of Pollution
1	Holding Pond, Panvel	19° 0'38.37"N 73° 6'21.11"E	Brackish water pond	Holding pond designed to avoid floods.	Highly polluted, High level of Ammonical nitrogen, D.O & Faecal coliform.
2	Owe dam, Kharghar	19° 4'34.72"N 73° 3'22.70"E	Fresh water dam	Natural dam	No Pollution
3	Central Park, Kharghar	19° 3'35.18"N 73° 3'54.41"E	Fresh water pond	Manmade pond	High pH, but not exceeding the limit.
4	Ballaleshwar Lake, Panvel	18°59'38.43"N 73° 6'42.01"E	Fresh water pond	Historically important water body	Moderately polluted, high DO level.
5	Mangrove patch, Kamothe	19° 1'56.99"N 73° 5'2.94"E	Brackish water	Mangrove wetland	Highly Polluted, High level of BOD, D.O, COD and Faecal coliform.
6	Marshy area, behind Khandeshwar railway station	19° 0'40.66"N 73° 5'39.53"E	Brackish water	Mangrove wetland with bird diversity	-

Session I: Welcome and introduction

All the participants reported at Khandeshwar Lake complex at around 08.30 AM and were presented with specially designed T -shirts and caps, as souvenir, for the event.

At the outset, Ar. Namrata Randive, Research Associate, TERI welcomed all the participants. She explained the importance of wetlands in our country and pointed out several important issues pertaining to wetland conservation. After this, she briefed everyone about the agenda of the programme (Annexure 3). To introduce the participants to the concept of wetlands, two audio-visuals, one developed by Ramsar convention and one on wetlands of Maharashtra developed by TERI's WRC, were screened.

Following this, Mr. Prathmesh Chourey, Associate Fellow, TERI gave a brief orientation of the programme and divided the participants into two teams, namely Lonar Lake and Bhigwan Lake. He also explained to everyone the importance of these wetlands and the reason for using such names. The teams then departed for the informative trail at 09.30 AM on two different routes (Picture No. 3).



Picture No. 2: Members of TERI's team delivering the briefing session



Picture No. 3: Route map of Team Lonar and Team Bhigwan

Table No. 2: Locations visited by both the teams (Duration of the trail- 2-3 hours)

TEAM: Bhigwan	TEAM: Lonar
Mangrove Patch, Kamothe	Owe Dam, Kharghar
Marshland, Khandeshwar	Central Park Lake, Kharghar
Ballaleshwar Lake, Panvel	Mangrove Patch, Kamothe
Holding Pond, Panvel	Holding Pond, Panvel

Session II: The Informative Trail

Owe Dam



Picture No. 4: Owe Dam

Owe dam is situated at Owe village near Kharghar, Navi Mumbai. In the past, the area was a natural pond and was used to supply water to a town nearby. The catchment was further developed into a small dam to augment water holding capacity. The wetland is rich with bird diversity but owing to its proximity to a quarrying project (Picture No. 6), it may face a threat from land use change in future.

The beauty of the Owe dam premises left the participants spell-bound. They were thrilled to be in the lap of nature. TERI's experts explained the importance of the natural pond ecosystem along with the concept of a riparian zone and its significance. Technique of water sampling to analyze water quality parameters was demonstrated. Participants sighted various birds at the dam like the little Cormorant (*Microcarbo niger*), flocks of Egrets (*Egretta spp*) and the constantly-chirping Red Wattled Lapwing (*Vanellus indicus*). Participants were asked to prepare a checklist of birds sighted on the trail (Annexure 4). Extensive growth of shrub *Ipomea* spp. along the periphery of lake was observed. While they were leaving for the next location, some participants observed quarrying activities near the dam and expressed their concern. Thus, the objective of offering first-hand experience about the threat to the ecosystem and raising concern was fulfilled.

Key Observations:



Picture No. 5: Washing of clothes on the banks of Owe dam



Picture No. 6: Quarrying activity near the dam

Table No. 3: Water quality parameters recorded for sample collected at the Owe dam

Water Quality Parameters (Owe Dam)							
Sr No	Class of Water						Observed Values
	CPCB	A	B	C	D	E	
	MPCB	A-I	Not Prescribed	A-II	A-III	A-IV	
1	pH	6.5-8.5	6.5-8.5	6.0-9.0	6.5-8.5	6.0-8.5	7.6
2	D.O (mg/l)	6 or more	5 or more	4 or more	4 or more	-	7
3	B.O.D (mg/l)	2	3 or less	3 or less	-	-	3.8
4	Ammonical Nitrogen (mg/l)	-	-	-	1.2 or less	-	0.54
5	Total Coliform MPN/100ml	50 or less	500 or less	5000 or less	-	-	225
	Best Designated Use				Propagati on of wildlife and fisheries	Irrigation, Industrial Cooling.	

Inference:

- B.O.D and Total coliform were found to be higher than the permissible limit which indicates pollution in water, possibly due to activities like the discharge of domestic waste from the villages nearby, washing of clothes, bathing and open defecation near the banks of the water body.
- As of now, the water quality may not have direct impact on the aquatic life and the water could be used for irrigation and secondary purposes.
- Sighting of various birds indicated that the Owe dam wetland provides a good habitat for various wetland associated birds. However, the anthropogenic disturbances in terms of quarrying and discharge of domestic water near the wetland may prove harmful in the near future. Hence, quarrying and anthropogenic activities like washing of clothes, bathing and so on should either be banned or appropriately regulated and monitored.

Water body at Central Park



Picture No. 7: Water Body at Central Park

CIDCO has constructed a small artificial pond for recreational purpose at Central Park, Kharghar. The water body receives around 5 million litres per day (MLD) tertiary treated water from a sewage treatment plant nearby. While developing this wetland, it was layered with concrete and boulders on the periphery and was devoid of riparian zone. Owing to high level of phosphates, nitrates and ample sunlight, it eventually triggered the growth of algae, leading to eutrophication.

To re-naturalize the water quality and as part of a sustainable strategy, TERI had implemented specific strategies. TERI introduced the concept of nutrient sink and riparian zone to improve the water quality and enhance the biodiversity within the wetland. This multi-pronged approach has helped achieve sustained and tenacious results to reduce algal growth.

The participants were explained the significance of the riparian zone and the adverse effects of its absence. A short walking trail was conducted around the wetland. Few Cormorants (*Microcarbo niger*) were spotted in the pond and the trees around it. TERI's experts explained the participants how TERI has tried to maintain the natural cycle of the pond by planting trees around the pond, a lotus ring on the periphery and implementing other restoration measures.

Water quality parameters shed light on why it is completely different from a natural pond. This visit helped the participants understand the exact difference between a natural lake and a man-made lake.

Construction of the riparian zone along the periphery of the wetland at Central Park, Navi Mumbai

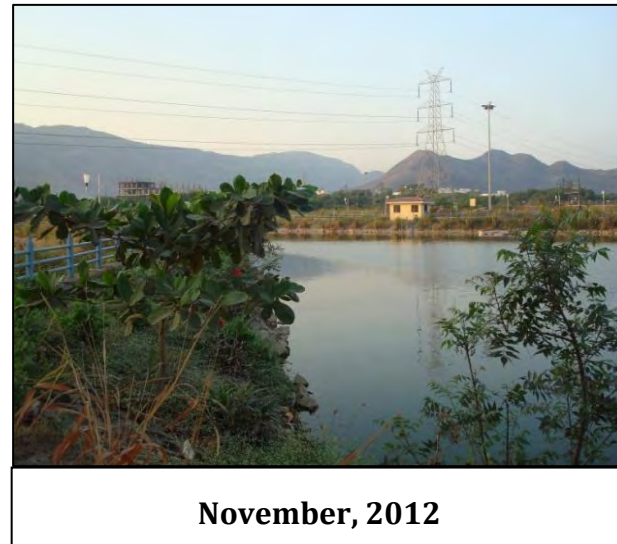
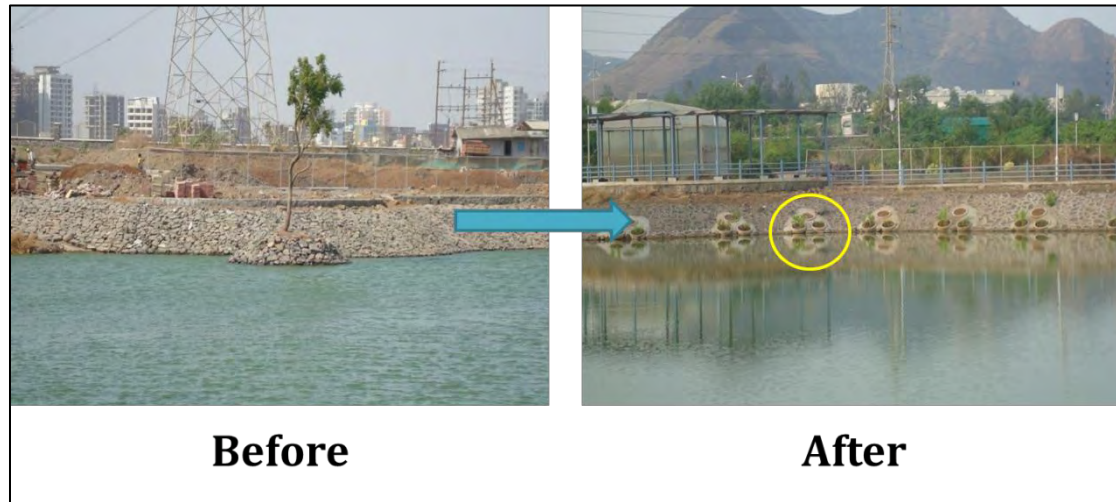


Table No. 4: Water quality parameters recorded for sample collected at the Central park Lake

Water Quality Parameters (Central Park Lake)							
Sr No	Class of Water						Observed Values
	CPCB	A	B	C	D	E	
	MPCB	A-I	Not Prescribed	A-II	A-III	A-IV	
1	pH	6.5-8.5	6.5-8.5	6.0-9.0	6.5-8.5	6.0-8.5	8.2
2	D.O (mg/l)	6 or more	5 or more	4 or more	4 or more	-	6.4
3	B.O.D (mg/l)	2	3 or less	3 or less	-	-	4.8
4	Ammonical Nitrogen (mg/l)	-	-	-	1.2 or less	-	1.25
5	Total Coliform MPN/100ml	50 or less	500 or less	5000 or less	-	-	250
	Best Designated Use				Propagation of wildlife and fisheries	Irrigation, Polishing pond for the tertiary treated water.	

Inference:

- Given the fact that the water body is retained perennial by refilling it with recycled water treated in a STP (Sewage Treatment Plant), the quality parameters have been maintained up to the permissible limits for irrigation applications and the water could be directly used for watering the lawns and landscape in the Central Park.
- Sighting of only one bird species, Cormorant (*Microcarbo niger*), indicates that the lake ecosystem, is dominated by one particular species and less preferred by other birds as their feeding and nesting habitat. Since it is a man-made wetland, there is concrete pitching along the periphery of the water body. To enhance the biodiversity of the aquatic and transient zone (area between water and land), and create an interphase with the natural elements like soil ecosystem, TERI designed and developed an artificial riparian zone and nutrient sink in 2010. Restoration activities such as introduction of tree species and developing the riparian zone has considerably improved the water quality and reduced the algal bloom.

Mangrove area



Picture No. 8: Mangrove trail

Mangroves are a taxonomically diverse group of salt tolerant, mainly arboreal, flowering plants that grow primarily in tropical and subtropical regions³. They are distributed in the inter-tidal region between the sea and land⁴. Mangrove wetlands are ecologically important since they serve as a home for a variety of diverse plants and animals. They play a valuable role as nature's shield against cyclones, ecological disasters and help protect shorelines. Navi Mumbai is blessed with around 50 sq. kms of mangrove belt⁵. Growing urbanization has resulted in a serious decline in mangrove areas⁶. It was important to sensitize people about the mangrove wetland ecosystem. Mangrove patch at Kamothe, near the creek, is easily accessible by road. This area was one of the ideal locations to study mangroves and threats on its ecosystem.

The participants were introduced to the typical mangrove ecosystem in terms of its importance. The significant features of mangroves, such as pneumatophores i.e. inverted roots, salt glands in leaves and their significance was explained. The mangrove species recorded in the area included *Avicennia marina* and a mangrove weed, *Acanthus ilicifolius*. The participants were also explained about the ecological aspects of this species like growth pattern and ability to flourish on degraded areas. The birds spotted at this ecosystem during the trail included Purple Heron (*Ardea purpurea*), House Swiftlet (*Apus nipalensis*), Red Wattled Lapwing (*Vanellus indicus*), Cormorants (*Microcarbo niger*) and so on. A dead dog faced sea snake was also recorded during the trail. Mollusk like, the largest of Horn snails (*Telescopium telescopium*), was also recorded. Also, few fiddler crabs (*Uca sps*) and Mud skippers (*Boleophthalmus sps*) were seen on the way back. The stress on the mangrove ecosystem from development, urbanization, oil spill and so on was also explained to the participants.

³http://cmsdata.iucn.org/downloads/managing_mangroves_for_resilience_to_climate_change.pdf

⁴http://www.marineclimatechange.com/marineclimatechange/bluecarbon_2_files/Girieta12011.pdf

⁵ [Times of India News Article](#)

⁶ [Threats to Mangroves](#)

Key Observations:



Picture No. 9: Dumping of debris at mangrove patch.



Picture No. 10: Construction activity just besides the mangrove habitat

Table No. 5: Water quality parameters recorded for sample collected at the Mangrove patch

Water Quality Parameters (Mangrove Patch)							
Sr No	Class of Water						Observed Values
	CPCB	A	B	C	D	E	
	MPCB	A-I	Not Prescribed	A-II	A-III	A-IV	
1	pH	6.5-8.5	6.5-8.5	6.0-9.0	6.5-8.5	6.0-8.5	7.6
2	D.O (mg/l)	6 or more	5 or more	4 or more	4 or more	-	-
3	B.O.D (mg/l)	2	3 or less	3 or less	-	-	320
4	Salinity (gm./Kg)	-	-	-	-	-	29.99
5	Ammonical Nitrogen (mg/l)	-	-	-	1.2 or less	-	2.33
6	Total Coliform MPN/100ml	50 or less	500 or less	5000 or less	-	-	1600
	Best Designated Use					Conservation of Creek/ Estuarine Ecosystem	

Inference:

- The B.O.D levels were observed to be very high compared to the standards and the D.O levels were extremely low. Hence, the water could not be measured using standard methods indicating severe lack of dissolved oxygen in the creek water.
- High total coliform count and ammonical nitrogen values indicate severe pollution in the wetland. The reason could be attributed to release of domestic and industrial sewage waste from the nearby areas.
- Sighting of diverse bird species at the location indicates that the ecosystem provides a habitat for feeding and roosting. However, increasing anthropogenic disturbance in terms of road widening, dumping of debris, land reclamation and urban sprawl in the vicinity could prove a major threat to the ecosystem.
- As the area is a feeding ground for birds, excessive pollution may lead to bird poisoning and high stress levels even on propagation of aquatic life. Release of domestic and industrial effluents released from CETPs should be minimized to a great extent in order to reduce the pollution levels.

Ballaleshwar Lake



Picture No. 11: Ballaleshwar Lake

Ballaleshwar Lake, now called 'Wadale Lake', is a historically significant, fresh water lake located at old Panvel city. The lake is a natural lake and has fresh water springs, which help to maintain the lake perennially.

The existence of the lake dates back to the 18th century. The Peshwa dynasty ruled over Panvel back then. The lake was developed to supply water to the city since there was chronic water shortage in the area in those days but now the lake is completely polluted due to disposal of solid waste, washing of clothes and release of floral and liquid offerings from the temple located on the bank of lake. As far as biodiversity of the lake is concerned, it is rich in lotus plants (*Nymphaea* sps) and has high density of fish population.

The participants were quite enthused to learn about the history of the lake and expressed sincere concern at the polluted condition of the lake. Upon taking a short walk along the periphery of the lake, birds like Purple Moorhen (*Porphyrio porphyrio*) and Pond Heron (*Ardeola grayii*) were spotted during the trail. The participants were then taught about the protocol of water sampling and were asked to perform the same.

Key Observations:



Picture No. 12: Eutrophication and dumping of solid waste directly in the Ballaleshwar Lake



Picture No. 13: Release of floral offerings, *Nirmalaya*, from the temple

Table No. 6: Water quality parameters recorded for sample collected at the Ballaleshwar Lake

Water Quality Parameters (Ballaleshwar Lake)							
Sr No	Class of Water						Observed Values
	CPCB	A	B	C	D	E	
	MPCB	A-I	Not Prescribed	A-II	A-III	A-IV	
1	pH	6.5-8.5	6.5-8.5	6.0-9.0	6.5-8.5	6.0-8.5	7.8
2	D.O (mg/l)	6 or more	5 or more	4 or More	4 or more	-	6.1
3	B.O.D (mg/l)	2	3 or less	3 or less	-	-	4.4
4	Ammonical Nitrogen (mg/l)	-	-	-	1.2 or less	-	2.05
5	Total Coliform MPN/100ml	50 or less	500 or less	5000 or less	-	-	225
	Best Designated Use				Urban pond and should be preserved as a historically significant water body		

Inference:

- B.O.D values, ammonical nitrogen level and total coliforms count were found to be more than the prescribed standards. This clearly indicates that the water is polluted, which may be attributed to release of dumping of waste, washing of clothes, vehicles and livestock and release of offerings from the temple.
- Presence of good fish density, growth of lotus and diversity of bird species indicate dependence of diverse species on wetlands. But as per the quality assessment, the water has high levels of ammonical nitrogen. This may lead to stress levels for wild life propagation. Eutrophication of the lake is very prominent and cause of great concern.
- To avoid such a situation, anthropogenic impacts should be minimized by spreading awareness among the residents living near the lake regarding the importance of lake.

Holding pond



Picture No. 14: Holding pond at Khandeshwar, Navi Mumbai

Navi Mumbai is a reclaimed city and certain areas lie about one meter below the sea-level. Owing to the fact that the area has high precipitation levels, there is always a threat of water logging, especially when heavy rains high tides. While developing the city, the CIDCO adopted the Dutch technology to reclaim land. This method involves construction of bunds (dykes) rising above Highest High Waterline along coast water line to block entry of tidewater in the area proposed to be reclaimed.⁷

These entities, more commonly known as the 'Dutch dykes', have been especially designed and installed with unidirectional flap gates along the bund wall. They help restrict the intrusion of sea water during high tide and open only when the tide level recedes, thus allowing the release of water accumulated due to surface runoff.

Given the functional significance of these wetlands, they became very essential and a unique feature of the city since they function as buffers from flooding, serve as breathing spaces and help revive the aquatic ecosystems. Thus, it was important to convey the importance of holding ponds to the citizens. This particular holding pond near Khandeshwar Lake is rich in its bird diversity and also an important example of a pond ecosystem.

Birds such as Red wattled Lapwing (*Vanellus indicus*), Ashy Prinia (*Prinia socialis*), Black winged Stilt (*Himantopus himantopus*), Egrets (*Egretta sps*), Pond herons (*Ardea grayii*), Black kites (*Milvus migrans*) and so on were spotted during the trail. Currently, it is facing threat from the discharge of domestic waste, accumulation of dumped solid waste, open defecation and so on. The participants were sensitized about the concept of a holding pond and its

⁷ [CIDCO \(City and Industrial Development Corporation of Maharashtra Ltd\)](#)

importance in the city by TERI's experts. All were glad to learn about the specific characteristics and uniqueness of the pond.

Table No. 7: Water quality parameters recorded for sample collected at the Holding pond

Water Quality Parameters (Holding Pond)							
Sr No	Class of Water						Observed Values
	CPCB MPCB	A A-I	B Not Prescribed	C A-II	D A-III	E A-IV	
1	pH	6.5-8.5	6.5-8.5	6.0-9.0	6.5-8.5	6.0-8.5	7.8
2	D.O (mg/l)	6 or more	5 or more	4 or more	4 or more	-	-
3	B.O.D (mg/l)	2	3 or less	3 or less	-	-	88
4	Ammonical Nitrogen (mg/l)	-	-	-	1.2 or less	-	27.96
5	Total Coliform MPN/100ml	50 or less	500 or less	5000 or less	-	-	225
	Best Designated Use					Holding Pond	

Inference:

- The water quality parameters for BOD and ammonical nitrogen were observed to be very high. The parameters do not meet the criteria even for propagation of wildlife and fish.
- A good diversity of birds indicates that the area is used by various bird species as a feeding ground. However, the ecosystem was heavily affected with anthropogenic impacts such as solid waste and sewage disposal, defecation along the lake and so on, which could prove detrimental to the ecosystem. Anthropogenic activities have caused septic in the pond. This may prove to be a serious issue for birds.
- Since the wetland ecosystem has a more mechanical and physical function of regulating the seawater intrusion during high tide and also create a transit for the surface run off during monsoons, blocking of the flap gates due to dumping solid waste may result in malfunctioning of the whole system. This ecosystem has a direct interphase with the creek water and any disturbance in this system will have various compounded impact like flooding, disturbing the tidal ecosystems and associated wildlife.
- The significance of this unique wetland system needs to be further emphasized and the direct access to the whole system needs to be controlled.

Marshy area, Khandeshwar railway station



Picture No. 15: Marshy area behind Khandeshwar temple

Marsh lands are low-lying wetlands with grassy vegetation. It is usually a transitory zone between land and water. Marshy areas support a typical habitat suitable for birds due to plenty of food supply such as aquatic invertebrates. A visit to this area provided the participants an insight into a typical marshy wetland preferred by birds as a habitat for feeding and nesting.

A small marshy patch behind the Khandeshwar railway station caught the interest of the participants. Small waders like the Sand Plovers (*Charadrius sps*) were spotted at the location. TERI's experts identified and explained the significance of sighting of these birds at the place. Many birds like Ruddy Shell Duck (*Tadorna ferruginea*) and Little Grebe (*Tachybaptus ruficollis*) were sighted. Participants were enthused to see a large diversity of birds at a single location. Discharge of domestic waste was also observed in the area, which had resulted in pollution. Participants were also explained how such activities are disturbing the natural balance of the wetland. This location helped the participants understand the importance of marshy areas for birds and the reasons for its conservation.

Inference:

Marsh lands prove to be a source of abundant food for the birds. Sighting of waders such as sandpiper indicate a good feeding ground for the wetland birds.

Currently, discharge of domestic waste can be seen. This can prove to be a threat for the birds and also influence the water quality. An alternative for the release of this domestic waste should be explored by the concerned agencies.

Session III: Experience sharing and concluding session

Post the informative trail, participants were given 20 minutes to prepare a brief presentation on their experience and learning from the trail. The participants under the age group of 18 were provided with a jumble word game puzzle (Annexure 5), which comprised the names of birds, habitats and plants found in wetland ecosystem.



Picture No. 16: Children solving “Find the words” and participants preparing the presentations (From left to right)

In the meantime, Dr. Anjali Parasnis, Associate Director, TERI-WRC welcomed Mr. Y.B Sontakke, Regional Officer, Navi Mumbai, MPCB. Dr. Parasnis explained to everyone how he had helped TERI in the event by providing the results of water samples. He further interacted with the participants from both the groups about the wetlands, issues and the necessary measures. Mr. Lele and Mr. B. N. Nayak expressed the need to minimize or ban quarrying or mining activity near the wetland areas. Mr. Sontakke fully agreed.



Picture No. 17: Mr. Sontakke interacting with participants along with Dr. Anjali Parasnis, Mr. Lele and Mr. Nayak



Picture No. 18: Presentations presented by participants: Team Lonar (Left) and Team Bhigwan (Right)

Both the groups, Bhigwan and Lonar, share their experiences about the sites visited, their significance and the need to conserve them. They also shared their learning absorbed during the informative trail. Youngsters took an active part in the activity and presented their views through creative drawings and slogans about conservation of wetlands. The team wise highlights of the presentations have been discussed below.

Team Lonar

Mr. Manish Pandit pointed out the contrast between environment and development. He also expressed a desire to sensitize youth for future conservation of such habitats. Mr. Shripad Lele also pointed out how deforestation around Owe dam by the locals will degrade the riparian zone of the lake. Ms. Nikita Bhavé and Prachi Jadhav expressed their concern for mangroves by portraying a picture about the past and current scenarios.

Team Bhigwan

Some participants also explained the issue of oil spills, which are causing destruction in the mangrove wetland habitat. Ms. Gayatri Unnikrishnan stressed on updating the educational system by adding the concept of wetlands in the syllabus from lower classes and linking the theories with practical field knowledge. She cited her own example and said, “I was ignorant about wetlands when it was taught during environmental science lectures but now, due to this trail, I am very interested in wetlands”.

Mr. Shirish Garud, *Associate Director and Senior Fellow*, TERI and Mr. Divanji Pawar expressed their views about the overall programme and announced Team Bhigwan the winner for best presentation. Prutha Lanjekar then shared a vote of thanks with all the participants. Dr. Anjali Parasnis concluded the programme by addressing the participants about their role in informing the young generation about wetlands.

Feedback of the visit

Participants gave a positive feedback about the informative trails. All of them accepted they were ignorant and negligent towards such significant entities existing in such close vicinity of their residences. The participants promised to be more vigilant towards the wetlands. Some important feedbacks provided by the participants are as follows:

- Mr. Manish Pandit, Deepak Fertilizers & Petrochemicals Corporation Limited, a civil engineer by profession, said, “Civil engineers and environmentalists seldom get together. Till date, I was completely naïve about the significance of the riparian zone of a wetland and its importance for the whole ecosystem. Henceforth, I will always consider this factor, whenever necessary. I thus thank TERI for about such an important entity.”
- Students Nikita Bhavé and Prachi Jadhav said, “We did not know the exact concept of a wetland until now. Our educational syllabus just gave us a brief introduction about the wetlands. This experience helped us connect better with these important ecosystems.” They further elaborated, “We really thank TERI for organizing such an event for students. We will always volunteer for TERI in future and help them organize many such activities related to wetlands and other environment-related issues.”
- A lady employee of Deepak Fertilizers & Petrochemicals Corporation Limited expressed her concern about wetlands by stating, “If wetlands play such a significant role in the ecosystem, they should be conserved with proper management.” She further suggested, “Very important wetlands like mangroves should be conserved by creating a proper buffer zone around it. No developmental activities should be permitted in this buffer zone, which may directly or indirectly harm these wetlands.”

Annexure 1: List of Participants

Sr no.	Name	Age	Designation	E mail
1	Mr. Sunil Bhave	50	Sr. Manager	sunilbhave66@gmail.com
2	Nikita Bhave	14	student	bhave.nikita@gmail.com
3	Mr.Shriram Shrinivasan	31	-	sri0001@yahoo.com
4	Prashant Jain	22	Asst.Data Processor	prashant.jain@gmail.com
5	Mr.B.N.Nayak	60	Managing Director	bighna.nayale@fugro.in
6	Mr.R.B.Jayaraman	61	Survay Manager	rb.jayaraman@gmail.com
7	Ramdas Jadhav	46	Sr. Manager	ramdasjadhav66@gmail.com
8	Prachi R Jadhav	18	Student	-
9	Shripad J Lele	56	Associate Vice President	shripad.lele@dfpcl.com
10	P.S.Patil	54	Asst. General Manager	prakashpatil@dfpcl.com
11	Sujatapatil	46	-	-
12	Suresh B.Amle	47	Sr. Manager	suresh.amle@dfpcl.com
13	Mrs.Manisha.S.Amle	43	-	-
14	Shri Pal Singh	51	-	shripalsingh1963@yahoo.in
15	Manish M.Pandit	41	-	mmPandit1972@radiffmail.com
16	Urvi M.Pandit	-	-	-
17	Datta F.Hande	46	Manager QA & QC	dattah01@gmail.com
18	Jay D.Hande	11	-	"
19	T.K.Shinde	47	-	shindetanaji09@gmail.com
20	Anil A.Ugale	48	-	anil.ugale@dfpcl.com
21	M.P.Patil	42	-	manojpatil887@yahoo.com
22	Umesh Kalbhor	23	GET	umeshkalbhormgp@gmail.com
23	Vartak B. G.	48	Lab manager	balkrishnavartak@gmail.com
24	Pranit B.G.	14	-	-
25	Jayamani B.Mirajkar	41	-	-
26	Cyrus B. Mirajkar	13	-	-
27	ShivajiThawl	-	Safety Manager	thawl.shivaji21@gmail.com
28	Sunil Ghadi	53	AGM Mech	sunil.ghadi@dfpcl.com
29	Mrs. Geetanjali S.Ghadi	48	-	-
30	Sneha Shriram	38	QHSE Manager	s.shriram@fugro.in
31	K. Unni Krishnan	51	-	unnikrishnan.k@dfpcl.com
32	Gayatri UnniKrishnan	16	-	-
33	Anil H .Kadam	47	Sr Manager	anilkadam@dfpcl.com
34	Prasad Khale	24	Tech Asst	prasad.18jan@yahoo.co.in
35	Abhijeet Nag	45	Project Manager	a.nag@fugro.in
36	Shirish Deshmukh	44	Safety Manager	shirish.deshmukh@dfpcl.com
37	Mayur Mogre	26	Officer Tendering	mayursfe@gmail.com
38	Vaibhav Birmole	27	Environ Engineer	vaibhavbirmole@gmail.com
39	Indrayani Nimkar	23	Research Associate	indrayani.nimkar03@gmail.com
40	Mayuri R. Naik	26	Technical lab Assitant	mayuri.mrn02@gmail.com
41	Vijay S.Khare	45	Sr Manager	vijayskhare@rediffmail.com

Sr no.	Name	Age	Designation	E mail
42	Prashad C. Mahesker	43	GM	prasad.maheskar@dfpcl.com
43	A.S. Mawande	45	Sr Manager	atul.mawande@dfpcl.com
44	VidyeshV.Nimkar	43	Sr Manager	vidyesh.nimkar@dfpcl.com
45	ArunDeshmukh	52	Asst Gen Manager	arundeshmukh@dfpcl.com
46	Dr T.K. Saha	45	-	tapas.saha@dfpcl.com
47	Rishab Saha	10	-	-
48	Diptesh Ganguly	25	-	dgangulysq@gmail.com
49	Umesh Kalbhor	23	GET	umeshkalbhormgp@gmail.com
50	Jadhav S.D	48	-	-
51	Roshvi R.s.	21	-	-
52	Ferusha B.Mirajkar	17	-	jasbery@gmail.com
53	Sharen angel Mirajkar	20	-	sharen251093@gmail.com
54	Alka S.Jadhav	42	-	-
55	Tanuja Mhatre	19	Student	
56	Kajal Vishwakarma	20	Student	
57	Sahil Mulla	19	Student	
58	Swapnil Dumbre	21	Student	
59	Uday Yadav	22	Student	Uday.yadav.uy@gmail.com
60	Shashikumar Sharma	21	Student	Shashi17jan@gmail.com
61	Mohammad Faizan	18	Student	Mumar4499@gmail.com
62	Anjali Parasnis	45	Associate Director	anjali@teri.res.in
63	Shirish Garud	48	Senior Fellow	Shirishg@teri.res.in
64	Prathmesh Chourey	27	Associate Fellow	Prathmesh.Chourey@teri.res.in
65	Namrata Randive	27	Research Associate	Namrata.Randive@teri.res.in
67	Swati Tomar	26	Research Associate	Swati.tomar@teri.res.in
68	Aditi Phansalkar	27	Research Associate	Aditi.phansalkar@teri.res.in
69	Prutha Lanjekar	28	Research Associate	Prutha.lanjekar@teri.res.in
70	Chinmay Kinjavdekar	29	Research Associate	Chinmay.kinjavdekar@teri.res.in
71	Pallavi Barua	30	Research Associate	Pallavi.barua@teri.res.in
72	Amol Handore	29	Project Consultant	ahandore@gmail.com
73	Pradeep Desai	29	Project Consultant	Deep_256@hotmail.com
74	Yatish Lele	24	Project Consultant	yatishlele@gmail.com
75	Prakash Joshi	40	Support staff	Prakashjoshi2011.teri@gmail.com
76	Lalit Joshi	23	Support staff	-

Annexure 2: Water Sampling & Test Results



Picture No. 19: Collection of water sample at Ballaleshwar Lake



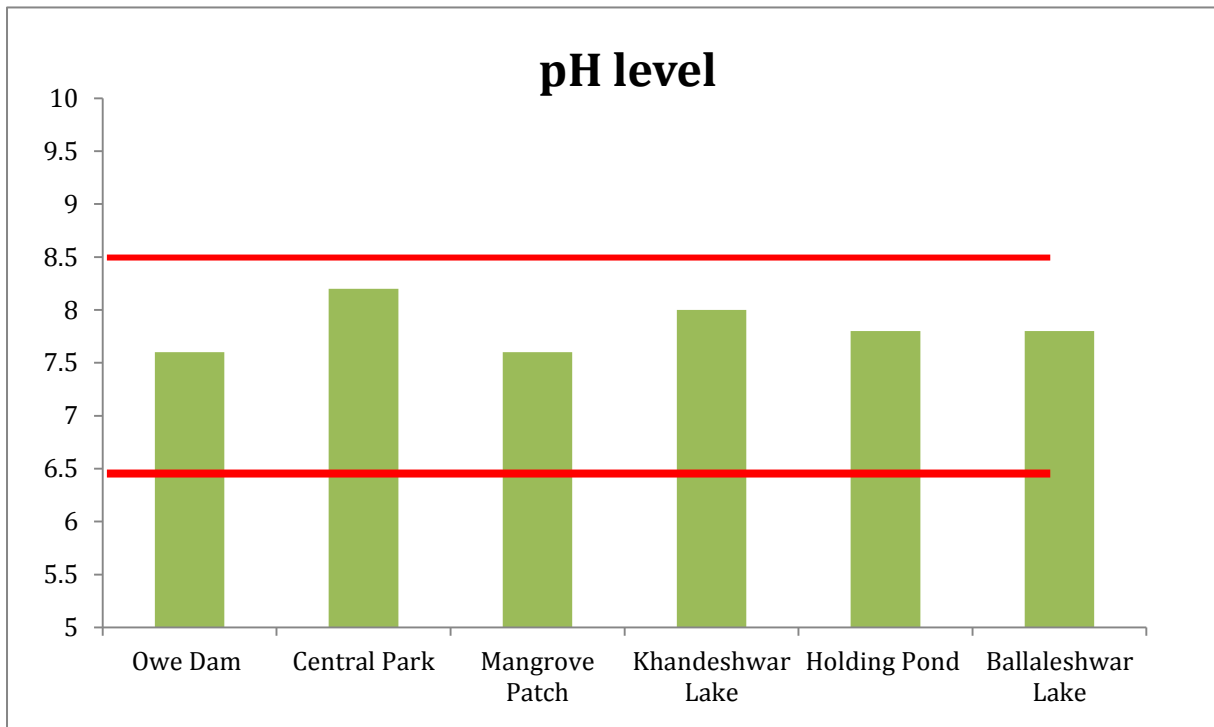
Picture No. 20: Collection of water sample under supervision of MPCB's field officer



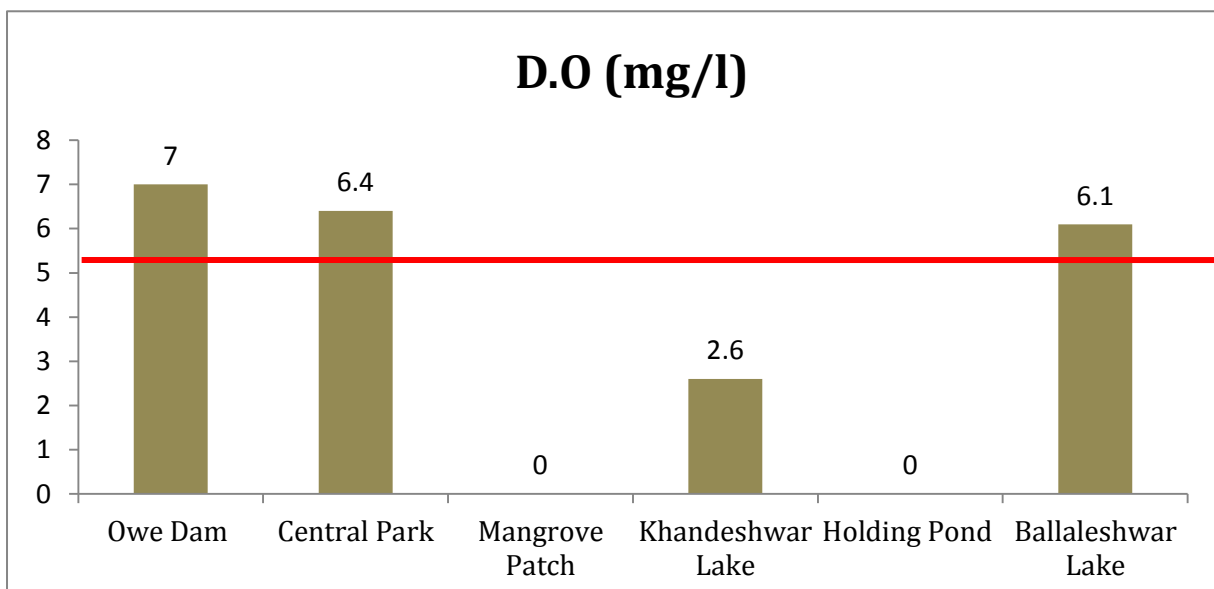
Picture No. 21: Scientific sampling of the water samples by experts from TERI



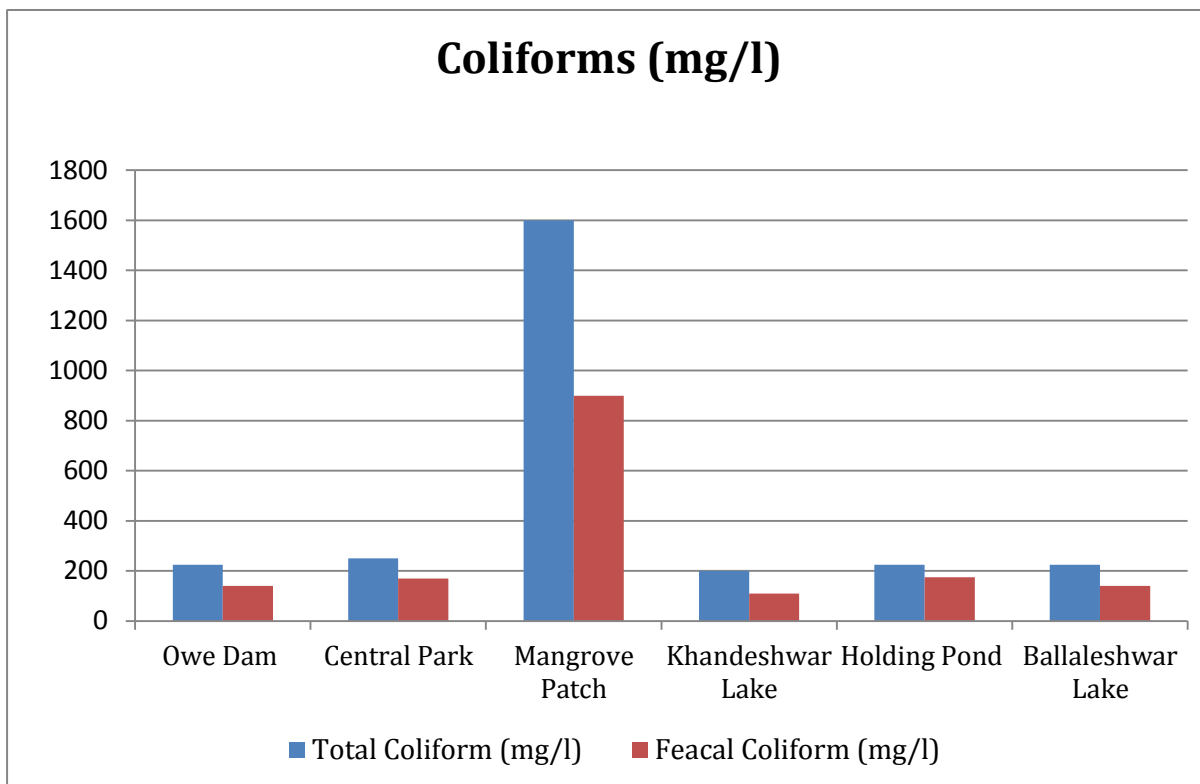
Picture No. 22: Appropriate labeling of water sample collected under guidance of MPCB's field officer



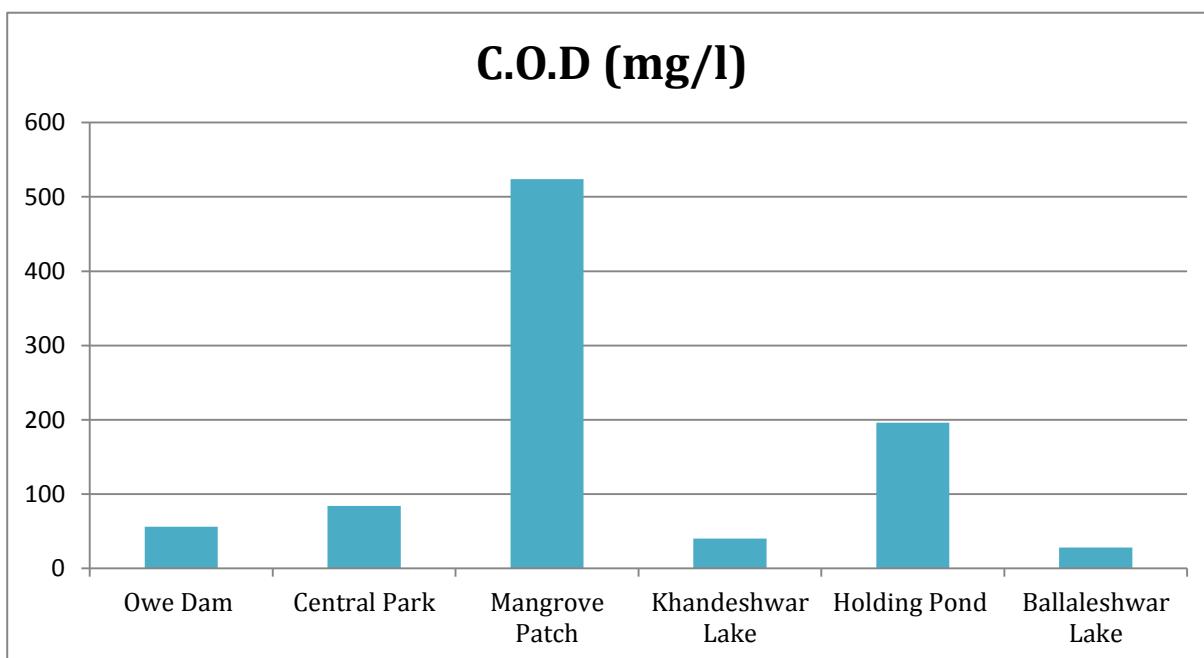
Inference: Within range for all sites



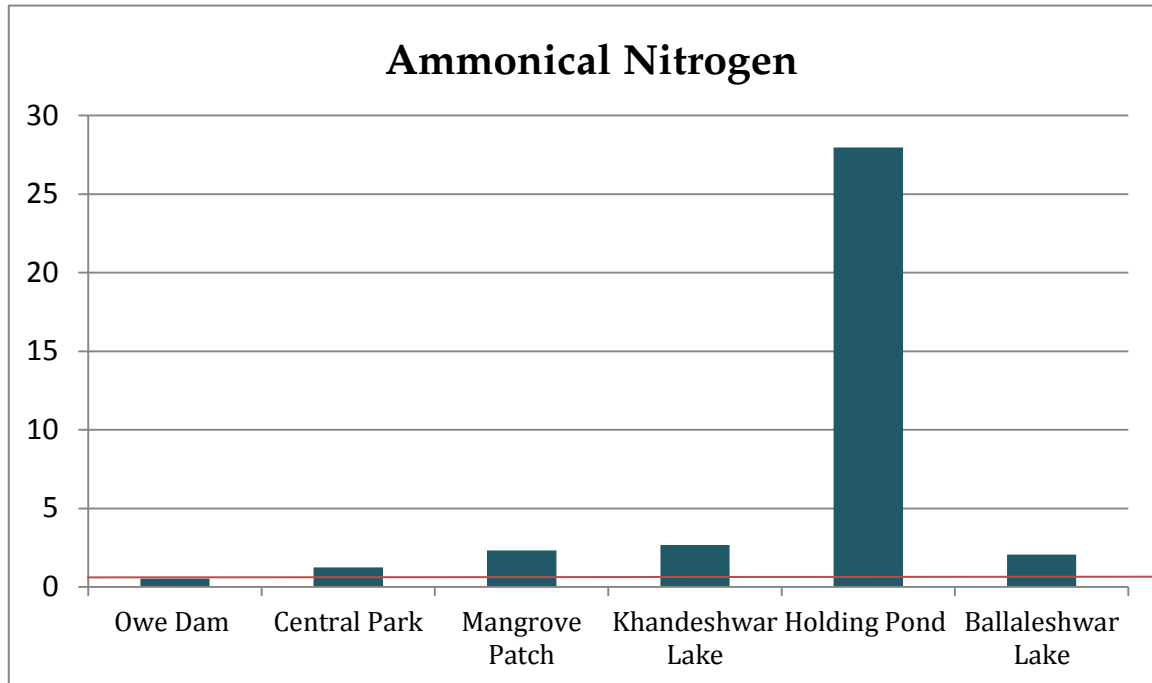
Inference:
Three sites registered DO levels below desired limits indicating stress on aquatic biodiversity, primarily on fishes.



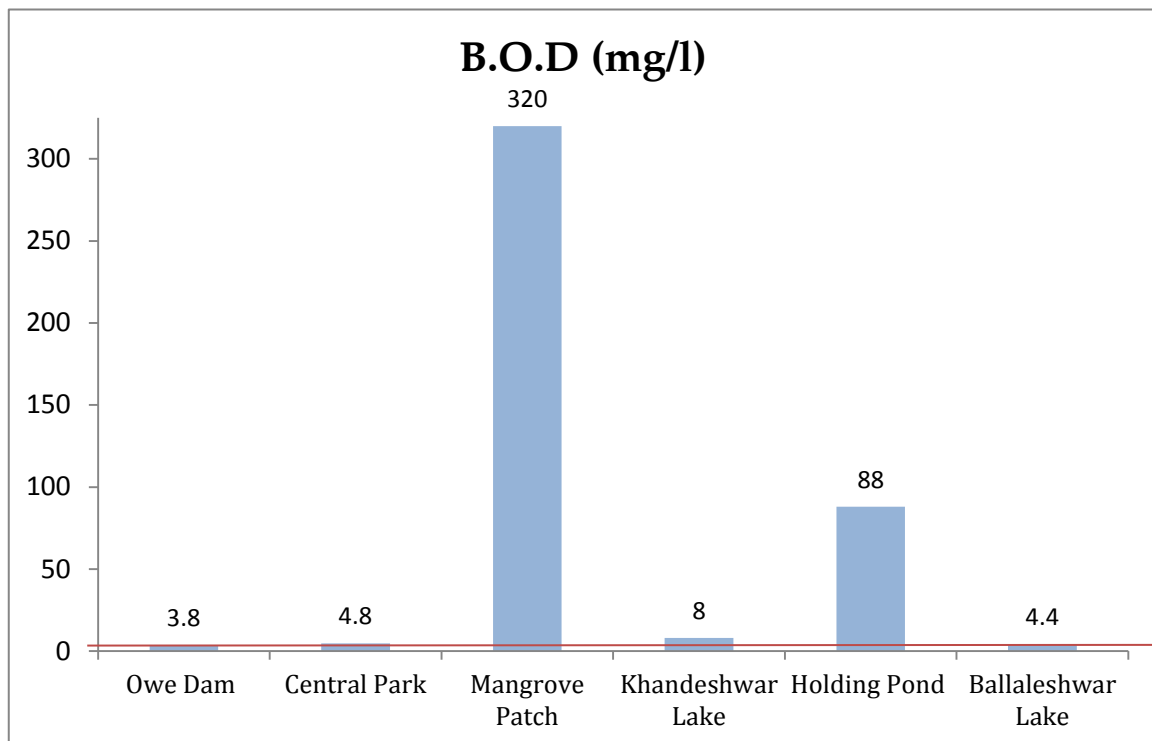
Inference: Indicates release/pollution from domestic sewage. Water quality at mangrove patch registered highest coliform levels.



Inference: Higher COD levels indicate release of chemical effluents from industrial. Water at Mangrove patch and holding pond are influenced with industrial waste.



Inference: Holding Pond indicates low level of oxygen, high growth of algae and other plants, septic may have occurred.



Inference: Mangrove patch has a very high B.O.D reading compared with the permissible limit, which clearly indicates lack of oxygen in the water. This reason for the same is excessive release of domestic waste.

MAHARASHTRA POLLUTION CONTROL BOARD

Phone : 022-67195042
022-67195012
Fax : 022-27780684
Website : <http://mpcb.gov.in>
E-mail : mahacenlab@rediffmail.com



Central Laboratory
Nirmal Bhavan, Plot No. 3,
TTC MIDC, Industrial Area
Sheel-Mahape Road, Mahape,
Navi Mumbai – 400 710

WATER SECTION Analysis Report

MPCB / C.Lab. No. / 18

/2014

Date : 01/02/2014

To,
Mr. Prathmesh Chourey,
The Energy and Resources Institute,
Western Regional Centre, Office No.318,
Sec-11, C.B.D. Belapur, Navi Mumbai.

Report No.: CL / P – 81 (1) to (6)

Date of Collection : 27/01/14 & 28/01/14

Date of Receipt : 28 / 01 / 2014

Sr. No.	Parameter	(1) WWD 1401 Owe Dam	(2) WWD 1402 Central Park	(3) WWD 1403 Mangrove patch	(4) WWD 1404 Khandeshwar Lake	(5) WWD 1405 Khandeshwar holding Pond	(6) WWD 1406 Ballaleshwar Lake
1.	pH	7.6	8.2	7.6	8.0	7.8	7.8
2.	Dissolved oxygen	7.0	6.4	Nil	2.6	Nil	6.1
3.	B.O.D.	3.8	4.8	320.0	8.0	88.0	4.4
4.	C.O.D.	56.0	84.0	524.0	40.0	196.0	28.0
5.	Salinity (gm/Kg)	0.17	0.17	29.99	0.10	2.30	0.10
6.	Ammonical Nitrogen	0.54	1.25	2.33	2.68	27.96	2.05
7.	Total Coliform	225.0	250.0	1600.0	200.0	225.0	225.0
8.	Faecal coliform	140.0	170.0	900.0	110.0	175.0	140.0

***The sample collected by party, hence the result will have no evidentiary value.**

Note: 1) All details are in mg/lit except pH and Salinity.

2) BDL indicates 'Below Detectable Limit'.

3) Total and Faecal Coliform are in MPN (Most Probable Number)

Archozale
I/c. Central Laboratory
M.P.C. Board, Mahape,
Navi Mumbai

Annexure 3: Agenda of the programme



Informative Trail to Wetlands of Navi-Mumbai
 7th Consecutive World Wetland's Day Commemoration by
 TERI (Western Regional Centre)

February 2nd, 2014
Khandeshwar Lake Complex, New Panvel

08.00 - 08.30 AM	Registrations and Breakfast	
08.30 - 08.35 AM	Welcome Note <i>Ar. Namrata Randive, Research Associate TERI-WRC</i>	
	Screening of Audiovisuals	
08.35 - 08.45 AM	<ul style="list-style-type: none"> • Ramsar Video on Wetlands – <i>An overview of Wetlands</i> • Our Wetlands our Heritage – <i>Wetlands of Maharashtra</i> 	
08.45 - 08.55 AM	Briefing and Orientation <i>Mr. Prathmesh Chowrey, Associate Fellow TERI-WRC</i>	
08.55 - 09.00 AM	Team Formation and Proceed to Informative Trail	
	Team Bhigwan	Team Lonar
09:00 – 12:00 PM	<ul style="list-style-type: none"> • Mangrove Habitat – <i>Kamothe</i> • Holding Pond – <i>Khandeshwar</i> • Marshland – <i>Khandeshwar</i> • Ballaleshwar Lake – <i>Panvel</i> 	<ul style="list-style-type: none"> • Owe Dam – <i>Kharghar</i> • Constructed wetland – <i>Kharghar</i> • Mangrove Habitat – <i>Kamothe</i> • Holding Pond – <i>Khandeshwar</i>
12:00 – 12:15 PM	Assemble at Khandeshwar Lake Complex	
12:15 – 12:30 PM	Discussions and Experience Sharing by Team Bhigwan and Team Lonar	
12:30 – 12:40 PM	Wetland Management Program <i>Dr. Anjali Parasnis, Associate Director, TERI-WRC</i>	
12:40 – 12:50 PM	Address/ Remarks <i>Hon'ble Chief Guest</i>	
12:50 – 12:55 PM	Vote of Thanks <i>Ms. Pruthi Lanjekar, Research Associate TERI-WRC</i>	
12:55 – 01:00 PM	Group Photograph	
01:00 PM	Lunch	

Organizers



The Energy and Resources Institute

Principal Sponsors



DEEPAK FERTILIZERS AND PETROCHEMICALS CORPORATION LIMITED

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Maharashtra Pollution Control Board



Ramsar CONVENTION ON WETLANDS (Ramsar, India, 1971)

37



Annexure 4: Checklist of Birds

Biodiversity of wetlands of New Mumbai



Common Coot:

Coots have black plumage and white bills. They feed mainly on plant material, small animals and eggs. They are aggressively territorial during the breeding season.



Purple Moorhen

The Purple Moorhen is, a "swamp hen" in the rail family, makes loud, quick, bleating and hooting calls, which are hardly bird-like in tone. The Purple Swamp Hen prefers wet areas with high rainfall, swamps, lake edges and damp pastures. The birds often live in pairs and larger communities.



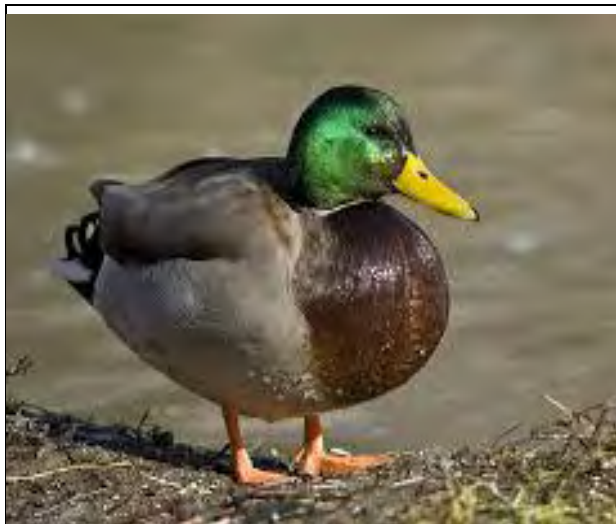
Bronze-winged Jacana

The Bronze-winged Jacana is identified by their huge feet and claws, which enable them to walk on floating vegetation in the shallow lakes, their preferred habitat. It lays four black-marked brown eggs in a floating nest.



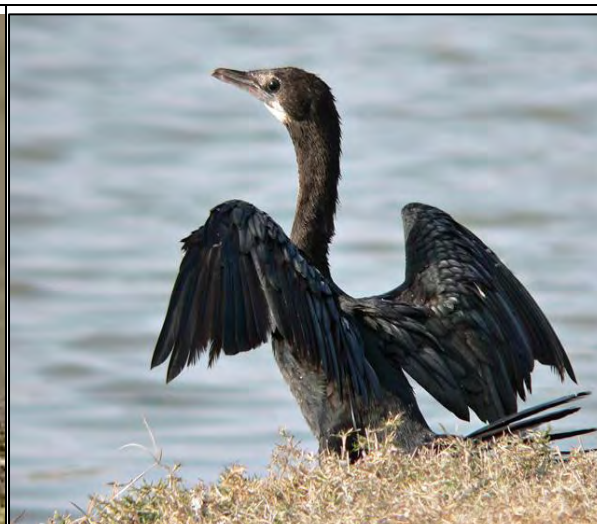
Asian Palm Swiftlet

It is a common resident breeder India. The down and feather nest is glued to the underside of a palm leaf with saliva, which is also used to secure the usually two or three eggs. This is a bird of open country and cultivation, which is strongly associated with oil palms.



Mallard:

It is omnivorous duck. The male has a nasal call and a high-pitched whistle, while the female has a deeper quack sound. The ducklings are fully capable of swimming as soon as they hatch. They instinctively stay near the mother for warmth and protection as well as to remember their habitat and forage for food.



Cormorant: (Water crow)

They are bronze brown with black feathers with a long narrow bill. Breeding birds have a short white ear tuft. The nest is a platform of twigs placed in the forks of partially-submerged trees. The nests are placed in close proximity with other water birds in dense colonies.



Ashy Prinia

It is a common bird in urban gardens and farmland. It feeds on insects and its song is a repetitive chup, tchup, tchup or zeet-zeet-zeet. Another call is a nasal tee-tee-tee. It is most easily distinguished by the loud snapping noise it makes during flight. The Ashy Prinia builds its nest close to the ground in a shrub or tall grass and lays 3-5 eggs.



Sandpiper:

Sandpipers have long bodies and legs, and narrow wings long bill. It nests in open areas in the ground and defends its territories with aerial displays. It feeds basically on fish caught by probing mud of wetland.



River tern:

The bird has a forked tail, long pointed wings, yellow bill red legs and black cap in breeding plumage. It is almost exclusively found on freshwater, rarely venturing to tidal creeks. It feeds by plunge-diving for fish, crustaceans, tadpoles and aquatic insects in rivers, lakes and tanks.



Pond Heron:

It is stocky with a short neck, short thick bill and buff-brown back. They are semi-colonial breeders and form communal roosts. They usually feed at the edge of ponds but make extensive use of floating vegetation such as water hyacinth to access deeper water.



Egret:

The characteristics of all egrets is a slow flight, with its long neck retracted (S-shaped). All species of egrets breed communally with large flocks on trees called as heronaries. All species usually have insectivorous and carnivorous diet. The commonly found egret types are Cattle egret, Median egret and Greater egret.



White Wagtail

The White Wagtail is a slender bird, with the characteristic long, constantly wagging tail. It comprises variety of habitats like forests, wetlands and so on, except deserts. Its diet mainly comprises of terrestrial and aquatic insects. Other small invertebrates form the major part of the diet.



Black winged stilt

They have long pink legs, a long thin black bill, with a white head and neck with a varying amount of black. The breeding habitat of all these stilts is marshes, shallow lakes and ponds. The nest site is a bare spot on the ground near water. These birds often nest in small groups.



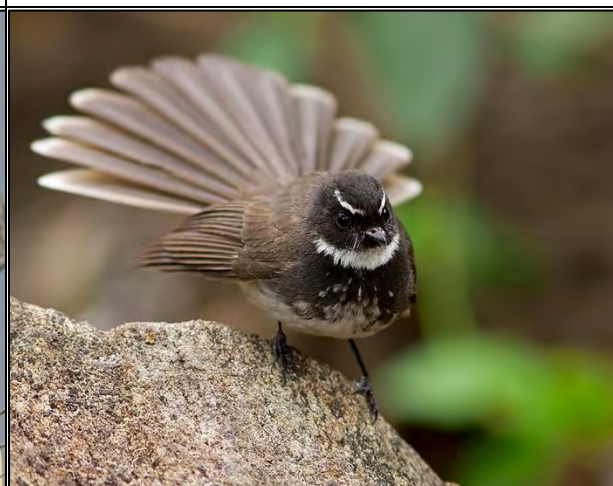
Grey Heron

It feeds in shallow water, catching fish, frogs, insects and sometimes even small mammals and reptiles. It will often wait motionless for prey, or slowly stalk its victim. It has a slow flight, with its long neck retracted (S-shaped). This species breeds in colonies (heronries) in trees close to lakes, the seashore or other wetlands.



Purple Heron:

It has a slow flight, with its neck retracted. It breeds in colonies in reed beds or trees close to large lakes or other extensive wetlands. It builds a bulky stick nest. It feeds in shallow water, spearing fish, frogs, insects and small mammals. It will often wait motionless for prey or slowly stalk its victim.



White browed Fantail Flycatcher

The bird has a white brow like stripes above the eye. The White-browed Fantail is insectivorous and often fans its tail as it moves through the undergrowth.



Red wattled lapwing:

It has characteristic loud alarm calls, which are variously rendered. The nest is usually just a simple shallow scrape in the ground encircled with small stones or hard clay. On sensing danger, the mother quickly calls the chicks and hides them under her wings.



White throated kingfisher:

This species mainly hunts large crustaceans, insects, earthworms, rodents, snakes, fish and frogs. Predation of small birds such as the Oriental White-eye, chick of a Red-wattled Lapwing, sparrows and munias has been reported. The nest is in a burrow excavated by both birds of the pair in a low vertical riverbank, or sometimes a quarry or other cutting.



Small Blue Kingfisher:

They are found by slow-flowing rivers, mangrove creeks, ponds and in swamps. They are small in size. Their food is mainly fish but sometimes, they catch aquatic insects such as dragonfly larvae and water beetles. In winter, it feeds on crustaceans including freshwater shrimps.



Grey Wagtail:

It is named so for its continuous wagging of tail during feeding on insects as a territorial display. These birds feed on a variety of aquatic invertebrates including adult flies, mayflies, beetles etc. It lives near fresh water streams or meadows. It nests close to the water body in dense vegetation and lays around 6- 8 eggs.



Yellow Wagtail:

Yellow wagtails are olive-green above and yellow below with a yellow face and a black and white tail. Males are brighter than females. They nest on the ground or in long grass, using plants, grasses and stems to build a cup-shape nest lined with fur.



Wire tailed swallow:

This species is named so from the very long filamentous outermost tail feathers, which trail behind like two wires. The half bowl-like nests are placed on vertical surfaces near water, under cliff edges or more commonly on man-made structures such as buildings and bridges. Swallows collect mud in their beak in order to build their nest.



Black Drongo:


It is known for its aggressive behavior against much larger birds, like crows invading its territory. Smaller birds often nest in the well-guarded vicinity of a nesting Black drongo. It feeds on insects.



Small Green Bee eater:

It feeds on insects, especially bees, wasps and ants. The entire plumage is bright green and tinged with blue. They prefer nesting on the ground along rivers and lakes. The nest tunnel that they construct in a sandy bank can run as much as 5 feet long.

Annexure 5: Wetland based jumble word puzzle



Informative Trail to Wetlands of Navi Mumbai

PUZZLES BASED ON INFORMATIVE TRAIL

E	T	G	L	N	D	N	O	P	C
D	E	K	O	O	D	L	K	C	A
N	R	E	T	R	E	V	I	R	T
G	G	T	U	E	G	R	E	O	L
H	E	E	S	H	S	R	A	M	R
J	E	M	R	D	D	I	B	K	E
T	L	P	A	N	E	U	U	F	G
J	T	L	S	O	R	L	I	S	R
K	T	E	D	P	T	O	S	A	I
Q	A	D	N	A	L	T	E	W	E
D	C	U	C	A	Y	U	T	J	R
T	N	A	R	O	M	R	O	C	H

2nd February,
2014
Khandeshwar Lake
Complex, New
Panvel

Clues:


1. Cormorant
2. River Tern
3. Lotus
4. Cattle Egret
5. Marsh
6. Pond Heron
7. Wetland

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Maharashtra Pollution Control Board

RAMSAR
CONVENTION ON WETLANDS
(Ramsar, Iran, 1971)

Answer Key for the puzzle:



Informative Trail to Wetlands of Navi Mumbai

PUZZLES BASED ON INFORMATIVE TRAIL


E	T	G	L	N	D	N	O	P	C
D	E	K	O	O	D	L	K	C	A
N	R	E	T	R	E	V	I	R	T
G	G	T	U	E	G	R	E	O	L
H	E	E	S	H	S	R	A	M	R
J	E	M	R	D	D	I	B	K	E
T	L	P	A	N	E	U	U	F	G
J	T	L	S	O	R	L	I	S	R
K	T	E	D	P	T	O	S	A	I
Q	A	D	N	A	L	T	E	W	E
D	C	U	C	A	Y	U	T	J	R
T	N	A	R	O	M	R	O	C	H

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Annexure 6: Photo Gallery



Picture No. 23: Participants walking through mangroves



Picture No. 24: Participants being explained about quarrying activities affecting wetlands



Picture No. 25: Participants observing the dyke at holding pond



Picture No. 26: Participants collecting water samples



Picture No. 27: Participants from both team presenting their respective presentations (Top - Lonar team and Bottom - Bhigwan team)



Picture No. 28: Both teams group photographs (Top - Lonar team and Bottom - Bhigwan team)

Appendix A

Wetlands

Wetlands are areas that are seasonally or perennially covered by water, which determines the soil type of that region and associated plant and animal life. The Ramsar Convention defines wetlands as:

“areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres”.⁸

Examples of natural wetlands are lagoons, rocky shores, mangroves, lakes, rivers, marshes, paddy fields and so on. Examples of man-made wetlands are fish and farm ponds, salt pans, reservoirs, canals and so on.

They are areas where water is the primary factor controlling the environment and supports floral and faunal life. They occur where the water table is at or near the surface of the land, or where the land is covered by the water⁹. Wetlands contribute significantly to a region's economy by providing water, fishery resources, agricultural products and tourism opportunities. They also serve as habitats for several species of flora and fauna, some of which are endangered and many species are harvested for food and as a source of income. They also have environmental significance such as groundwater replenishment, retention of nutrients and sediments, water purification as well as helping to adapt to changes in climate by controlling flood and providing protection from storm.

Since wetlands are of such varied nature, the exact and real extent of different types of wetlands on the earth's surface is unknown. According to UNEP World Conservation Monitoring Centre, the global estimate of areal extent of wetlands is approximately 570 million hectares, which contribute to 6% of earth's land surface¹⁰.

World Wetland Day

During 1960s, biodiversity experts and environmental conservationist in Europe noticed the decreasing marshlands and waterfowl in the region. Following this, several meetings and conferences were held during which a convention text was negotiated to conserve the species as well as the habitats, namely wetlands which housed these species. On February 2, 1971, the Convention on Wetlands, widely known as 'Ramsar Convention' (formally, the Convention on Wetlands of International Importance, especially as Waterfowl Habitat), was agreed by delegates of 18 nations in the Iranian city of Ramsar. The main objective of the treaty was the conservation and sustainable utilization of wetlands, i.e. to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. Gradually, several nations recognized the importance of wetlands and became contracting parties to this convention to safeguard their wetlands.

⁸ Based on Article 1.1 of Ramsar Convention.

⁹ [The Ramsar Convention Website](#)

¹⁰ [The Ramsar Convention Website](#)

TERI

The Energy and Resources Institute, commonly known as TERI (formerly Tata Energy Research Institute), established in 1974, is an independent, not-for-profit research institute based in New-Delhi. TERI's research activities are focused on energy, environment and sustainable development, devoted to efficient and sustainable use of natural resources. In its 38 years of existence, TERI has completed more than 2600 projects and has about 20 divisions.

According to Think Tanks and Civil Societies Program (TTCSP) at the International Relations Programme, University of Pennsylvania, TERI was ranked 20 in the list of top global think tanks on environment and 16 in top global think tanks on science and technology.

The institute is committed to provide sustainable solutions in the areas of energy, environment and resource management. As a part of TERI's commitment towards wetlands, TERI's Western Regional Centre (Navi Mumbai) has been celebrating World Wetlands Day (WWD) for the past six consecutive years under their flagship program entitled Wetland Management Programme (WeMaP) with an objective to sensitize diverse stakeholders through their active involvement. Please [click here](#) for more information.

Jaltarang

TERI launched Wetland Management Programme (**WeMaP**) in 2007 with research, policy intervention and awareness as its three main pillars. In its endeavor to bridge the gap and to ensure that the ecological, economic and aesthetic value of wetlands are acknowledged by them. TERI celebrates WWD under the title '**Jaltarang**' to deliberate on the current status, issues, views and policies pertaining to the preservation and restoration of fresh water resources.

Many of the wetlands present are often neglected and degraded for other uses. In urban and semi-urban areas, the dumping of waste and debris and reclamation of wetlands for new construction and development is a common practice. It is the lack of information and awareness about the role of these ecosystems in our daily life, the services they provide and the diversity that they add to our environment that leads to destruction of wetlands. That is why TERI is trying to spread awareness among the people through various measures.

TERI has been celebrating World Wetlands Day for the last six consecutive years. It has brought the key decision makers, government officials, environmentalists, researchers, educational institutions, industrialists, citizens and the media on a common platform. A glimpse of the same is given below:

Jaltarang, 2013:

- **Urban Wetland Cleanup Activity**

TERI had organized an urban wetland clean up activity to commemorate WWD, 2013 in collaboration with the Navi Mumbai Municipal Corporation (NMMC), Fugro Survey (India) Private Limited and the Ramsar Convention on Wetlands. The half day event focused on cleaning the wetland and a short nature trail to acquaint the participants with the migratory pattern of the flamingos, which fly to this wetland all the way from Rann

of Kutch in Gujarat, their feeding behavior, and also about the uniqueness of mangrove and mudflat ecosystems.

- **Brainstorming session on “Development of Urban Wetlands: Need, gaps and way forward.”**

A state-level brainstorming session ‘Development of Urban Wetlands: Need, gaps and way forward’ was organized by TERI in collaboration with the Urban Development department, GoM on February 4, 2013 to commemorate World Wetlands Day, 2013. The programme focused on identifying need and gaps and devising strategies for long-term conservation of urban wetlands. The program was attended by more than 75 municipal commissioners and town planners from 18 districts of Maharashtra.

[Click here for the report](#)

Jaltarang, 2012: “Experience the World of Wetlands”.

On the occasion of WWD 2012, TERI launched a first-of-its-kind interactive resource kit entitled, “Experience the World of Wetlands” for visually-challenged students. The kit comprised a booklet in Braille script (English language) and touches and feels sheets explaining the importance and significance of wetlands.

[Click here for the report](#)

Jaltarang, 2011: Event for senior architectural students.

WWD 2011 celebration programme was organized for students of architecture from Rachana Sansad Institute, Mumbai. The event screened a short multimedia film on wetlands prepared by Ramsar Convention, highlighting the social and environmental significance and benefits of wetlands.

Jaltarang, 2010: Poster dissemination activity, workshop on Recycle and Reuse, stakeholders meet and inauguration of solar tree “Ravi-Taru”.

With the help of 20 educational institutes and State Transport department, GoM, around 9000 handmade posters were disseminated on inter-state transport vehicles. This unique awareness drive was acknowledged by Limca Book of Records – 2011 and has been registered under the category for disseminating maximum number of handmade posters on transport vehicles in a record time.

[Click here for the report](#)

Jaltarang, 2009: Interaction with students in Navi Mumbai

TERI’s experts interacted with around 1000 students from 8 municipal schools in Navi Mumbai and emphasized upon wetland ecosystems and its importance in our day-to-day life.

Jaltarang, 2008: Awareness programme at Delhi Public School

TERI organized an event at Delhi Public School, Navi Mumbai to create awareness about the importance and preservation of wetlands in Mumbai amongst school children and teachers. A nature walk, presentation on significance of wetlands, poster and quiz competition were organized as a part of the sensitization programme. More than 150 children between the age groups of 10-14 years participated in the fun-n-learn programmes.

[Click here for the Report](#)