We debated for a long time amongst the members of FROST regarding how we could contribute to society during the pandemic and after. A consensus emerged that we could perhaps publish a book in the same context by inviting eminent personalities, both professionals and academics, to write how they conceive the effects of the pandemic and what would be the new normal later in the water body management scenario and associated areas. The efforts indicated an overwhelming enthusiasm from people who were contacted. Thus the book ***2020 Lockdown effects and Future Trends in Water Body management*** was conceived. The Book has now been published by ***Lambert Academic Publishing (LAP)*** and is being marketed by ***More Books, Germany.*** FROST expresses sincere thanks to both LAP and More Books for their enthusiasm and efforts. Presented below is the Forward by Professor R. P. Gokarn and the Editorial.

FOREWORD

Professor Suresh Chandra Misra and Dr. Purnendu Misra, President and Vice-President of the Forum for River and Ocean Scientists and Technologists (FROST), have honoured me greatly by asking me to write the foreword for this book, “2020 Lockdown Effects and Future Trends in Water Body Management”. They and FROST must be commended for their initiative and effort in producing such a timely and useful book.

The authors of the fourteen papers in this book deserve our thanks for their excellent work. The papers cover a wide range of topics and provide insights into several points of which many of us may not be aware. One must also congratulate the authors on their liberal interpretation of the title of the book allowing access to knowledge that may have been denied to us otherwise.

There are four papers which deal with water management. One of these papers discusses the deficiencies in water management at present, the new challenges posed by pollutants such as medical waste and biocides in water and the urgent need for efficient waste water treatment systems. Another paper describes the pollution of water caused by industrial waste from different industries, and

recommends “Zero Liquid Discharge” from industry as well as investment in clean water. The third topic considered is the need to augment water supply and the methods of doing so, including treatment of grey water and desalination plants, which however need indigenization and use of renewable energy. The fourth paper concerned with water management emphasizes the need for proper management of ground water and rain water, and describes with worked out examples several rain water management plans. Environmental pollution can take many forms. One of the papers in this volume discusses noise pollution of the oceans by ships, the effect of this noise on marine mammals and the measurement of the noise made by ships. Ships also cause air pollution, and a paper describes the measurement and data processing of Carbon dioxide emissions in a coastal region before and during the Covid-19 lockdown and the international regulations regarding greenhouse gas emissions from ships. Much attention has been given to pollution of the seas by plastics, and a paper here traces the journey of a plastic bag from a shop to the sea to determine the optimum point for its recovery for recycling or safe disposal.

Transportation over water is the focus of another set of papers. The effect of the Covid-19 lockdown on maritime industries ranging from sea trade and shipping to shipbuilding and ship recycling is considered in detail and the role played by seafarers commended. The functions of maritime regulators in normal circumstances and in the present trying times are described and some of the lessons learnt for the future such as the importance of remote survey techniques considered. The future of Indian shipbuilding, the subject of another paper, lies in undergoing a digital transformation, investing in modern technology, providing specific training for shipbuilding and developing an industrial base to serve shipbuilding. There is a paper on inland water transportation, its history in India and the vision for the future including projects such as the Jal Marg Vikas Project as well as a study of traditional country boats.

There are three papers of a more general nature. One of them considers the different facets of Information Technology and is applications, the effects that the Covid-19 lockdown is having on these sectors, future developments worldwide and in India and national policies regarding IT. Another paper considers the various aspects of Micro, Small and Medium Enterprises (MSMEs) including their role in the

Indian economy, their problems, the likely future developments and the need for government support. In the third paper, the effect of Covid-19 in making the manufacturing industry move faster towards automation is explained, the different types of automation are reviewed, and measures to deal with the effects of automation on manpower described.

The authors of all the papers in this book are scientists and technologists. Therefore, it is natural that the solutions of the problems that this Covid-19 pandemic has brought to the fore are mostly based on science and technology such as automation, robotics and artificial intelligence. The human consequences of these problems such as manpower reduction, elimination of low skilled jobs and reduced inter-personal contact have been mentioned but, except briefly in one paper, not really addressed. India's population is still growing and for decades there has been talk of our "demographic dividend". Will this now become a demographic liability? What will be the psychological effects on individuals whose skills acquired after years of hard work suddenly become worthless? Work places are often areas where individuals are stressed while home is where the stress is relieved. How will "work from home" affect such people? What will happen to "aspirational India" if the requirements for meeting their aspirations are unattainable for the vast majority of Indians? A study of the effects on human beings of our headlong rush towards advanced technology is as necessary as the technology. However, that requires another book with a different set of authors.

The brief reviews of the papers in this book are meant to show how wide is the area that the papers cover. Unfortunately, in this review it has not been possible to also convey how interesting, informative and thought-provoking these papers are. I am sure that if you turn to the paper of your interest, you will not be disappointed and will, in fact, feel encouraged to read the other papers in this volume.

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EDITORIAL

At present, the world is going through a pandemic attack due to COVID 19 which has caused real or virtual lockdown throughout the world. This lockdown has caused untold misery to the entire world, be it the business community, the academic world or the organised and unorganised working class or even individuals. Not only have individuals been restricted with regard to movement, but also transport on land and air has come to a virtual stop. Marine transportation is continuing with the added problem of ship's crew being bound to the ship only and therefore being unable to go home for months together. Air travel has nosedived causing companies to ground their planes. There has been a significant recession in the financial sector and business, in general, is on a downtrend. There has been significant retrenchment in large companies and there is a substantial increase in unemployment.

In India, the lockdown has caused a stop in the business of building construction and businesses where a large number of migrant workers work in the unorganised sector. The lockdown has stopped their earning and livelihood and these migrant workers have been forced to move to their villages by whatever means in the absence of regular modes of transport. The immense misery caused due to this movement of migrant workers has been highlighted in the press and television and this is going to haunt the mind for a long time to come. The stoppage of business and cash flow problems in each micro, small, medium and large enterprise has caused a large drop in national growth. Large scale rural and urban unemployment coupled with resistance of labour to move to different locations has caused manpower problems for almost all kinds of industries. Even otherwise, the social distancing norms and hygienic norms have caused problems, particularly in micro, small and medium sector enterprises.

The lockdown has also displayed some interesting facets of the present lifestyle. The hygiene standards of normal Indians have certainly undergone a change for the better. Hopefully the standards set by force due to the threat of the pandemic spreading, will continue to stay after the lockdown and give all of us a clean and hygienic world. Similarly, stoppage of transportation and reduction of industrial activity has demonstrated what a clean environment can be. Reduction of pollution levels in cities, clean water flowing through rivers having most polluted waters earlier, reduction of carbon dioxide emission, visualisation of fearless wildlife on land and in water are some of the effects of pollution reduction.

From television and newspaper media, we learn that the human race is very resilient. It has got over the threat of wars, World Wars I and II, it has got over the economic recessions in 1971, 1981, 2001 and 2008. It has also tolerated and come out of the pandemic Spanish Flu attack during 1918. The world will also get over the pandemic due to virus COVID 19 and its many variants. Financial packages for fast recovery have been announced by various government. It is to be expected that vaccines for COVID 19 will be ready by the year end and the spread of the disease can be restrained. It remains to be seen if these vaccines will be effective for all variants of the Corona virus. In the meantime, the world will have to take lessons from the problems it has faced and hope that 2021 will see a fast economic recovery and a cleaner world.

The Forum for River and Ocean Scientists and Technologists, FROST, is a technical society mainly focusing on water body technology and management. During the pandemic, FROST has had time to discuss through video conferencing and webinars various issues related to technology and management that are likely to emerge after the complete lifting of the lockdown physically and emotionally. It became obvious that though such issues related to land and air systems have been discussed in many forums

this has hardly been done for water bodies. Since FROST had many members and associated persons dealing with water related technologies and management, it was decided to invite authors to write articles on issues related to their area of expertise and compile all the articles together to form this book.

There are totally fourteen articles broadly divided into four groups. One group consists of four articles on various transportation issues on oceans and inland waters. Three of these articles discuss issues related to ocean trade and shipping, shipbuilding and the regulator's role during the pandemic as well as after it is over. The fourth article is India specific and discusses the probable growth of inland water transportation based on various criteria. Another set of four articles discusses the effects of the lockdown on pollution and how to maintain sustainable development in the post pandemic era. One of these articles discusses measurement of air quality during the lockdown period and another discusses reduction of anthropogenic noise in coastal waters. A third article discusses the pollution in rivers and seas due to plastics and their removal. A fourth article discusses pollution due to mining activity and advocates a case for zero liquid discharge (ZLD) in the post pandemic scenario. A set of articles discusses fresh water scarcity for domestic use, irrigation and pollution due to medical waste generation during the pandemic. The way ahead to save water, to reduce pollution and to augment fresh water availability has been discussed in these articles. All these articles draw on utilising activities in other technical spheres and, to highlight their utility, three articles of a general nature have been presented in the book. It is expected that IT, ITES, IoT, web technology and electronics are likely to find large use in the areas of water technology and management. Large manufacturing industries are likely to undergo major changes even in India where such industries are presently labour intensive. An article in this group discusses issues thrown up by the pandemic leading to automatic manufacturing processes. Movement of migrant labour, hygienic requirements and financial

difficulties certainly demand large changes in the industrial and service sectors and micro, small and medium enterprises will see major changes in future as discussed in the third paper in the context of Odisha.

One aspect of change is that perhaps there will be some modifications in the application of manpower in industrial and service sector. It is likely to be reduced increasing output per each employed person. This can be achieved by using information technology, internet of things and sensors and automation with new technical skills. Therefore, self-reliance is likely to be a mantra of the future and this may lead to more balanced trade and commerce in the world. Utilisation of local talent and skill will accelerate utilisation of innovative efforts for development of new and appropriate technologies for sustainable development.

The pandemic is stretching itself far longer than expected earlier. The articles written in this book have been compiled by taking data available till July 2020. Though there is uncertainty with regard to water body management in the future, yet the articles presented indicate that there is no cause for desperation. We hope it will lead us to a better and leaner world which will be sustainable and keep us prepared for any eventuality in the future.

Editors
S C Misra, President, FROST
Purnendu Misra, Vice President, FROST

Professor Suresh Chandra Misra is a naval architect with a B.Tech. from IIT Kharagpur and Ph.D. from University of Newcastle upon Tyne. After working for a few years in M/S Hindustan Shipyard Ltd., he joined IIT Kharagpur as a faculty member retiring in 2013. He served as the first Director of the IMU, Visakhapatnam

Campus for 5 years. He has wide experience in ship design, inland water transport and general water body issues.

Dr Purnendu Misra is a marine engineer having graduated from DMET Calcutta. He is a career technocrat with the government of India who has interacted with most of the top national and international institutions and policy making bodies as well as shipping companies. He has eagerly pursued deep academic interests and has earned double Ph.D. from Andhra University and Padmashree Dr.D.Y. Patil University. He has also been very active in academic-industry interaction to bring in upgradation of sustainable technologies in water related common utilities and practices.

Professor Omkar Nath Mohanty has been kind enough to have given the **Introduction** for the book in the first article.(only the beginning is reproduced below)

How does one begin an introduction to a book comprising a collection of titles on such 'diverse' subjects? On the surface, there seems to be a common thread connecting the articles, i.e. the COVID-19, and naturally so. What started as a serious outbreak in Wuhan, capital of Hubei province in PR China, developed quickly into a pandemic and has hit the entire world. Having spread to over 213 countries, it has not spared even remote places such as Iceland, Greenland and the Hawaiian archipelago. It is stunning that the virus comprising a protein molecule encrusted with a thin fat layer, with a diameter of only ~ 100 nm and weighing just $5x\ 10^{-5}$ gm for a total of 70 billion such viruses (necessary to make an adult person sick) could have brought the human kind to its knees! But, that is the way the virus dynamics works.

While the compendium is not meant to be a treatise on the COVID pandemic *per se*, its impact, manifest on many common and not-so-common anthropogenic activities has been dealt with, in details, in the articles. What has been the **dominant theme running through the papers is water**: issues relating to its availability, conservation, making it fit for consumption that involves recycling the waste water in urban settlement or in mining, desalination of sea water, using it for water

transport and related activities of inland waterways, ports, industry related to shipping, shipbuilding, manufacture of smaller vessels/ boats, maritime industry and connected regulations, safety and so on apart from impact of COVID-19…Thus, **all conceivable aspects relating to water have been covered.**

Dr Omkar Nath Mohanty, F.N.A.Sc
Director Technology and Academic Initiative, RSB Metaltech, Pune; Former Vice-Chancellor, BPUT, Odisha; Ex-Director, Tata Steel R&D; Ex-Scientist 'G', NML Jamshedpur; Former Professor, IIT Kharagpur.

This is followed by abstracts of 14 articles , each followed by an introduction of the author(s).

EFFECT OF COVID-19 PANDEMIC IN SHIPPING

ABSTRACT

The perceptibly slow rise in Jan. 2020, but fast growth in later months of spread of Corona virus, termed as COVID-19 led to a major slow-down in shipping, as it is linked to economic activity. The trade conflict between China and the US along with over capacity saw shipping in a very depressed state and is now seeing further deterioration in its trade quantum and volume

There are multi-faceted effects of COVID-19 on shipping:-

- Effects on various ship segments – tanker, bulker, container, and cruise liners.
- Ships crew longer stay on board, due to no international flights.
- Swings in freight value
- Swings in scrap value of ships.
- New operating procedures by port terminals.

- Geo-political trade disruptions and
- Uncertain course of opening up of economy.

Bodh Nath Prasad, born on 15 July 1955, is currently working for a container ship owner company in Singapore for over six years. He was Managing Director of Bernhard Schulte Shipmanagement (India) Pvt. Ltd. He worked ashore in BSM for 21 years, and sailed for 19 years. He is an alumni of D.M.E.T. (1969~73) and Netarhat Residential School (1963 ~69).

INDIAN SHIPBUILDING POST COVID-19PANDEMIC CHALLENGES AND MITIGATION STRATEGY

ABSTRACT

COVID-19 pandemic has caused widespread disruptions in shipbuilding industry in India. Present geo-political scene and emergent need to revive our economy, destroyed by the pandemic, throws up many challenges. These are to be mitigated using doable actions without causing much upheaval. Post COVID-19 era, it is hoped that market conditions would be conducive to shipbuilding. While major shipbuilding nations are toying with the idea of introducing Industrie 4.0 in their yards, the same may not be ideal for India at this stage. It is recommended that Indian yards attempt to be ready to adopt Industrie 4.0. Some simple steps in this direction would be ‘Integrated Shipbuilding’, use of single monolithic database shareable between all stake holders during entire period of ‘womb to tomb’ of a ship would be a win-win situation for shipbuilders and ship-owners. This database would help in building a ‘Digital Twin’ which is a digital replica of the real asset. Digital Twin helps in faster construction with minimal reworks and better appreciation of construction progress. It also helps to digitally handover a ship, which is gradual, spread across the construction period in contrast to handover ‘over

the wall' at the end of construction and trials. As regards manpower, gig workforce will assume importance, and yards should aim to employ naval personnel who retire early and have sound domain knowledge and their own people who retire. For a healthy shipbuilding industry, a supportive industrial base is sine qua non. While 'Make in India' and similar steps are welcome, there is a need for handholding the MSME sector.

Rear Admiral NK Mishra, NM is an alumnus of National Defence Academy, Khadakwasla and passed out as the Best Naval Cadet. He has done his M Tech in Computer Science from IIT Bombay. During his 34 years of service in Indian Navy he has many difficult refits of ships including Modernisation Refit of INS Viraat. He left Navy to join Hindustan Shipyard Ltd in 2011 as Chairman and Managing Director and superannuated in 2015.

IMPACT OF COVID-19 ON THE MARITIME INDUSTRY – A REGULATOR'S PERSPECTIVE

ABSTRACT

COVID-19 pandemic severely disrupted the maritime industry causing serious concerns for functioning of global supply chain and economy. This also impacted the functioning of the personnel within the maritime community especially the crew, shore staff, service suppliers, personnel belonging to regulatory bodies, classification societies and inspection agencies. This article chronicles the various stages of the pandemic and its impact on the Maritime Industry. It further enumerates the steps taken by maritime regulators to tackle the novel challenges posed by the pandemic. It also presents the experience and perspective of the maritime regulators in discharging their roles to maintain maritime safety & security of life, protection of property and environment during this period. The outlook for future

considering Indian and global maritime industry is presented identifying key elements. These key elements are envisaged to holistically influence the various facets of the maritime industry and bring a paradigm shift in the approaches of the maritime regulators in discharging their functions.

Karan M Doshi is a structural engineer working in the research divison of the Indian Register of Shipping. His core specializations include development and validation of procedures and analysis techniques for internal assessment and development of IRS Rules. He also has a keen interest in maritime regulatory matters.

Apurba Ranjan Kar has B.Tech (hons) in naval architecture, M.Tech in marine technology and reliability engineer of ASQ-USA. Currently he is working at the Indian Register of Shipping. Core competences include ship structures, ship hydrodynamics, risk based regulations. Incumbent chair, manager and member of various expert groups and project teams of IACS , EU, IMO and ACS.

FUTURE TRENDS IN INLAND WATER TRANSPORT SYSTEM FOR CONTRIBUTINGTO GREEN ECONOMY OF INDIA

ABSTRACT

To harness the benefits of IWT system through sustainable development of the potential navigable inland waterway system of the country, Inland Waterways Authority of India, as the apex body has been mandated since 1986 for development, and regulation of the National Waterways initially for five and subsequently additional 106 NWs during 2016 having a total length of 20,236 km for their shipping and navigation and promotion of IWT. The freight and

passenger movement through traditional country boats even during twenty-first century exists in many parts of the country in an unorganised sector being the lifeline for the inhabitants in the inaccessible areas where the modern infrastructures are yet to be developed or planned in near future. After 75 years of independence of India, and 34 years of the constitution of IWAI, IWT system in the country remains in its nascent stage with only 2% of modal share to the total national transportation scenario. There has been no significant development of the state waterways and growth in the freight and passenger movement. The operational status of the traditional country boating over the years has also remained unaltered. Considering the severe impact of the COVID-19 in IWT sector with loss of employment in passenger ferry, tourism & country boat services besides the freight transport, and disruption in the development schedules and also the potential of the sector for contributing to the India economy, the article deals on the new strategy and vision during post COVID-19 scenario for its resurgence.

Subhakar Dandapat with graduate and post-graduate degree in Naval Architecture and Ship Production Technology respectively started his career with M/s Hindustan Shipyard Ltd, followed by Inland Water Transport Directorate and Development Advisor (Shipbuilding and Ship repair) in the ministry of Shipping. Subsequently he joined Inland waterways Authority of India and superannuated as chief engineer in 2016. As the post-retirement assignment, Mr. Dandapat was associated with M/s Adani Port and SEZ Pvt. Ltd and currently with M/s Howe Engineering Project (India) Pvt Ltd, a consultancy firm on port and infrastructure.

POST COVID SCENARIO FOR THE MANUFACTURING INDUSTRY

ABSTRACT

The impact of Covid-19 is being felt in virtually every aspect of our dailly life. No one is certain about how long this pandemic would last and as a consequence its impact on the global economy. The COVID-19 pandemic and the consequent need for social distancing is raising new questions about the pace of automation due . This pandemic has strengthened the need to automate so that manufacturing systems are less people-dependent. In this scenario we expect that the manufacturing industry will speed up the process of automation particularly in industries, that have traditionally been labour intensive, such as garment, leather, food processing, wood and furniture industry, etc. This sudden pace of automation is likely to create a surge in unemployment which could explode in to serious social unrest particularly in the developing world. Automation is creating great wealth for some, but we are simultaneously experiencing historic income and wealth inequality. Without robust policies and strong institutions, automation risks exacerbating the economic insecurity and political and civil divides that are experiencing today. New jobs are being created, but many low-skilled jobs are lost irrevocably. Policies and reforms should encourage both the development of new technologies as well as employment opportunities for all sections of the society

Dr Aditya Mukherjee received his PhD in chemical engineering from Illinois Institute of Technology, Chicago. He has extensive experience in various chemical industries in Process and product development. He is currently a faculty in chemical Engineering at Gayatri Vidya Parishad College of Engineering, Visakhapatnam.

MSMES OF ODISHA – PAST PRESENT AND FUTURE

ABSTRACT

Odisha has very high portion of natural resource in the Indian peninsula in the form of mineral deposits such as iron ore and bauxite, good agricultural land

and substantial water resource with more than 450 km of coast line. The author laments that in spite having these resources, the state has not shown substantial growth in the MSME sector. He compares some of the growth scenarios of certain areas with that of the state and also discusses some of the major failures. COVID-19 pandemic has made the situation mush worse for the MSME sector with acute cash crunch, problems associated with migrant labour, supply chain management issues and, of course, issues with personal hygiene. The author goes on to say that this pandemic may spur the growth of MSME sector with renewed vigour given a helping hand by the government and society at large. He argues that new areas such as ship and boat building and water transport, tourism, garment industry, Industry for building fittings, electrical items, stainless steel pipes and utensils, automobile and cycle parts manufacturing, IT and electronics industry and similar other areas may see a growth based in skilled migrant labour returning to state and skill training now available. This also may spur innovation in many areas. The author argues that though there have been initial difficulties, these will be overcome in due course leading to a vibrant and fast growing MSME sector in Odisha.

JK Rath is a first generation entrepreneur (since 1979), a technocrat and the Director in MECHEM PRIVATE LIMITED. Mechem manufactures fibreglass boats since 1987 and is a recipient of two National Awards including First prize in quality. Mechem also produces steel hinges and many other items. He is also the Chairperson of FICCI MSME Odisha State.

COVID-19 AND INFORMATION TECHNOLOGY

ABSTRACT

The pandemic Covid-19 has shaken the economic foundation of nations and disturbed the social behaviour of people. Both advanced and third world

countries are equally affected. These negative impacts are likely to stay for quite some time affecting the psychology of humans as they try to cope up with the changing situations in long run. Information Technology (IT) has always been an enabler to various activities. How IT will evolve as a result of Covid-19 is difficult to predict. In this paper, the author makes an effort to analyse the impact to IT as a result of the Covid pandemic, with respect to the pre-Covid situation and take a look at the future. The material has been collected from various sources and presented in a systematic manner. The paper is tuned to the Indian situation.

Dr Rachita Misra is an MSc in Mathematics and PhD in Computer Science. After working for nearly 25 years in IT services she joined as Professor of Computer science and IT in CV Raman Global University from where she retired in 2020. Her areas of interest are data mining, machine learning and IoT, software engineering and project management, computer architecture, parallel computing, engineering education and transformations. She has many scholarly publications to her credit.

AN ANALYSIS OF EMISSION LEVELS ALONG COASTAL WATERS OF INDIA-PRE & POST COVID-19 LOCKDOWN PHASE

ABSTRACT

Human life has come to a halt temporarily as countries declare lockdown due to the novel Coronavirus disease (COVID-19) pandemic that has hit in the first quarter of 2020. It is surely the first time in modern history that all human activity, vehicle movement and business work was suspended temporarily to stop the virus to run rampant. While this crisis has imposed immense financial

and social surprises as worldwide production, consumption and employment levels dropped abruptly, they have also been associated with noteworthy minimization in emissions level. Coastal waters store roughly 20% of the carbon dioxide [CO_2] emissions resulted due to anthropogenic activities. In the middle of difficulty lies opportunity, hence, a study has been carried out to analyze the impact of human activity considering CO_2 emissions along the coastal area of India prior and post lockdown phases using CO_2 analyzer onboard the Coastal Research Vessel Sagar Anveshika. Based on the study, it is evident that there is a considerable dip in CO_2 emissions level along the coastal areas by 8.16 % due to minimal human activities, thereby heartening us to anticipate that our mankind may be able to curtail greenhouse gas emissions significantly over the long term to ameliorate looming climate change.

Dr D. Rajasekhar is an eminent scientist with extensive experience in marine Industry both in India and abroad w.r.to shipbuilding, ship maintenance and repair. He is a recipient of numerous prestigious National Awards and a technical expert member in various national expert committees and has published numerous technical papers in refereed journals and conferences.

D. Narendrakumar has specialized knowledge on marine-based applications of nanotechnology. He is a recipient of the ‘National Maritime Award’ from the “ministry of shipping” and the ‘Young Engineer Award’ from the “Institution of Engineers, India”.

Ananthakrishna has hands-on experience in Design Engineering and a recipient of the ‘National Maritime Award’ from the “ministry of shipping”.

P. S. Deepak Sankar has specialized knowledge on marine engineering and he has provided engineering solutions for research ships

Dr K. Anandasabari is a marine geologist with special experience on coastal environmental monitoring and bathymetry survey.

Pratik Bose has hands-on experience in non-traditional machining, ship construction and quality control techniques

SILENCE IN THE INDIAN WATERS DUE TO REDUCTION IN SHIPPING TRAFFIC DURING COVID 19 LOCKDOWN

ABSTRACT

Sound has always been the best form of energy to understand the ocean environment. The underwater ocean noise is mainly due to abiotic (wind, wave, and other natural sources), biotic (due to marine species), and anthropogenic (due to man-made activity) forms. Over the years a serious concern was raised by the International Scientific Community that a significant portion of the underwater noise generated by human activity had led to the increase in the ambient noise levels and also recognized to have negative consequences on marine life. India has a coastline of 7,516.6 Km with 12 major and about 200 non-major ports. However, the point of interest is on the present timeline, where the world is facing i.e. COVID-19 pandemic to understand the quantification of changes in human activities on the environment against the historical baseline. During the financial year 2019, cargo traffic at major ports in the country was reported at 699.05 Million

Tonnes. Cargo traffic handled stood at 585.72 million tonnes in 2019 (till January 2020). With the outbreak of the COIVD-19 pandemic in the first quarter of 2020, the scenario completely changed the economic activities in the country. It has been reported that the cargo volume at state-owned ports declined by 21% in April 2020 to 47.42 million tonnes from 60.08 million tonnes a year ago. All the commodities except raw fertilizers reported a decline in volumes. India being the fasted growing trillion-dollar economy in the world, with a nominal GDP of $2.94 trillion. At the present stage, GDP growth slows to 3.1% in the January-March quarter, partly as a result of the COVID-19 pandemic clampdown. The number of vessels handled at major ports during 2019-2020 when compared with 2018-2019 showed a slight decline by 0.08%. Real-time studies conducted in the Indian Ocean Region resulted in a significant reduction in the ocean average noise levels during the lockdown due to the decrease in the shipping movement. The reduction in noise levels shall be a benefit to the marine ecosystem leading to an improvement in the habitat of marine species. Shipping noise is a low-frequency noise level which is overlapping with the activities of most of the marine species. Though the lockdown had negative impacts on mankind but has become a silver lining for the marine ecosystem for a short-term period.

GVV Pavan Kumar holds the current position of faculty, School of Naval Architecture and Ocean Engineering, Indian Maritime University, Visakhapatnam Campus, India. He is responsible for the teaching and researching the areas of ship dynamics, vibration, and noise and their application in ship design and involvement in field data collection of underwater noise data in Indian waters.

VVS Prasad holds the current positions of Professor and Head of Department in the Department of Marine Engineering, AU College of Engineering; Andhra University,

Visakhapatnam, India. He is responsible for the teaching and research in the areas of manufacturing engineering, marine engineering, composite materials, and natural fiber-reinforced plastic composites.

US Ramesh holds the current position of Chief Manager of Indian Maritime University, Visakhapatnam Campus, India. He has been teaching various courses at the graduate and postgraduate levels. Earlier was involved in ship design, the building of Indian research vessels. Currently, he is involved in many research projects and specializes in the areas of ship design, shipbuilding, and computer-aided design of research vessels and emissions.

THE JOURNEY OF PLASTICS TO THE SEA

ABSTRACT

A few years back, this author had written an article on river Ganga cleanup. This article had argued that ‘If you shut all pollution like one shuts off the taps, the river will flush itself clean in two weeks’. This article further pointed out the socio-economic issues in implementing such a drastic action. But one could never imagine that a sub microscopic virus would be able to do this. The lock down did exactly that. Industrial discharges came to a halt. Human pillaging of this water resource had paused. The river water quality improved immediately and it was there for everyone to see.

The human inactivity also reduced the waste generated and the amount of plastics discarded into the environment. This is important. Plastics serve a useful life of a few weeks and then are an environmental burden for few centuries. Some of the plastics are recycled but a lot of the plastics are not. Some of them reach a neighborhood drain or stream and slowly make their journey towards a tributary, a river and finally the sea. Recovering the plastics from the sea is impractical task while it is yet macro plastics on the sea

surface. It is almost impossible, once it breaks up into micro plastics and sinks. This article analyses the various options to arrest the plastics on this journey and discusses the challenges at each stage. The writer is a merchant ship captain and has designed floating trash barriers that have proven to be the most successful intervention to stop the flow of plastics to the ocean.

D. C. Sekhar is a master mariner having done an EGMP from IIMB and MBA Finance U21 Singapore. He is the founder director of AlphaMERS Ltd., an SME that has designed a successful river cleanup with floating barriers, an ocean wave energy harvester, silt traps, flood relief devices and robots for hazardous tank cleaning.

INDUSTRIAL WASTE MANAGEMENT AND PROTECTIONOF WATER BODIES POST COVID-19 PANDEMIC

ABSTRACT

Industrial waste is an inevitable evil output of every possible industrial activity. It covers all three forms of pollutants - gaseous, particulate and aqueous. Industrial pollutants of all forms ultimately come down to the earth and pollute water bodies thereon. Industries have been long positioned as the prime culprit for polluting of all forms of water bodies – rivers, lakes and underground sources and even the sea.

With increasing population, it is expected that demand for industrial products is bound to keep on increasing resulting in larger and more in number industrial plants being set up all over the globe. Under the circumstances, can industry cope up with more and more stringent norms being brought in and

continue to be economically sustainable in their operations? Can the environmental hygiene levels achieved in even some of the most polluted water bodies in India and many other parts of the world during the lockdown period of Covid-19 pandemic be sustained?

Can industry and enforcement agencies rise to the challenge and ensure that this basic human need is met and sustained post Covid period? Would industry be ready to impose self-regulations on it and despite additional capital investments, adopt available Zero Liquid Discharge (ZLD) technologies to protect the limited global sweet water resources and truly become “responsible corporate citizen”?

B.S. Pani is a metallurgist with over 32 years of aluminium smelting experience. He has been a visiting Fellow with a number of technology and management institutions in India and Overseas since 1984. Currently he functions as an Industrial consultant, media presenter and entrepreneurship mentor operating from Bhubaneswar.

IMPACT OF THE COVID PANDEMIC ON WATER IN INDIA

ABSTRACT

The CoViD -19 pandemic has led to new challenges in our daily life including social distancing and hand washing. These have a lot of impact on the water scenario. In an already water stressed situation, the need for more water for hygiene and cleanliness necessitates new technologies for the augmentation of water. Treatment and desalination can augment large quantities of water which are discussed. Additionally, there are several steps that need to be taken to introduce novel methods for monitoring water, treating it and also disposing the bye products of augmentation systems in an environmentally safe manner. Finally the use of renewables for desalination and treatment is discussed.

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POST COVID-19 CHALLENGES FOR WATER MANAGEMENT

ABSTRACT

The common perception around fifty years ago was that water was an infinite resource. At that time, there were fewer than half the current number of people on the planet. People were not as wealthy as today, consumed fewer calories and ate less meat, so less water was needed to produce their food. They required a third of the volume of water we presently take from rivers. There are now seven billion people on the planet, their consumption of water-thirsty meat and vegetables is rising, and there is increasing competition for water from industryand water reliant food items. In the future, even more water will be needed to produce food because the earth's population is forecast to rise to 9 billion by 2050. 97% of the water on the Earth is salt water and only three percent is fresh water; slightly over two thirds of this is frozen in glaciers and polar ice caps. The remaining unfrozen fresh water is found mainly as groundwater, with only a small fraction present above ground or in the air. Fresh water is a renewable resource, yet the world's supply of groundwater is steadily decreasing, with depletion occurring most prominently in Asia, South America and North America, although it is still

unclear how much natural renewal balances this usage, and whether ecosystems are threatened.The presence of the SARS-CoV-2 in fresh water or waste water hasbeen a matter of concern.

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WATER SECURITY IN THE CONTEXT OF COVID-19

ABSTRACT

Fresh water is a very small percentage of water available on our planet. Further, ground water is, as yet, not readily available for daily use and people generally depend on surface water for drinking, irrigation and industrial needs. The corona pandemic has increased the need for water use and brought into focus the need for more fresh water. India gets approximately 4000 billion cubic meters of precipitation (rain fall) every year leaving out the drought years. A very small percentage of this water is utilised for flow projects and the rest is left to catchment areas which are not utilised to charge the ground water. Even Cherapunji, which gets the maximum rain fall annually suffers from drought in other seasons, the reason being that rain water is not retained on the hill tops but flows down to plains. The authors have given a workable rain water management plan using different kinds of bunds to charge the ground from hilltops to lower land thus providing a

ground water reservoir for use over the entire year. The authors have given three examples of this system having been implemented in western Odisha giving encouraging results. Corona pandemic or otherwise, the need for drinking water and other uses can be met by recharging the ground with suitable planned rain water management programme, the authors have argued.

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