



THE EAST ASIAN SEAS CONGRESS

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**27-30 November 2018** • Iloilo Convention Center, Philippines



**TRACK 1: CLIMATE AND BLUE CARBON**

### SESSION 1.1

## Establishing Blue Carbon Research Network in East Asian Seas Region

**CONVENERS:**



Korea Marine Environment  
Management Corporation



Partnerships in Environmental  
Management for the Seas of  
East Asia

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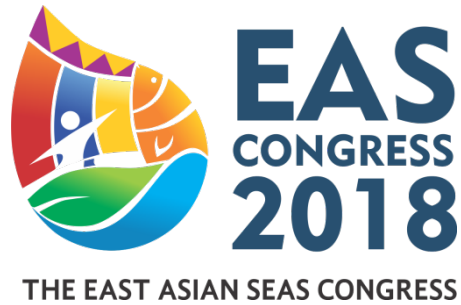
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## **REPORT**

**TRACK 1: CLIMATE AND BLUE CARBON**

### **Session 1.1: Establishing a Blue Carbon Research Network In the East Asian Seas Region**

**Co-convenors:**



**27 November 2018  
Iloilo Convention Center, Philippines**

**Korea Marine Environment Management Corporation**

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## **INTRODUCTION**

Blue Carbon is gaining currency in recent years as one of the solutions for mitigating climate change. The carbon storing potential of blue carbon should be assessed in a scientifically sound way in order to receive the recognition from the UNFCCC process. In order to achieve the goal, a network of researchers should be formed to collate concerted efforts in demonstrating the potential. The research efforts of blue carbon will significantly enhance the awareness and conservation efforts of global community on key marine ecosystems such as tidal marshes, seagrass meadows, and mangrove forests.

Blue carbon can play a significant role in the implementation of the Nationally Determined Contributions (NDC) in the UNFCCC process. Therefore, national policy and research efforts should be enhanced in advancing the blue carbon concepts in EAS region.

### **Objectives**

- Sharing state-of-the-art information on blue carbon status and research efforts in East Asia and the global community
- Assessing the role of blue carbon in the Nationally Determined Contributions (NDC)
- Establishing a network of blue carbon research in East Asia

### **Co-convenors:**

- Korea Marine Environment Management Corporation (KOEM)
- PEMSEA

### **Sponsor:**

- Ministry of Oceans and Fisheries, RO Korea

### **Desired Outcome:**

- Fostering research on Blue Carbon in EAS region aiming at receiving recognition of blue carbon such as mangrove, seagrass, tidal flat and even coral as the sequestration method by the UNFCCC process.

## PROGRAM

**Chair: Dr. Lee Sukhui, Manager, KOEM**

27 November 2018

Time	Agenda
13:30-13:45	Opening <ul style="list-style-type: none"> <li>- Welcome Remarks, Mr. Stephen Adrian Ross, Former Executive Director, PEMSEA</li> </ul>
13:45-14:00	Blue Carbon in the Context of Blue Economy in the EAS Region <ul style="list-style-type: none"> <li>- Ms. Maricor Ebarvia-Bautista, PEMSEA</li> </ul>
14:00-14:15	Current Research Efforts on Blue Carbon in RO Korea <ul style="list-style-type: none"> <li>- Mr. Kim Young don, KOEM, RO Korea</li> </ul>
14:15-14:30	Blue Carbon Policy and Strategy Development in China <ul style="list-style-type: none"> <li>- Dr. Zhao Peng, Fourth Institute of Oceanography, PR China</li> </ul>
14:30-14:50	Coffee Break
14:50-15:05	Potential of Coastal Blue Carbon in Indonesia: Mangrove <ul style="list-style-type: none"> <li>- Dr. Andreas Hutahaeen, Deputy Director, Coordinating Ministry for Maritime Affairs, Indonesia</li> </ul>
15:05-15:20	Potential of Blue Carbon in the Philippines <ul style="list-style-type: none"> <li>- Prof. Laura David, Marine Science Institute, University of the Philippines</li> </ul>
15:20-15:35	Influencing Mechanisms of Eutrophication on Sediment Organic Carbon Sequestration within a Typical Tropical Seagrass Meadows <ul style="list-style-type: none"> <li>- Dr. Songlin Liu, Chinese Academy of Sciences, PR China</li> </ul>
15:35-15:50	Potential of Blue Carbon: Tidal Flat <ul style="list-style-type: none"> <li>- Dr. Kwon Bongoh, Seoul National University, RO Korea</li> </ul>
15:50-16:10	Coffee Break
16:10-17:00	Panel Discussion <p>Topics:</p> <ul style="list-style-type: none"> <li>- Recognition of Carbon Sequestration Potential of Blue Carbon in the UNFCCC mechanism</li> <li>- Establishing a Blue Carbon Network in EAS region</li> </ul> <p>Moderator: Dr. Won-Tae Shin, PEMSEA</p> <p>Panelist:</p> <ul style="list-style-type: none"> <li>- Dr. Zhao Peng, Fourth Institute of Oceanography, PR China</li> <li>- Prof. Laura David, Marine Science Institute, University of the Philippines</li> <li>- Dr. Andreas Hutahaeen, Coordinating Ministry for Maritime Affairs, Indonesia</li> </ul>

	- Dr. Park Heungsik, KIOST, RO Korea
17:00-17:40	Open Forum  Participants will make comments and raise questions to speakers and panels.
17:40-17:45	Wrap-up - Dr. Lee Sukhui, KOEM  Closing remarks - Dr. Park Seunggee, CEO, KOEM

## OPENING REMARKS

### **Mr. Stephen Adrian Ross, Former Executive Director, PEMSEA**

I would like to convey my deep appreciation to the Convener, Korea Marine Environment Management Corporation or KOEM for organizing this workshop and the collaborating organizations, PEMSEA and the First Institute of Oceanography. Many participants from the region including KOEM, 4<sup>th</sup> Institute of Oceanography, PR China, Marine Science Institute, University of the Philippines, Chinese Academy of Sciences, PR China, Coordinating Ministry of Marine Affairs, Indonesia, Seoul National University, RO Korea, Korea Institute of Oceanography, Science and Technology and PEMSEA have contributed this workshop.

Over the past 10 years, researchers, policymakers, and practitioners have built a strong foundation of science, policy, finance and coastal management approaches to integrating the conservation and restoration of blue carbon ecosystems into the global effort to address climate change. Such efforts reflect a growing awareness of the importance of coastal blue carbon ecosystems, in terms of global climate regulation and adaptation for local communities. Protecting and restoring blue carbon ecosystems are a key link to achieving sustainable development goals, growing blue economy and meeting national commitments to the Paris Climate Agreement.

East Asia is a global hotspot for the remaining coastal blue carbon ecosystems (mangroves, tidal marshes and seagrass) but it is experiencing high rates of loss due to conversion to aquaculture, palm oil plantations, deforestation and urbanization.

In May 2017, in partnership with Conservation International, the Nature Conservancy, Silvestum Climate Associates, and the Blue Carbon Initiative, PEMSEA published a report entitled, UNDERSTANDING STRATEGIC COASTAL BLUE CARBON OPPORTUNITIES IN THE SEAS OF EAST ASIA.

The report sought to better understand the status of coastal blue carbon ecosystems in East Asia and raise awareness of the opportunities to include improved management of these ecosystems within climate mitigation and adaptation actions and commitments, including opportunities to access new forms of financing.

The geographic focus of the report was the 14 countries that adopted the SDS-SEA. The report summarized:

- current knowledge of each ecosystem's distribution on East Asia, estimated carbon stocks, and estimated emissions due to ecosystem loss

- blue carbon approaches under nationally determined contributions, including policy opportunities and linking climate finance and blue carbon investment
- practical steps to advance blue carbon interventions, focusing on awareness building, knowledge exchange, and acceleration of practical action, including making use of emerging climate change instruments.

Importance of this workshop and partnership dialogue in moving forward with blue carbon applications in the region have well acknowledged. Possible focus of a regional blue carbon research network in terms gaps in policy and programs include:

- Improved tracking of blue carbon gains and losses (lack of data on tidal marshes and sea grasses), quantification and reporting of GHG emissions and removals
- Measuring and weighing the significance of coastal blue carbon ecosystems across policy areas, planning and development documents, at regional, national and local levels
- Providing scientific basis and input to climate change vulnerability assessments, adaptation and resilience plans and promoting the role of coastal blue carbon ecosystems as a vehicle for sustainable environmental infrastructure and
- Building on/strengthening bilateral and regional cooperation of PEMSEA countries to enhance joint planning and implementation of climate change mitigation and adaptation through the NDC framework

Wishing you good discussions and looking forward to your recommended actions.

Thank you.



## CLOSING REMARKS

**Dr. Seunggee Park, CEO, KOEM**

Mr. Stephen Adrian Ross, former Executive Director of PEMSEA, speakers and panel, ladies and gentlemen, I would like to thank you all for joining this workshop and sharing your frank thoughts and experiences in Blue Carbon research. Also, I apologize for being late since I had other important schedule to keep.

As you may already realize, the global community is feeling severe impacts of climate change. The adverse impacts have been sporadically felt in few years back but now we are feeling them in a daily basis. In one part of globe, people suffer from draught but on the other side people suffer from floods with loss of lives and properties. Some parts suffer from severe heat wave, on the other side, suffer from severe cold. These events are rather frequent than not. In this, the global community is trying hard to respond to climate change through UNFCCC and Paris Agreement to minimize the temperature increase to a certain limit. But we expect that the adverse impacts of climate change will not be easily overcome in a foreseeable future.

Climate change also affects global ecosystems in a tremendous rate and scale. In particular, climate change is significantly exerting adverse impacts to the marine ecosystems which consist of 90% of global ecosystem and in turn adversely affecting our daily lives. The question is how we can effectively protect our marine ecosystem and improve the deteriorating trend of climate change.

For this reason, KOEM is conducting research project on Blue Carbon under the auspices of the RO Korean government. The project is intended to prove the carbon sequestration power of the marine ecosystems such as holophyte, mangrove, seagrass, mud flat so that these blue carbon assets will be protected and contribute to alleviate climate change. We are hoping that the research project will contribute to the conservation of the blue carbon assets and eventually increase in covered areas.

I would like to thank you all for participating this workshop. I learned that many countries already initiated their endeavor to conduct research on Blue Carbon assets. I hope that you have learned fresh information and knowledge on blue carbon research results during this workshop. It is anticipated that it will take some time for the blue carbon assets to be approved as a method for sequestering green house gases. This workshop would pave the

way to form a blue carbon research network in the East Asian Seas region.

KOEM will continue our efforts in promoting the blue carbon research and wish to collaborate with you in the future. I am cordially inviting you to join the network.

Thank you very much.

## SUMMARY OF THE SESSION

**Chairman** : Dr. Sukhui Lee

**Moderator** : Dr. Won-Tae Shin

### I. PRESENTATIONS

#### Current Research Efforts on Blue Carbon in RO Korea

**Mr. Kim Youngdon, KOEM**

- Mr. Kim presented the following: introduction, research plan, recent achievements and challenges and lessons
- Blue carbon storage in marine ecosystems are 50 times faster than terrestrial ecosystems
- Other potential carbon sources:
  - Saltmarshes – 3x higher than terrestrial ecosystems
  - Seagrasses – 2x higher than terrestrial ecosystems
- Global Trend in blue carbon research and potential:
  - IPCC special report
  - Ramsar convention
  - Developing the inventory of all wetlands – USA
  - Investigating inclusion of a range of activities – Australia
- RO Korea's Blue Carbon Research Plan is to come up with a blue carbon information system which have been started since 2017 and up to 2021
- Roadmap of Blue Carbon Research:
  - Information system establishment
  - Identification of carbon cycle
  - Blue carbon estimate information and establishment of international blue carbon networks.
- Recent main results:
  - Estimate coastal wetland blue carbon storage
  - Vegetated area organic carbon storage ability is 150% higher than non-vegetated area
  - *Zostera marina* meadows
  - Distribution of salt marsh in the West Coast using hyperspectral images
  - National tidal flat area distribution survey
  - Pilot survey conducted in West coast
  - Outcome of R&D facilitated the creation of SOP, MRV, Academic papers and database of Blue Carbon Survey

- Challenges and lessons:
  - Development of Criteria for Survey Location and Cycle
  - How to get data from past activities on Blue Carbon ecosystems

## **Blue Carbon in the Context of Blue-Economy in the EAS Region**

### **Ms. Maricor Ebarvia-Bautista, PEMSEA**

- Blue economy and blue carbon in the EAS region equate to 1.4 trillion dollars in the ocean economy
- Ocean as source of incomes, livelihood and jobs:
  - Fisheries
  - Tourism
  - Industries
  - Education and
  - Energy
- Oceans as drivers of innovative growth
- Oceans as natural capital
  - Near shore – terrestrial
  - Intertidal
  - Benthic
  - Pelagic
- Why value coastal and marine resources?
  - EAS is said to be the most productive biologically and are also over-exploited and generally neglected.
  - There is a need to improve management of ecosystem putting economic values on their presence, products and uses.
  - This is aimed to help decisionmakers
- There is a need to avoid irreversible environmental impacts.
  - Although there are methods to rehabilitate lost ecosystems, still it is not par in terms of biodiversity of the original ecosystem.
  - Total economic value takes into consideration the provisioning, supporting, regulating and cultural ecosystem services.
- Opportunity: The EAS region has a vast are and distribution of blue carbon ecosystems such as Mangrove, seagrasses and corals
- Challenges:
  - A standard method in valuating Blue Carbon
  - How to commercialize Blue Carbon Ecosystems
  - How to make Blue Carbon Work on the ground
  - Global Carbon Price has been found to be volatile in recent years.

- Important to: map out Blue Carbon Ecosystems, determine the conditions of these ecosystems and value their potential in the blue economy.
- More research on the condition of the ecosystems and their actual sequestration rate.

## **Blue Carbon Policy and Strategy Development in China**

**Dr. Zao Peng, Fourth Institute of Oceanography, PR China**

- With the current global temperature increase of 1.5°C, it is recommended to take action as there is no much time left of us.
- China's promise for the future is to decrease carbon dioxide emission by 60-65% and increase forest stock to 4.5 billion m<sup>3</sup> compared to the 2005 level.
- Mapping of the distribution of Seagrasses, mangroves and tidal marches has been done in China
- In recent years, rapid losses of blue carbon ecosystems are due to coastal exploitation, habitat damage, agriculture, overfishing and water pollution.
- The blue carbon sequestration has been estimated in China.
  - More than blue carbon ecosystems. Blue Carbon is a combination of natural; processes and artificial effort
  - Top Algae producing countries include: China, Indonesia, Philippines, Korea and Japan
- Blue carbon in China's national policies:
  - Marine carbon sink to control GHG emissions have been recognized
  - 13<sup>th</sup> 5-year plan
- China's progress on blue carbon:
  - Blue carbon has been included in China's first Biennial report on climate change submitted to UNFCCC on January 2017.
  - China's blue carbon standard system include: investigation, monitoring, accounting, mitigation and adaptation.
  - National blue carbon pilot scheme is under drafting which includes the participation of local government and private sectors.
- Belt and Road maritime cooperation:
  - Coastal blue carbon survey and monitoring
  - Blue carbon scientific researches
  - International cooperation
- Seagrass habitat restoration has an 80% survival
- Mangrove habitat restoration
  - Blue Carbon vs. shrimp ponds
- Way Forward and Challenges:

- Enumerated some suggestions regarding the Blue Carbon Network:
  - Regional Working Group-Regional Network-Regional Initiative
  - Regional Scientific and Policy Report
  - Blue Carbon Inventory
  - Mitigation and Adaptation Pilot Projects
  - Sustainable Livelihood based on Blue Carbon Enhancement

**Question and Answer:**

- Mr. Kim Youngdon: How do you calculate disappearing blue carbon areas?
  - Dr. Zhao Peng: China does not compare errors/differences between different years. But satellite data can be used for comparison purposes.
  - Marie Frances Nievales (UP Visayas, Philippines): What is the relevance of Belt and Road Program on Blue Carbon?
  - Dr. Zhao Peng: China's central government has realized the importance of Ecosystem Restoration along Belt and Road Program counties.
- Dr. Won-Tae Shin: You mentioned about natural processes and artificial efforts. What does it have to do with fisheries?
  - Dr. Zhao Peng: emphasized the importance of macroalgae rearing and its contribution to blue carbon storage.
  - Jang Lee (Seoul National University, Korea): What about the invasive species problem in the saltmarshes of China?
  - Dr. Zhao Peng: Noted the efficiency of blue carbon sink of certain invasive plant in China. Though it is suggested to restore/replant native species, invasive species can be used resources as medicine, industrial material and food for animals.
- Dr. Lee Sukhui: Why is there a wide range of difference of values between blue carbon ecosystems?
  - Dr. Zhao Peng: The data posted were not that precise. In China, Tidal marshes are changing and developed that is why there is no precise estimation of tidal flats.

**Potential of Coastal Blue Carbon in Indonesia: Mangrove**

**Dr. Andreas Hutahaean, Deputy Director, Coordinating Ministry for Maritime affairs, Indonesia**

- Dr. Andreas Hutahaean presented the challenges met on a national perspective in Indonesia and importance of Coastal and Ocean ecosystem services

- Indonesia blue carbon significance: more than half of blue carbon ecosystem in the world is located in SEA/EAS.
  - Indonesia (2005) released map of mangrove ecosystem based on remote sensing data.
  - There are 3.4 million hectares of mangroves compared to the 3.1 million hectares projected by Giri.
  - Most of the seagrass ecosystem in Indonesia are located in the Eastern part.
- Study on the blue carbon storage in the different major mangrove setting in Indonesia
  - Kongsu Island
  - Segara Anakan Lagoon, Central Java
  - Berau delta – which was shown to have the highest organic carbon in both below and above ground.
- Traced sources of organic matter using stable isotope composition and C/N ratio based on Khan et al., 2005.
  - Study site in Berau was shown to have the highest carbon accumulation rate compared to other regions/areas in the world.
- Mainstreaming Indonesia Blue Carbon in the regulatory framework which includes Indonesia Ocean Policy, National strategy for mangrove ecosystem management, Paris Agreement responses, Answer to Sustainable Development Goals 13 and 14, Maritime affairs/National planning agency down to the subnational and local level.
- Indonesia Blue Carbon Initiative – coordinate blue carbon scientific policy activities
- Emphasized the importance of social sciences to deliver the message because scientific researches cannot be readily absorbed by the local community/people.

#### **Question and Answer:**

- Dr. Won-Tae Shin: Commercialization may be important in blue carbon because of monetization of coastal resources are competing the blue carbon. Indonesia seems to stop at the policy level. How to address the issue of commercialization?
  - Dr. Andreas Hutahaean: emphasized the importance of policies on improving coastal community livelihoods. Government must formulate sustainable alternative livelihoods.
  - Dr. Won-Tae Shin: You need to develop what kind of livelihood to be implemented in the coastal area.
  - Dr. Andreas Hutahaean: cited examples such as mangrove ecotourism projects and the importance of mangroves in filtering water quality in ponds.
  - Ms. Lormelyn E. Claudio (EMB Region 3, Philippines): the experiment shown was limited to an estuary. How about the water bodies with conflicting land-uses? How to apply a strategy?

- Dr. Andreas Hutahaen: People in the grassroots level is not thinking in the long term but only for short-term survival. The government aims to increase economic growth which does not always coincide with the thinking of conserving ecosystems. That is why we need social sciences to deliver the message of conservation. For example, carbon sequestration may mean nothing to people, but what matters to them is how big or small the size of fishes are. Government (i.e. policy makers) does not need complicated graphs and figures which are the output of researches. They just need simple words.

### **Potential of Blue Carbon in the Philippines**

**Prof. Laura David, Marine Science Institute, University of the Philippines**

- Seagrasses in the Philippines:
  - 27,282 km<sup>2</sup> (Fortes, 2008)
  - Belonging to 18 species (Fortes, 2013)
  - 1.2 billion mg CO<sub>2</sub> national sequestration rate in the Philippines
  - Seagrass cover have been quantified in NIPAS areas (1990-2000-2010)
  - Only 57.3 km<sup>2</sup> are persistent seagrass area (20-25% of NIPAS sites) while other appear and disappeared.
  - There is a total of 239 million carbon sequestered in these persistent areas.
- Habitat destruction is the greatest threat of seagrasses which include: mariculture, (overfeeds also bury seagrasses), reclamation and mangrove replantation.
- Seagrasses release bicarbonate that contributes to alkalinity combating ocean acidification. That is why corals are more protected from bleaching if they are located near seagrass areas.
- Way Forward and Challenges:
  - How to keep the remaining root system in areas with seagrass die-off because they are capable of regenerating?
  - There is a lack/little publication on blue carbon in seagrasses in the Philippines.

Question and Answer:

- Dr. Won-Tae Shin: compared to other types, seagrasses tends to have low carbon sequestration capacity?
  - Prof. Laura David: Yes that is true but seagrasses have higher sequestration rate than terrestrial ecosystems.
  - Dr. Alicia Lustica (ERDB-DENR, Philippines): There has been a recent carbon



- symposium in Subic, Philippines that shows a lot of studies on blue carbon.
- Prof Laura David: Studies yes, but publication not that much.

### **Influencing Mechanisms of Eutrophication on Sediment Organic Carbon Sequestration within a Typical Tropical Seagrass Meadows**

**Dr. Songlin Liu, South China Sea Institute, Chinese Academy of Sciences, PR China**

- Seagrasses are important because they contribute 10% of yearly organic carbon in oceans
- Dr. Liu presented research results such as: surface SOC sources, surface SOC compositions, stable isotopes, sediment enzyme activities, SOC composition in core sediment, stable isotope carbon on sediment cores and SOC storage.
  - Results show the relative contribution of seagrass derived carbon to bacteria increased with nutrient loading.
  - The relative contribution of seagrass plant material to sediment BOC in *E. accoroides* meadows were half that of *T. hemprichii* meadows.
  - Nutrient loading changes the relative contribution of seagrass and algal sources to SOC pools boosting sediment microbial biomass and extracellular enzyme activity, thereby enhancing SOC transformation.
- Way Forward and Challenges:
  - Determine the nutrient threshold that do not lead to the loss of seagrasses and seagrass meadows.
  - The labile organic carbon (MBC and DOC) and enzyme activities (Polyphenol oxidase and cellulases) should be taken as important indicators to evaluate carbon sequestration.
  - Selection of site matching but higher carbon sequestration species to amplify blue carbon.

Question and Answer:

- Jang Lee (Seoul National University, Korea): How did you come up with 6.8 Mg C/ha in Xiamen Bay. It is quite low compared to the values that we got from Korea.
  - Dr. Songlin Liu: Sandy areas in our study sites were shown to have very low carbon.

## Potential of Blue Carbon: Tidal Flat

Dr. Kwon Bongoh, Seoul National University, RO Korea

- Korea has no mangroves, therefore, studies were focused on salt marshes and tidal flats.
- There was noted to be a problem with the reclamation of saltmarshes in Korean rivers over the years.
- Methodology of the study include the review of >300 references around Korea
- Comparison of organic carbon and bulk density by sediment depth
- *Spartina* will increase blue carbon in tidal flats.
- There was an observed lower Total organic carbon in tidal flats compared to mangroves.
- Total organic carbon is lower in the salt marshes of Korea compared to other countries such as China.
- Vegetated flat = 76 Mg C ha<sup>-1</sup>
- Bare Flat = 60 Mg C ha<sup>-1</sup>
- Reclaimed area = 31 Mg C ha<sup>-1</sup>
- Reclamation causes 50% decrease in TOC.
- TOC with moisture content showed positive relationship

Question and Answer:

- Dr. Songlin Liu: Have you include plant tissues in the sediment in the analyses?
  - Dr. Kwon Bongoh: No. tissues were removed in the calculation. Only compared bulk sediment
- Dr. Songlin Liu: How did you remove very small plant tissues?
  - Dr. Kwon Bongoh: That can be answered by Mr. Jongmin Lee who conducted the sediment Analysis.
  - Accordin to Mr. Jongmin Lee, only, tissues larger than 1 mm were removed at the very least.

## II. PANEL DISCUSSION/OPEN FORUM

Guide questions:

1. What can we do with all the research we have done on Blue Carbon? How we can utilize these research results in “commercialization” of these Blue Carbon Assets?
2. How we can register Blue Carbon as one of the sequestration methods like REDD?
3. What is the bottleneck in blue carbon research in your country?
4. Will it be necessary to form a Blue Carbon Research Network in EAS region?

Panelist:

- Dr. Zhao Peng, Fourth Institute of Oceanography, PR China
  - Prof. Laura David, Marine Science Institute, University of the Philippines
  - Dr. Andreas Hutahaean, Coordinating Ministry for Maritime Affairs, Indonesia
  - Dr. Park Heungsik, KIOST, RO Korea
- 
- Dr. Zhao Peng: We do not necessarily need to ratify parties, we need to realize methodologies and use previous studies to quantify carbon storage. In China there have been no nationwide database and no nationwide maps.
    - Prof. Laura David: It is important to interpret data at every level. Moreover, we need to agree on one number of carbon currency/hectare. Therefore, we must come up with a standard metric.
  - Dr. Won-Tae Shin: Emphasized the importance of standardization/normalization of data.
    - Prof Laura David: We cannot argue globally if we follow a national system.
    - Dr. Alicia Lustica: There are many different factors and equipment. Therefore, we need to level up and come up with different factors and equipment. Develop one standard method to have a unified action plan regarding blue carbon.
  - Suzhen Yang (Xiamen University, China): How can we use research for human well-being? How to differentiate carbon anthropogenic versus natural carbon?
    - Dr. Andreas Hutahaean: In this case, we know what science is needed, blue carbon research should be multidisciplinary. In general it is hard to distinguish artificial carbon because it is usually mixed up but one way to look at it is to study areas that are undisturbed or with minimal disturbance and also determine the source of organic matter. National Policy is different from research or scientific method/data. In terms of local livelihood, fishermen don't know blue carbon, they are more concerned with their fishes and catches. This is where social science should come in. They need to translate scientific results to understandable terms for local community/fishermen.
  - Dr. Park Heungsik: These are my 3 point of view: 1) We need integration of the different tools, because different countries have different methods. 2) PEMSEA as lead to the conformation of the different countries; and 3) Funding mechanisms for blue carbon research and evaluation.
    - Dr. Won-Tae Shin: PEMSEA to lead is a good proposal. However, I think countries such as China, Korea and other non-country partners (e.g. KOEM) should be the lead because they have the power and PEMSEA play a role as a coordinating mechanism for blue carbon partnership with both governments and non-

country partners. PEMSEA will act as the platform for collaboration. With this, there is a strong need for normalization/standardization of data so that we will have one voice in the blue carbon arena.

- Dr. Andreas Hutahaen: agrees and stressed the need for a network. Emphasized again the need for social scientists in delivering the message. Added that to do it, we need national focal point coordinators and asked what specific role can PEMSEA offer. Challenged PEMSEA to put the ocean in the UNFCCC agenda.
- Dr. Won-Tae Shin: Acknowledge the challenge. PEMSEA cannot initiate but will support country initiatives because PEMSEA can only serves as the platform and has limited resources. Promises that PEMSEA will do its best to promote blue carbon economy.
  
- Dr. Lee Sukhui: Asks the opinion of the panel on mangroves as coastal forest or as wetland?
  - Prof. Laura David: We have several conflicting point view, for example in the Philippines, we have an environment department that sees mangroves as forests, a fisheries sector that sees it as a wetland and other sectors sees it as alienable/disposable land for other uses. But I agree that mangroves should be categorized as coastal wetland.
  - Marie Frances Nieves: Has this commercialization been done in EAS or areas outside EAS?
  
- Dr. Won-Tae Shin: Commercialization as defined here is giving value to the ecosystem and ecosystem resources. It defines the evaluation of the value of the blue carbon assets and ecosystem services. Stressed the need for standardization/normalization and the need to lower the gap between country to country.

### **III. Conclusions and Recommendations**

#### **Conclusions**

1. The participants acknowledged the importance of blue carbon assets such as mangrove, seagrass and mud flat in combating climate change
2. Major Blue Carbon countries are actively conducting blue carbon research within their countries.
3. The blue carbon assets should be maintained or enhanced in order to alleviate adverse impacts of climate change
4. There are high demands for research in proving the carbon sequestration power of blue carbon assets.

5. There is a need to prove the carbon sequestration power of blue carbon assets within the UNFCCC framework

**Recommendations**

1. It is require that research efforts should be coordinated through network of research institutes within EAS region in order to expedite and maximize the resources for such efforts.
2. It is agree that regular gathering of blue carbon research network be organized.

The session was ended with a wrap-up by Dr. Lee Sukhui of KOEM and Chair of Session.

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