

# NEWSLETTER

# **ISSUE # 25 | JANUARY 2022**

**CENTER FOR ENVIRONMENT & MARINE STUDIES** 

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#### Acronyms

- Three Dimensional Acoustic Doppler current Profile Carbon Dioxide ADCP CO2 CODAR Coastal Ocean Dynamics Applications Radar Conductivity Temperature Depth Center for Environment & Marine Sciences CTD CEMS EIA Environmental Impact Assessment Gas Chromatography Gulf Cooperation Council GC GCC gr/L Gram per liter
- KFUPM King Fahd University of Petroleum & Minerals
- KPIs Key Performance Indicators
- LC Liquid Chromatography LC -50 Lethal Concentration

- Three Dimensional ADCP Acoustic Doppler current Profile Carbon Dioxide CO2
- CODAR Coastal Ocean Dynamics Applications Radar
- CTD Conductivity Temperature Depth CEMS Center for Environment & Marine Sciences
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#### **PROJECT REVIEW MEETINGS IN JANUARY 2022**

Center for Environment & Marine Studies (CEMS) conducted five project review meetings in January 2022, to discuss the progress, milestones achieved and issues encountered for all on-going projects in the Center. The Center Director, Dr. Fahad Al Ismail, chaired all of the meetings except the last meeting on 30-01-2022 which was chaired by the Center's senior technical advisor, Dr. Nabeel Abuzaid. Project managers (PMs) and coordinators of each client-funded project summarized the status of their respective projects.



Research Scientist III CEMS/RI abdu k@kfunm edu sa

The PM of CEM02700 (Sustaining Project Phase VII) reported that the project has been officially started and briefed the attendees on the progress of important aspects of the project. The Center Director appreciated the PM's decision to include additional fundamental research in the project and suggested publishing at least five review articles corresponding to each element of the project. For CEW02442 (LC50 Toxicity Lab) the Director suggested to ensure all pre-requisite elements of safety are present and emphasized the importance of maintaining safety and hygiene standards at all times in the lab. After a lengthy discussion about CEW02500, the Director suggested to proceed with field-wise environmental assessments instead of assessments based on each well. The PM of CEW02555 reported issues related to the disruption of environmental monitoring at Safaniya. Accordingly, the Director requested the PM to contact Saudi Aramco for their advice on the continuation of monitoring. Progress on the commissioning and installation of mooring buoys (CEW02557), CODAR (CEW02557), underwater cameras (CEW02560) and mangrove ecoparks (CEW02590) were reviewed. The importance of initiating the required civil works as soon as Saudi Aramco provides the required permits for these projects was emphasized.

While discussing the EIA projects with NPCC (CEW02608, CEW02609 and CEW02610) and the new National Center for Environmental Compliance (NCEC) EIA report submission and approval procedures, the Director advised PMs of all EIA projects to ensure considering these new requirement for their respective projects. The progress of SAIPEM monitoring projects (CEM02613, CEW2573 and CEM02636) was evaluated and necessary instructions were given to concerned PMs to contact their focal points to acquire required permits and GIS files, and to expedite payment of pending invoices. The PMs of recently-started EIA projects for SAIPEM (CEM02685, CEM02691 and CEM02692) discussed various requirements such as ESSS and interim reports. The PM of CEM02696 (PIF modeling project) discussed the progress of modeling with DHI, Denmark. The progress and accomplishment for NEOM projects (CEW02619 and CEM02669) were highlighted by its PM. The PM of environmental compliance monitoring projects for the China Harbor Company in the Red Sea (CEW02642 and CEW02645) summarized their progress and reported the possibility of the extension of these projects. The Director requested the PC of new baseline study (CEM02697) in Thadig National park and the PM of new baseline study in Uruq Bani Mu'Arid Protected Area to expedite the field sampling and complete the required surveys on priority basis. The Center's management provided appropriate solutions to the respective PMs and PCs for smooth progress of the projects. The Director thanked all PMs and PCs for their active involvement, dedication and continued effort in supporting the Center.

#### SUBMITTED REPORTS AND PROPOSALS IN JANUARY 2022

CEMS currently has 49 active client-funded projects. Some of the most important clients are Saudi Aramco, NEOM, The Red Sea Development Company (TRSDC), Public Investment Fund (PIF), National Center for Environmental Compliance (NCEC), SAIPEM, WOOD etc. The multi-disciplinary nature of these projects requires a high-level of coordination between subject experts and the logistic team, who acquire all data and analysis on scheduled time.



Mr. Muaadh A. Alnuwairah

CEMS/RI Jaadhabdu@kfupm.edu.s

Since most of the projects carried out by CEMS are fast track in nature and for oil and gas, and ecotourism industries, its timely completion and submission of all its deliverables are essential for the client and, subsequently, for the development of the Kingdom. The deliverables for some projects are weekly, while some clients require monthly and annual progress reports. Most EIA projects demand the timely submission of final reports for acquiring necessary permissions from authorities. CEMS has established a legacy of submitting all its deliverables on time. Accordingly, below table shows the list of reports submitted in January 2022.

| SUBMITTED REPORTS FOR JANUARY, 2022 |                         |             |   |                                   |  |  |  |
|-------------------------------------|-------------------------|-------------|---|-----------------------------------|--|--|--|
| Proj. Manager / Coor.               | Report Type             | Project No. | Project Title   | Client                            |  |  |  |
| Dr. Surya Prakash Tiwari            | Monthly progress report | CEM02691    | Environmental Impact Assessment for One Oil Producer & Two Water Injection<br>Production Deck Modules and Associated Facilities in Marian Field                                     | SAIPEM                            |  |  |  |
| Dr. Surya Prakash Tiwari            | Monthly progress report | CEW02573    | Environmental Monitoring (Compliance and Post-construction) of Water<br>Injection Facilities and Shallow Water Pipelines for Marjan Increment (BI-10-<br>12201 & BI-10-12222)       | SAIPEM                            |  |  |  |
| Dr. Joydas/Dr.Manokaran             | Draft Final EIA report  | CEW02604    | Environmental Impact Assessment for Zuluf AM Platforms Upgrade (BI-10-<br>12741)  | Worley                            |  |  |  |
| Mr.Mohamed Ashraf                   | Weekly Progress Report  | CEW02642    | Weekly Report: Week # 50: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Sheybarah Island<br>Development (Parkage#1)      | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Weekly Progress Report  | CEW02642    | Weekly Report: Week # 51: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Sheybarah Island<br>Development (Package#1)      | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Weekly Progress Report  | CEW02642    | Weekly Report: Week # 52: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Sheybarah Island<br>Development (Package#1)      | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Weekly Progress Report  | CEW02642    | Weekly Report: Week # 53: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Sheybarah Island<br>Development (Package#1)      | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Weekly Progress Report  | CEW02642    | Weekly Report ; Week # 22: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Ummahat Island<br>Development (Package#1)       | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Weekly Progress Report  | CEW02642    | Weekly Report ; Week # 22: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Ummahat Island<br>Development (Package#1)       | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Weekly Progress Report  | CEW02642    | Weekly Report ; Week # 24: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Ummahat Island<br>Development (Package#1)       | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Weekly Progress Report  | CEW02642    | Weekly Report ; Week # 25: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Ummahat Island<br>Development (Package#1)       | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Biweekly Lab Report     | CEW02642    | Lab Report: Phase # 21: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Sheybarah Island<br>Development (Package#1)        | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Biweekly Lab Report     | CEW02642    | Lab Report: Phase # 22: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Sheybarah Island<br>Development (Package#1)        | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Biweekly Lab Report     | CEW02642    | Lab Report: Phase # 08: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Ummahat Island<br>Development (Package#1)          | China Harbour Engineering Company |  |  |  |
| Mr.Mohamed Ashraf                   | Biweekly Lab Report     | CEW02642    | Lab Report: Phase # 09: Environmental Monitoring (During Construction-<br>Phase) For The Dredging, Filling & Compaction Works of Ummahat Island<br>Development (Package#1)          | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report  | CEW02645    | Weekly report # 15: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-10 | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report  | CEW02645    | Weekly report # 16: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-10 | China Harbour Engineering Company |  |  |  |









## SUBMITTED REPORTS AND PROPOSALS IN JANUARY 2022

| SUBMITTED REPORTS FOR JANUARY, 2022 |                        |             |   |                                   |  |  |  |
|-------------------------------------|------------------------|-------------|---|-----------------------------------|--|--|--|
| Proj. Manager / Coor.               | Report Type            | Project No. | Project Title   | Client                            |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report | CEW02645    | Weekly report # 18: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-10 | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report | CEW02645    | Weekly report # 20: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-11 | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report | CEW02645    | Weekly report # 21: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-11 | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report | CEW02645    | Weekly report # 22: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-11 | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report | CEW02645    | Weekly report # 23: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-11 | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report | CEW02645    | Weekly report # 5: Environmental Monitoring (During Construction-Phase) For<br>The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-12  | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report | CEW02645    | Weekly report # 6: Environmental Monitoring (During Construction-Phase) For<br>The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-12  | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report | CEW02645    | Weekly report # 7: Environmental Monitoring (During Construction-Phase) For<br>The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-12  | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Weekly Progress Report | CEW02645    | Weekly report # 8: Environmental Monitoring (During Construction-Phase) For<br>The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-12  | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Monthly Report         | CEW02645    | Monthly report # 4: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-10 | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Monthly Report         | CEW02645    | Monthly report # 5: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-11 | China Harbour Engineering Company |  |  |  |
| Dr. Sivasankar                      | Monthly Report         | CEW02645    | Monthly report # 2: Environmental Monitoring (During Construction-Phase)<br>For The Piling And Foundation Works Of Sheybarah And Ummahat Alshaykh<br>Islands (Package#2) – Hotel-12 | China Harbour Engineering Company |  |  |  |

CEMS serves as a bonafide research body in the field of environment and marine studies. Many companies carrying out development in the oil and gas, and ecotourism sectors need to conduct various research studies that are pre-requisite for associated construction activities both in the terrestrial and marine areas. CEMS submitted several research proposals in the month of January 2022, to various companies, the details of which are given in the table below.

| SUBMITTED PROPOSALS DURING JANUARY, 2022 |   |                      |  |  |  |  |  |
|--|---|----------------------|--|--|--|--|--|
| Proposal                                 | Title   | Client               |  |  |  |  |  |
| CEMO2703                                 | Environmental Monitoring During Construction and Post-Construction for the Construction of offshore Facilities in<br>Juaymah - New Crude Oil Terminal Facilities and Associated Pipelines (BI-10-14244) | Larsen & Toubro      |  |  |  |  |  |
| CEM02706                                 | Environmental Impact Assessment for the installation of One Oil Production Deck Module and Associated Facilities in Abu<br>Safah Oil Field (BI-12-22000)  | Larsen & Toubro      |  |  |  |  |  |
| CEM02707                                 | Environmental Monitoring During Construction for the installation of One Water injection Production Deck Module and<br>Associated Facilities in Marjan Oil Field (BI-12-22000)                          | Larsen & Toubro      |  |  |  |  |  |
| CEM02712                                 | Environmental Impact Assessment for the Drilling and installation of SSS Jackets in the Manifa Oil Field (BI-12-22000)  | Lamprell Energy Ltd. |  |  |  |  |  |
| CEM02713                                 | Environmental Impact Assessment for the Drilling and installation of SSS Jackets in the Safaniya Oil Field (CRPO 88) (BI-<br>12-22000)  | Lamprell Energy Ltd. |  |  |  |  |  |
| CEM02714                                 | Environmental Impact Assessment for the Drilling and installation of SSS Jackets in the Safaniya Oil Field (CRPO 89) (BI-<br>12-22000)  | Lamprell Energy Ltd. |  |  |  |  |  |
| CEM02715                                 | Environmental Impact Assessment for the Drilling and installation of SSS Jackets in the Safaniya Oil Field (CRPO 90) (BI-<br>12-22000)  | Lamprell Energy Ltd. |  |  |  |  |  |
| CEM02716                                 | Environmental Impact Assessment for the Drilling and installation of SSS Jackets in Abu Safa, Marjan and Zuluf Oil Fields<br>(BI-12-22000)  | Lamprell Energy Ltd. |  |  |  |  |  |
| CEM02717                                 | Environmental Impact Assessment for Manifa Ah Crude increment Oil Facilities (BI-10-14856) and Water injection<br>Facilities (BI-10-14861) in Manifa Oil Field  | KBR-AMCDE            |  |  |  |  |  |
| CEM02718                                 | Environmental Impact Assessment for the Drilling and installation of SSS Jackets in the Safaniya Oil Field (CRPO 88, 89<br>and 90) (BI-12-22000)  | Lamprell Energy Ltd. |  |  |  |  |  |









## SEA TURTLE SATELLITE TRACKING PROGRAM ON DISPLAY IN THE RAS TANURA SEA TURTLE CENTER

CEMS provided technical support to the Ras Tanura Sea Turtle Center during a visit of senior Saudi Aramco management on January 3, 2022, an event organized by the Saudi Aramco Ras Tanura Community Services Department. First, Dr. Rommel H. Maneja from the Fisheries Group, presented an overview of the Sea Turtle Satellite Tracking Program to two Saudi Aramco senior vice presidents who visited the exhibits at the Sea Turtle Center.

Dr. Rommel explained the importance of establishing connectivity of essential sea turtle habitats (e.g. feeding and nesting areas) to the conservation of the species and on how the satellite tracking technology helps to achieve this. The Sea Turtle Satellite Tracking Program is a collaboration between Saudi Aramco and KFUPM and was started during the Sustaining Research VI Project in 2017. KFUPM has provided educational materials that are displayed at the Sea Turtle Center, including animated maps of sea turtle migration paths in the Arabian Gulf, posters about sea turtle ecology and conservation, 3D models of hatchling green and hawksbill turtles, and ecosystem survey videos of islands where turtles nest and of coastal areas where they have been found stranded.



After Dr. Rommel's talk, an overview of the Turtle Center's rescue and rehabilitation program was presented by Mrs. Cathy McDaniels, senior volunteer overseeing the care of rescued sea turtles undergoing rehabilitation. During the visit, there were two adult green sea turtles and one juvenile hawksbill turtle undergoing treatment and rehabilitation. One of the green turtles had been rescued from the Corniche in Saihat by the joint KFUPM-Saudi Aramco turtle rescue team.









Dr. Rommel Maneja Research Scientist III CEMS/RI

### TRAINING PROGRAM FOR POP-UP BUOY RECOVERY SYSTEM

CEMS recently acquired Pop-Up Buoy Recovery System (PUB), which can be attached to any subsea deployment such as an ADCP, sound trap, or hydrophones. The Pop-Up Buoy Recovery System allows for direct retrieval of seabed packages, bottom-mounted frames (Figure 1), or other marine research instrument.



Scientist II

Easily mounted on any framework, the assembly sits on the seafloor until an acoustic release is activated (Figure 2). Once the release completely disconnects, the buoy subassembly will lift free from the canister and rise to the surface. A synthetic line connecting the buoy directly to the framework of the seabed item allows for its retrieval (Figure 3). This should reduce the hassle of finding devices placed on the seabed.

The training program for the pop-up buoy recovery system (Figure 4) was provided by Unique Systems, Dubai. The purpose of the training program was to familiarize CEMS field team with the use of the Pop-up Buoy System for the retrieval of seabed-mounted instruments.



Figure 1. Frame mounted ADCP with Teledyne Benthos acoustic release installed



Figure 2. Deck unit of the acoustic release system



Figure 3. Pop-Up Buoy recovery system with the synthetic line connecting the buoy directly to the framework





Figure 4. Training



#### TERRESTRIAL ECOLOGICAL SURVEY AT THADIQ NATIONAL PARK

In January 2022, CEMS Terrestrial team successfully conducted an ecological survey at Thadiq National Park as a part of recently-awarded project CEM02697. The survey team included Dr. Naveen Kumar, Mr. Goutham Subbusamy, and Mr. Muhammed Mouswi from KFUPM. Officials from the National Center for Vegetation Cover (NCVC) and the GCC Electrical Company also accompanied the team during the first day of their field visit.

The ecological survey included documentation of both flora and fauna species at six selected stations, representing various types of habitats including wadi, vegetation, mixed gravel and sand sheet. In addition a night survey was conducted to study the activities of nocturnal animals.

Although this area is not very diverse, more than 20 species of plants, around 10 species of birds and one mammal were recorded during the survey.

المركز الوطني لتنمية الغطاء النباتي National Center for Vegetation Cover المملكة العربية السعودية







## KICK-OFF MEETING AT NATIONAL CENTER FOR WILDLIFE IN RIYADH

CEMS has been awarded a project entitled "Baseline Status of Pollutants, Noise and Dust in the Uruq Bani Mu'Arid Protected Area" (CEW02650) by the Saudi National Center for Wildlife (NCW). The kick-off meeting for this new project was held on January 10, 2022, at NCW, Riyadh. From CEMS, Dr. Fahad Al-Ismail (Center Director) along with the Dr. Subhajit Sen (Project Manger) and Dr. Mazen K. Nazal (Chemistry group leader)attended the meeting. Dr. Subhajit presented the project description, objectives, methodology that will be adopted and the deliverables to NCW representatives. The meeting was fruitful and CEMS team clarified all the queries raised by NCW.

المركز الوطني لتنمية الحياة الفطرية National Center for Wildlife المملكة العربية السعودية





Dr. Subhajit Sen Lab Specialist CEMS/RI





#### AN ONLINE TRAINING ON CETACEAN PASSIVE ACOUSTIC MONITORING

Members of the CEMS Fisheries and Marine Groups attended a short online training on data processing and error detection using the F-POD software on January 13, 2022. Dr. Nicholas Tregenza, inventor of passive acoustic monitoring instruments for marine cetaceans in the wild, delivered the presentation and led the discussion. The instruments known as F-POD and C-POD are fully automated passive acoustic monitoring instruments that detect porpoises, dolphins, and other toothed whales.

These marine cetaceans produce echo-location sounds to detect prey, orient themselves, and interact with other animals. These F-POD and C-POD instruments detect and record echo-location sounds in the form of click trains, to monitor the presence of cetaceans, which is labor-intensive and expensive, when done visually by human observers.

In addition to the normal click trains produced by cetaceans, the instruments also detect low-frequency sounds that erroneously produce click trains in the F-POD software. These sounds were identified to originate from underwater sand movement and tiny crustaceans which needs to be considered when analyzing the data.

The training was attended by 25 participants, with CEMS representatives including Dr. Rommel H. Maneja, Dr. Abdurahiman Pullikoden, Dr. Yu Jia Lin, Mr. Premlal Panickan, Mr. Jinoy Gopalan, and Mr. Ace Vincent B. Flandez. There were also other trainees from various countries and several on-going passive acoustic monitoring programs for cetaceans.









Dr. Rommel Maneja Research Scientist III CEMS/RI



Dr. Nicholas Tregenza



## AN ONLINE WORKSHOP TO DISCUSS CEMS FOURTH QUARTER KPIS' TARGETS AND ACHIEVEMENTS

For the year 2021, CEMS established 22 Key Performance Indicators (KPIs), based on five (5) clear strategic objectives. These KPIs were prepared after thorough discussions with CEMS five research groups. On April 21, August 04 and October 27 of 2021, CEMS conducted its first, second and third workshops, respectively, to discuss the quarterly targets and achievements. During these workshops, scrutiny of details showed best outcomes between the targets and KPIs achievements. Wherever needed, recommendations were made to improve KPIs accomplishments. Accordingly, great efforts were made by CEMS research groups in that direction.

To discuss the fourth quarter of 2021, KPIs targets and achievements, CEMS conducted an online workshop on January 26, 2022. Total number of attendees for the workshop were around 60 including CEMS members and other KFUPM community. In this workshop, KPIs targets of the fourth quarter and the related achievements were shown and discussed. Additionally, following main objectives for the workshop were achieved:

- To discuss KPI targets vs achievement of KPIs with group leaders.
- To investigate potential reasons for mismatch between target KPIs and achievement.
- Getting public opinion as feedback.

The workshop was inaugurated by the Center Director, Dr. Fahad S. Al-Ismail, with an introductory speech. Dr. Nabil Abuzaid briefed about CEMS five research groups and the KPIs document. Mr. Humayun Baig, who moderated the workshop, took up each KPIs and set in motion the discussion regarding the targets and performance for each group. The Director evaluated the performance of each group in relation to the target. Wherever the targets were achieved and exceeded, the Director appreciated the group and wherever there was shortfall, he was ascertaining the reasons and then gave suggestions to overcome the short fall. Overall, CEMS achieved 96% accumulative progress in four quarters.

Expressing satisfaction of the outcomes during the fourth Quarter the KPIs workshop, CEMS members gave suggestions regarding the Center's KPIs. The online workshop ended with the Director's concluding remarks.











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# **RESEARCH SPOTLIGHT**



Trends in Environmental Analytical Chemistry Volume 30, June 2021, e00120

Porous graphene-based electrodes: Advances in electrochemical sensing of environmental contaminants

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#### Multi-Input Nonlinear Programming Based Deterministic Optimization Framework for Evaluating Microgrids with Optimal Renewable-Storage Energy Mix

by 🙁 Yousef Alhumaid 1 🖂, 🙁 Khalid Khan 1 🖂 💿, 🙁 Fahad Alismail 1.2.3 🖂 💿 and 🙁 Muhammad Khalid 1.2.\* 🖂 💿

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South African Journal of Botany Available online 24 October 2021 In Press, Corrected Proof (?)

#### An integrative review on bioactive compounds from Indian mangroves for future drug discovery

A. Parthiban <sup>1, #</sup>, R. Sivasankar <sup>2</sup>, V. Sachithanandam <sup>1</sup>  $\stackrel{>}{\sim}$   $\stackrel{\boxtimes}{\sim}$ , S. Ajmal Khan <sup>3</sup>, A. Jayshree <sup>4</sup>, K. Murugan <sup>4</sup>, R. Sridhar <sup>1</sup>  $\stackrel{>}{\sim}$   $\stackrel{\boxtimes}{\sim}$ 

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- <sup>4</sup> Centre for Environmental Studies, Anna University, CEG Campus, Chennai 600 025



#### **WEEKLY SEMINARS**

# Twenty-one days in the Red Sea on R/V OceanXplorer: Technical and Research Experiences

#### Mr. Mustafa Falimban, Assistant Research Scientist, CEMS-RI

OceanXplorer is an advanced exploration, research, and media production vessel owned by OceanX, an ocean exploration organization. This USA-built vessel has a length of 87.1 m long and 21.4 m wide and can accommodate a maximum of 72 crew members. NEOM chartered the OceanXplorer for scientific exploration in the Red Sea for a period of 3 weeks from 7th October to 28th October 2020. The exploration focused on marine ecosystems, including megafauna, brine pools, and coral reef conservation and regeneration. To carry out these surveys, NEOM offered a three (3) week internship for young local scientists (Saudi citizens) who aspire to learn advanced techniques and knowledge in their respective fields.

This seminar highlights the facilities provided during the exploration to study the marine ecosystem. The facilities include advanced instruments such as ROV, ADCP, CTD, Submarines, Multibeam Sonar onboard to collect valuable data and map the seabed to assess and study marine life. Moreover, this presentation also highlights how the program provided an opportunity to gain practical fieldwork experience and familiarization with the above-mentioned instruments.

#### **Organic Waste as a Source for Generating Electricity**

#### Mr. Bahauldeen Mohammed Ali Qurban ,Environmental Engineer , CEMS-RI.

The major global energy resources include coal, oil, and natural gas. The increasing consumption trend of these resources has been negatively impacting the atmosphere and the biosphere. However, energy can be generated from renewable sources. One of the most common renewable energy sources is organic waste generated by daily human activities. Organic waste is a significant source of biogas, an alternative to fossil fuel sources. Biogas is produced during the natural activities of the anaerobic bacteria by the process of anaerobic fermentation. The biogas mainly contains methane and carbon dioxide (i.e., greenhouse gases) that contribute to global warming. The use of methane in generating electricity will reduce its greenhouse effect. Because in the process of electricity generation, methane will be converted to carbon dioxide, which has less global warming potential. This seminar the results of a study related to a dry anaerobic process based on a plug-flow reactor and co-generation unit. The process produces compost which can be used as fertilizer. The study presented in this seminar, also investigated the greenhouse gas emissions avoidance and the cost-benefit performance.

# Fisheries Impact Assessment: The Concepts and Approaches in EIA Studies

#### Dr. Abdu Rahiman Kambrath Pullikkoden, Research Scientist III, CEMS-RI.

Fisheries resources constitute one of the major protein sources for humans worldwide. These resources also form an important source of income, livelihood, food supply, and employment for millions of fishers, particularly in many developing countries. Fisheries resources provide the fundamental and demand-derived ecosystem services which are essential for ecosystem function and resilience. Despite these essential roles, anthropogenic impacts such as overfishing, illegal, unreported, and unregulated fishing (IUU), pollution, habitat degradation, climate change, and other stress factors continue to exert intense pressure on fish populations. This human-induced decline of fisheries resources might threaten ecosystem services generated by fish with consequences on biodiversity, ecosystem functioning, and ultimately human survival. Considering these facts, there is an increasing consciousness among government organizations, institutions, and policymakers to include fisheries impact assessments in all coastal and marine developmental projects, including dredging, trenching, backfilling, drilling and reclamation projects to ensure the sustainability of fisheries. Fisheries impact assessment studies delineate and predict the potential direct and indirect impacts of all developmental projects on fish abundance and productivity, fishing grounds, feeding, and spawning grounds, bioaccumulation, larval recruitment, and fishermen's livelihoods. This presentation will discuss the concept, methodology, impact analysis and mitigation measures with respect to fisheries impact assessment.

#### **CEMS 2021 Fourth Quarter KPIs: Targets and Achievements**

#### Dr. Nabil S. Abuzaid and Mr. Meerja Humayun Baig

#### **Background**

Center for Environment & Marine Studies (CEMS) prepared 22 Key Performance Indicators (KPIs) for the year 2021, based on established strategic objectives. These KPIs resulted from a collective effort of different CEMS research groups. On Apr 21st, Aug 04th and Oct 27th of 2021, CEMS conducted its first, second and third workshops, respectively, to discuss the quarterly targets and achievements. KPIs targets of the fourth quarter and the related achievements as well as the those for the whole year will be shown and discussed during this workshop.

- <u>Objectives:</u>
- To discuss KPI targets vs achievement of KPIs with group leaders.
- To investigate potential reasons for mismatch between target KPIs and achievement.
- Getting public opinion as feedback.

#### • Agenda

- Introduction Speech and Overview of CEMS strategic Objectives: CEMS Director, Dr. Fahad S. Al-Ismail.
- CEMS KPIs: Moderated by Dr. Nabil Abuzaid and Mr. Humayun Baig with participation of the Center Director and Group Leaders.
- Conclusions: Dr. Nabil Abuzaid.
- Closing Remarks: Dr. Fahad S. Al-Ismail.
- Public opinion as feedback and remarks.



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### FACTORS AFFECTING GLOBAL CLIMATE CHANGE AND SOLUTIONS TO COMBAT CLIMATE CHANGE

Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. But since the 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil and gas. Climate change is affecting rainfall patterns and intensifying the water cycle. It is causing more intense rainfall and associated flooding, as well as more intense drought in many regions.

It is predicted that extreme sea-level events that previously occurred once in 100 years could happen every year by the end of this century. The impacts of climate change on different sectors of society are interrelated. Drought can harm food production and human health. Flooding can lead to the spread of disease and damage to ecosystems and infrastructure. Human health issues can increase mortality, impact food availability, and limit worker productivity. Conditions like the rise of sea levels and intrusion of saltwater have advanced to the point where whole communities have had to relocate, and protracted droughts are putting people at risk of famine. In the future, the number of "climate refugees" are expected to rise.

However, significant and sustained reductions in emissions of carbon dioxide ( $CO_2$ ) and other greenhouse gases would limit climate change. While benefits in air quality would come quickly, it could take 20-30 years to see global temperatures stabilize. Burning fossil fuels, such as carbon dioxide or methane, generates greenhouse gas emissions that act like a blanket wrapped around the Earth, trapping the sun's heat and raising temperatures. These are generated by burning gasoline to drive a car or coal to heat a building, for example. Landfills for garbage are also a major source of methane emissions. The energy, transport, construction, and agriculture industries are among the main emitters of greenhouse gasses.

Many climate change solutions can deliver economic benefits while improving our lives. Three broad categories of action are: cutting emissions, adapting to climate impacts, and financing required adjustments. Switching energy systems from fossil fuels to renewables like solar or wind power will reduce the emissions driving climate change. In addition, everyone can take simple steps like saving energy at home, walking, cycling, or using public transport to help reduce the impact of climate change.



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#### **EVAPORITE COLLAPSE POTENTIALS AND HAZARDS**

Evaporites are types of sedimentary rocks formed by chemical precipitation from saline water in shallow, arid marine environments. Gypsum, anhydrite and halite are the most common types of mono-mineralic rock in the evaporite group. Fine, thinlyinterbedded sandstone, mudstone, and black shales can also occur in evaporate deposits. The Middle Miocene Formation at Al-Bad' is the most significant evaporite rock deposit in Saudi Arabia.

Evaporites covers wide areas in NEOM, particularly around the towns of Al Bad' and Magna. Evaporite rocks are characterized by a high rate of dissolution. For example, gypsum (CaSO4 2H2O) and halite (NaCl) have solubility of 2.4 and 360 gr/L in distilled water, respectively, which are extremely high in comparison to the solubility of calcite and dolomite found in natural environments (lower than 0.5 gr/L). Ancient tectonic activity in the NEOM area resulted in several types of weak planes (faults, fractures and joints) which allowed surface water to circulate within these sediments and accelerate the rate of evaporite dissolution. The Bad' Formation features different types of dissolution structures, including collapses, subsidence sags, open fissures, sinkholes and karsts. Since these structures can be hazardous, detailed geoscientific data should be collected and used for urban development planning.



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Figure 1: Field photo shows collapsed structures in evaporite rock, Magna, NEOM.



Figure 2: Field photo shows fully-developed open fissures in evaporite rock, Al-Bad, NEOM.



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Figure 3: Field photo shows caves, sinkholes of pre-collapsed evaporite, Ras Al-Shaikh Hamed, NEOM.



#### TURBIDITY SILT CURTAINS – A MAJOR PLAYER IN ENVIRONMENTAL MITIGATION ASSOCIATED WITH DREDGING AND MARINE CONSTRUCTION ACTIVITIES

Silt curtains are vertical barriers (Figure 1) positioned in water to contain fine material (sediment) introduced into the water column by dredging or other construction activities. A silt curtain comprises of a geo-textile sheets which are attached to floats and weights that descend to the seafloor and are anchored.



Mr. Mohammed Ashraf

When dredging or other construction activities disturb fine grained sediment, the suspended particles may reduce water quality and impact organisms (including mangroves, coral, and seagrass) in its vicinity which are sensitive to light and/or sediment deposition. Installing a silt barrier aims to prevent fine-grained suspended material from migrating by advection or being diffused into the wider environment.

According to the prevailing hydrodynamic and metocean conditions, three types of silt curtains can be used. Type I (light-weight) curtains are designed for use in lower energy environments where there are no currents. Type II (medium-weight) curtains are suited to sites where there is a small to moderate current of up to about 1 m/s. Type III (heavy-duty) curtains are for sites in higher-energy environments, with currents in excess of 1.5 m/s.

Type III silt curtains (Figure 2) are commonly recommended for use in marine projects in the Arabian Gulf and Red Sea where there are construction activities, including dredging, trenching, piling, and drilling, as a part of standard environmental mitigation measures (Figure 3).

During environmental monitoring, regular inspection of the deployed silt curtains should be carried out and accordingly, recommendations should be made for routine maintenances and corrective actions in case of non-compliance issues such as gaps or damage in the curtains.



Figure 1. A typical installation of silt curtain

Figure 2. Components of a Type III silt curtains



Figure 3. Type III- Silt curtain installed near dredging/trenching areas

#### SOLID-PHASE MICROEXTRACTION

Solid-phase microextraction (SPME) was introduced in the early 1990s. It integrates several analytical steps, such as sampling, extraction, pre-concentration, and sample introduction for instrumental analysis in the case of gas chromatography (GC). A SPME device consists of a fiber coated with a thin layer of sorbent. The most commonly used fibers include fused silica, plastic support, or metallic wire.



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The sorbent can be coated on the fiber using different strategies, such as physical deposition, a sol-gel method, or electrochemical modification. The SPME fiber can be introduced into a sample solution in two modes: direct immersion or headspace. Direct immersion mode is generally suitable for clean samples. Headspace mode might be a good choice for complex samples or semivolatile analytes.

Unlike classical exhaustive solid-phase extraction, SPME is a non-exhaustive technique that relies on partition equilibrium of the analytes between the sample matrix and coated sorbent phase. After extraction, the analytes are thermally desorbed from the SPME fiber into the injection port of the GC instrument. Liquid desorption is performed if the final instrument performs liquid chromatography (LC). In this way, SPME is a solvent less technique for GC and requires a minimal volume of solvent in the case of LC.

The most common coating materials used for SPME include polydimethylsiloxane, divinylbenzene, carboxen, or a combination of these. SPME fibers based on these coatings are commercially available and can extract a wide range of analytes. Due to the diversity of target compounds and inherent limitations of commercial SPME fibers, many well-known materials, including carbon, molecularly imprinted polymers, metal-organic frameworks, have been investigated as SPME coatings.

In conclusion, SPME is advantageous because it is a simple, sensitive, cost-effective, reliable, easy-to-automate, portable sample-preparation technique that significantly minimizes the consumption of hazardous solvents. A schematic of headspace-SPME-GC-MS is shown in Figure 1.



Figure 1. Diagram of analysis with headspace solid phase microextraction-gas chromatography-mass spectrometry. Reused from "Journal of Biomarkers, vol. 2015, Article ID 981458, 16 pages, 2015. https://doi.org/10.1155/2015/981458"



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