

# Roadmap to the 4<sup>th</sup> Industrial Development of Bangladesh Oceanographic Research Institute (BORI)

## BORI at a glance

Bangladesh Oceanographic Research Institute (BORI) in Cox's Bazar under the Ministry of Science and Technology is the country's first and only national institution on maritime science and oceanography. In the context of winning the maritime boundary delimitation with Myanmar and India, Bangladesh achieved sovereign right over all types of living and non-living resources within 1,18,813 square kilometers of sea area, 200 nautical miles Exclusive Economic Zone (EEZ) and 354 nautical miles Continental Shelf from the coast of the seafloor. To implement Blue Economy Plan Bangladesh Oceanographic Research Institute (BORI) is playing an important role in creating sea related research and development of skilled man power. The Institute is working to conduct all the activities as a focal point of Bangladesh at national and international levels in the field of oceanography.

## 4<sup>th</sup> Industrial Revolution

The Fourth Industrial Revolution (4IR) is a buzzword in today's world. It is one of the driving forces, which has the apex momentum on globalization. The increased use of internet and computers, communication devices, software and AIs, has led the world to the most competitive one ever before. In the field of oceanographic research, 4IR has brought enormous facilities through underwater robots, drones, AIs for research sampling and data collection. Through data buoy and marine robots real time monitoring of ocean is quite possible today. Oceanographer can get support from robots and drones to reach at arduous places at ocean. The modern sampling gears can help the scientists to get the right sample and right data at right place. Transgenic marine plant is quite possible to grow after an inclusive and detail research.

## Objectives of the Road map

Through the 4IR roadmap, BORI will achieve the following objectives:

- i. To create an environment conducive for ocean research, innovation and technology development.
- ii. To develop institutional capacity for ocean research and to cope up with modern technology around the world.
- iii. To accelerate the ocean research activities.

## Challenges:

- a) As BORI is a very new research institution, it has a lack of skilled manpower and experienced persons.
- b) Lack of related knowledge.
- c) Expensive installation of technologies.
- d) Scanty infrastructure and low budget.





**Roadmap of the activities to face the challenges of 4<sup>th</sup> Industrial Revolution**

Serial	Name & Description of 4IR Technology	BORI Plan	Time	Relevant Activities
1	<p><b>Autonomous Vehicles:</b></p> <p><b>i) Robots:</b> Electro mechanical machines that automate augment or assist human activities by a state of instructions. Robots can reduce human efforts. However, oceanographer has to collect underwater data and sample through robot like as mini submarine. Under water robot is a composition of robotics, naval architecture and marine engineering.</p> <p><b>ii) Drones:</b> Enabled by robots, these vehicles can operate and navigate with little or no human control. Oceanographers very often use the satellite data and images. They need close picture of sea surface to compare with satellite images for the detection of marine debris, oil spillage and nutritional behavior of seawater etc. Nevertheless, even high-resolution cameras are not capable of capturing good tilted and panned images from boats and ships Use of autonomous vehicle like drone will reduce the problems.</p>	<p>a) To collect marine surface robots filled with various sensors to collect surface data and sample which oceanographer will use regularly.</p> <p>b) To collect an underwater marine robot to collect various data and sample and to develop/modify underwater marine robots as own and unique instrument by BORI which will be used regularly by oceanographer.</p> <p>c) To collect a number of high quality drone that has high tilting and panning facilities for cameras.</p>	2024-2026	<p>a) BORI has planned to procure a marine surface robot filled with various sensors to test and trial to collect surface data in Bangladesh coast in FY 2024-25 or in 2025-26. After the test and trial BORI will develop own surface profiler as BORI technology that will be suitable to collect surface data in Bangladesh coast in FY 2025-26</p> <p>b) BORI has planned to procure an underwater marine robot to test and trial to collect various underwater data in Bangladesh coast in FY 2024-25. After the test and trial BORI will develop/modify a Remotely Operated Vertical Profiler (ROVP) as BORI technology that will be suitable to collect underwater data in Bangladesh coast in FY 2025-26</p> <p>c) A research drone for marine debris detection will be collected for PSOD Lab at FY 2022-23. Required number of drones will be collected in FY 2024-25.</p>
2	<p><b>Cloud Technology including big data:</b> Enables the delivery of computer applications and services over the internet reducing storage and computer power needs. Computer digitalization of the paperwork can be done through cloud computing and big data. The future BORI Data Center will provide ocean data, information and advisory services to the government and scientific community.</p>	<p>a) To establish an Oceanographic Data Center (ODC) as per the Bangladesh Oceanographic Research Institute Act 2015</p> <p>b) To develop an Ocean Observation System (OOS) as a data center's prime activity</p> <p>c) To enhance the institutional capacity for real time ocean monitoring and time-stratum observational reports from big data analysis.</p>	2023-2026	<p>a) BORI has planned to establish ODC and OOS 'Bangladesh Oceanographic Research Institute Establishment Project (2<sup>nd</sup> Phase)'. Both sampling and laboratory will be made of composite and advanced materials.</p> <p>b) Scientists are being trained and equipped to use big data and to use the related equipment for real time ocean monitoring.</p> <p>c) BORI has planned to set up a High Computing Computer (HPC) in PSOD Lab.</p>






3	<p><b>Transgenic Plant and Bioinformatics:</b> Transgenic plants are plants into which one or more genes from another species into the genome through genetic engineering. Bioinformatics is an interdisciplinary field that develops methods and software tools for understanding biological data, in particular when the data sets are large and complex.</p>	<p>a) To establish a genetic engineering lab with updated equipment for gene sequencing and bioinformatics tools. b) To produce transgenic marine plants that has economic and nutritional significance.</p>	2025-2026	<p>a) A genetic engineering lab with modern facilities will be set up within 2025. b) To produce at least one transgenic marine plant that has economic and nutritional significance within 2026.</p>
4	<p><b>Internet of Things (IOT):</b> Network of objects embedded with sensors, software, network connectivity that can collect and exchange data over the internet and enable smart solutions. Internet of things can be used in agriculture, tourism and hospitality sector, traffic monitoring, health sector etc.</p>	<p>a) To integrate sensors, software and networking connectivity among BORI research laboratories, research vessel, data buoys and oceanographic data center. b) Use of sensors in marine robots, ROVs/AUVs. c) Use of QR codes, mobile apps for Analytical Service and electronic employee pass in BORI to track the location and activities. d) Digital security software and system will be collected at Data center for data security. e) To be connected with Integrated Digital Service Delivery Platform (IDSDP) of Ministry of Science &amp; Technology.</p>	2023-2026	<p>a) To enhance the use of sensors in sample analysis equipment in all laboratories. b) Marine robots will be equipped with various kinds of sensors like DO, BOD, Chl-A, Salinity, pressure and other sorts of sensors. c) A Mobile Apps will be developed for analytical service provided by BORI in FY 2023-24. d) QR codes that contain the detail information will be placed at every point of service delivery. e) Oceanographic Data Center will develop own Cyber Security System from its first operational day. f) To cope up with the upcoming Integrated Digital Service Delivery Platform (IDSDP).</p>




### The Time Schedule of BORI Activities to face challenges of 4<sup>th</sup> Industrial Revolution

4IR Technology	Time required to implement the roadmap											
	FY 2023-24				FY 2024-25				FY 2025-26			
	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter	1 <sup>st</sup> Quarter	2 <sup>nd</sup> Quarter	3 <sup>rd</sup> Quarter	4 <sup>th</sup> Quarter
Autonomous Vehicles : Robots												
Autonomous Vehicles : Drones												
Cloud Technology including big data												
Transgenic Plant and Bioinformatics												
Internet of Things (IOT)												

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