SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Carbon Sequestration
Name	Tim Rixen[1,2], Andreas A. Hutahaean[3] *and the* CISKA team
Institution	[1]Leibniz Zentrum für Marine Tropenökologie (ZMT), Bremen, Germany [2]Institute of Geology, University of Hamburg, Germany [3]Blue Carbon Center - Research Center for Coastal & Marine Resources, Agency for Research & Development of Marine and Fisheries, Jakarta, Indonesia
E-mail	Tim.Rixen@leibniz-zmt,de, andreas0212@gmail.com

Carbon sequestration in the Indonesian Seas and its global significance: Generation of scientific knowledge for formulating strategies for adaptation to climate change (CISKA)

Tim Rixen[1,2], Andreas A. Hutahaean[3] *and the* CISKA team

[1]Leibniz Zentrum für Marine Tropenökologie (ZMT), Bremen, Germany
[2]Institute of Geology, University of Hamburg, Germany
[3]Blue Carbon Center - Research Center for Coastal & Marine Resources, Agency for Research & Development of Marine and Fisheries, Jakarta, Indonesia

corresponding author: Tim.Rixen@leibniz-zmt,de

Abstract

The overarching scientific aim of the project CISKA was to quantify and to value carbon storage in and the CO_2 emission from the Indonesian Seas caused by declining ecosystems for the development of sustainable mitigation strategies within the framework of compensation-based institutional approaches to reduce the CO_2 emissions. A budget for the carbon cycle from the Indonesian Seas had to be established including carbon exports from coastal ecosystems into the ocean and the atmosphere. Therefore

1. carbon accumulation and export rates from peat and non-peat dominated ecosystems as well as CO_2 emissions from rivers and the ocean into the atmosphere had to be determined,
2. hydrodynamical and global carbon cycle models had to be developed and combined with satellite data to extrapolate field data to regional and global scales,
3. the impact of peatland degradation on coastal ecosystems and especially food web structures and fisheries had to be determined,
4. existing institutional approaches aiming at the reduction of emissions had to be evaluated, and
5. young scientists had to be trained to strengthen international efforts to reduce the CO_2 emissions in future.

SPICE final conference

January 20&21, 2016

Proposal	
Affiliated to topic (Session 1-8)	Carbon Sequestration
Name	Andreas A. Hutahaean, Agustin Rustam, Restu N Afiati, Terry Kepel, August Daulat, Widodo Pranowo & Budi Sulistyo
Institution	Blue Carbon Center (BCC) - Research Center for Coastal & Marine Resources, Agency for Research & Development of Marine and Fisheries, Jakarta, Indonesia
E-mail	andreas0212@gmail.com ; bluecarbon_indonesia@kkp.go.id

Intergrated *Blue Carbon* Program for Sustainable Coastal –Marine Resources in Derawan Archipelago-Berau, East Kalimantan.

Andreas A. Hutahaean, Agustin Rustam, Terry Kepel, Restu Nur Afiati, August Daulat,
Widodo Pranowo & Budi Sulistyo

Blue Carbon Center (BCC)- Agency for Research & Development of Marine and Fisheries, Jakarta, Indonesia

Corresponding author: andreas0212@gmail.com

Abstract

Blue Carbon ecosystem such as Mangrove and Seagrass are very important but often-underrated ecosystems. These ecosystems provide many essential ecosystem services, such as for fisheries, protection of beaches and coastlines from storm surges, waves and floods. They are also having significant contribution for the global climate by storing and sequestering atmospheric carbon. Recently, it has been recognized that coastal ecosystem actually contain much more carbon per unit area than many terrestrial ecosystems; giving additional value to what is already known about these important ecosystem.

The significance of coastal ecosystems and the role they can play in climate change mitigation, adaptation and support to livelihoods is also recognized in various international declarations (e.g. the Manado Declaration for Oceans), conventions (e.g. UNFCCC and CBD) and science-policy platforms (IPCC).

This presentation will show the ongoing initiatives blue carbon program in MPA of Derawan Archipelago, East kalimantan and projects to become a major driver of sustainable coastal ecosystem based management utilizing economic values associated with carbon sequestration and ecosystem services such us for coastal livelihoods (tourism, fisheries).

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Carbon Sequestration
Name	Bernhard Mayer , Thomas Pohlmann
Institution	Institute of Oceanography, Hamburg University
E-mail	bernhard.mayer@uni.hamburg.de

Impact of physical conditions on the carbon cycle in the Indonesian waters

Bernhard Mayer[1], Mutiara Putri[2], Thomas Pohlmann[1], Agus Setiawan[3]

[1] Institute of Oceanography -- University of Hamburg, Bundesstr. 53, 20146 Hamburg

[2] Institute of Technology Bandung, ITB, Jalan Ganesha 10, Bandung

[3] Agency f. Marine and Fisheries Research and Development, AMFRD -- Jl. KS Tubun Petamburan VI, Jakarta Pusat 10260

corresponding author: bernhard.mayer@uni-hamburg.de

Abstract

For the investigation of the impact of the physical conditions on the carbon cycle in the Indonesian waters, five numerical models have been utilized: the global hydrodynamical model MPI-OM, the global hydrological model MPI-HM, the regional hydrodynamical model HAMSOM, the carbon transport model ECOHAM and a Lagrangian tracer model. The combined and subsequent application gave an estimation of the circulation, distribution of temperature, salinity, water residence times as well as the distribution and development of important chemical carbon cycle parameters like pCO_2, DIC, pH and alkalinity in the Indonesian waters and the exchange of carbon dioxide between ocean and atmosphere. The model data were validated against observational data from remote sensing and from direct measurements. Observational data from the ship campaigns carried out within this project were used to validate the hydrodynamical model results and to feed the carbon model's riverine DIC and alkalinity concentrations.

The main result of this study demonstrates that all the parameters show a significant seasonal and spatial variability. Superimposed to this variability, a strong trend can be found for important quantities over the last 50 years. This concerns especially parameters related to the carbon cycle, which is strongly influenced by the anthropogenic trend of the atmospheric CO_2 concentration. From the pure chemical carbon transport model simulations of the past 50 years, the CO_2 outgassing from the Indonesian waters decreased and, for a very first time, turned into a temporary and short-term uptake in January 2008. These results will be highly relevant for understanding the future development of the marine environment in Indonesia, since in particular coral reefs are strongly affected by changing temperatures and pH values of the surrounding water masses.

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Carbon Sequestration
Name	Jesse F. Abrams
Institution	ZMT
E-mail	jab@zmt-bremen.de

The impact of Indonesian peatland degradation on downstream marine ecosystems and the global carbon cycle

Abrams, J.F.[1,2], Hohn, S.[1], Baum, A.[3], Merico, A.[1,2], Rixen, T.[3]

[1] Systems Ecology, Leibniz Center for Tropical Marine Ecology, Fahrenheitstrasse 6, 28359 Bremen, Germany, [2] Faculty of Physics & Earth Sciences, Jacobs University Bremen, Campus Ring 1, 28759 Bremen, Germany, [3] Carbon and Nutrient Cycling, Leibniz Center for Tropical Marine Ecology, Fahrenheitstrasse 6, 28359 Bremen, Germany

corresponding author: jab@zmt-bremen.de

Abstract

Tropical peatlands are one of the most space-efficient stores of carbon on the planet, storing approximately 89 Gt of carbon. Indonesian peatlands account for approximately 65% (57 Gt C) of the total tropical peatland carbon pool. Anthropogenic activity has lead to increased degradation of peatlands, which results in the outgassing of CO2 to the atmosphere and the leakage of DOC into the coastal ocean via riverine runoff. This has turned Indonesian peatlands from a sink of carbon into a significant source of carbon to both the atmosphere and the coastal ocean. The eventual fate and impact of the additional carbon on the downstream ecosystems and regional and global carbon cycles remains to be fully characterized. Using a biogeochemical box model of the Indonesian Car- bon System we test the impact of different carbon emission and functioning scenarios on the combined ocean-atmosphere sys- tem. A full suite of time series are output, including inorganic nutrient and phytoplankton concentrations, seagrass and coral abundances, alkalinity, dissolved inorganic carbon (DIC), pH, pCO2 for seawater, saturation state, fluxes, and atmospheric CO2. Here we present the results of the modeling study concerning (1) the effect on atmospheric pCO2, (2) the effect on oceanic pCO2 and the resulting change in pH and saturation state, (3) the effect on biomass distribution in the Indonesian coastal ocean, and (4) the final destination of the additional fluvial carbon.

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Carbon Sequestration
Institution	Fisheries Research and Development Center, Ministry of Fisheries and Marine Affairs
E-mail	samhudi_husnah@yahoo.com

ROLE OF ORGANIC MATTER TO PHYSICO-CHEMICAL QUALITY, THE ABUNDANCE OF AQUATIC ORGANISMS AND FISH HEALTH OF EASTERN SUMATRA RIVERS

Husnah[1]

[1]Fisheries Research Center and Development, Ministry of Fisheries and Marine Affairs- Jalan Pasir Putih II, Ancol Timur, Jakarta Utara

Corresponding author: husnah@kkp.go.id

Abstract

Allochthonous organic matter for long time has been considered as the main energy source for stream biota of low order streams. About 30 to 75% of energy supplies derived from organic matter resulting from decomposition of riparian vegetation occured in wetland areas such as floodplain forest. Escallation of human population not only burst the exploitation of the upland forest but also lowland forest such as peatland clearence. For instance, canalization of peatland forest for oil palm and rubber plantation caused deepening ground water and trigger the disaster of forest fire, haze and carbon emision in some provinces in Sumatra island specially eastern sumatra. Change in floodplain forest have the potential to affect the assemblages of aquatic organisms such as aquatic biodiversity, productivity and fish production. This paper will discuss the results of study on role of organic matter to physico-chemical quality, the abundance of aquatic organisms and fish health of eastern Sumatra rivers as a part of German-Indonesian Cooperation in Marine Sciences and Geosciences SPICE Cluster 4 (2008-2010).

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Carbon Sequestration
Name	Alexandra Ghosh
Institution	Leibniz Center for Tropical Marine Ecology (ZMT)
E-mail	alexandra.ghosh@leibniz-zmt.de

Beyond REDD+: Institutional Considerations for Peatland Conservation in Indonesia.

Ghosh, Alexandra.[1,2], Schlüter, A.[1,2]

1) Leibniz Center for Tropical Marine Ecology (ZMT), Fahrenheitstr. 6, 28359 Bremen

2) School of Humanities and Social Sciences (SHSS), Jacobs University, Campus Ring 1, 28759 Bremen

corresponding author: alexandra.ghosh@leibniz-zmt.de

Peatland destruction in Indonesia contributes to substantial CO2 emissions, making Indonesia the world's largest carbon emitter resulting from deforestation. Indonesia's decentralization process, combined with international policy discussions, particularly the UN-led scheme, REDD+, have brought increased attention to local forest communities as part of the solution to this global carbon problem. Many of these forest-dependent communities will be incorporated into Payment for Environmental Services (PES) projects, whereby users will be compensated for averted deforestation. However, due to high transaction costs, as well as weak and unclear property rights, many of these communities will be offered collective payments, and potentially, community-based investments. Combining our experimental data with that of Abrams et al. (2015), we try to develop some institutional considerations for increasing carbon storage in Riau, Sumatra. As Abrams et al. (2015) note, peatland destruction should have a much more significant short-run impact on the Java sea ecosystems. This finding, along with our experimental findings testing different PES incentives, we cautiously suggest that PES could encourage conservation in this region. Our results show that subjects respond to financial rewards, and furthermore, that there is a positive response to a reward with a low marginal return. Some literature suggests that even if the PES does not compensate farmers' opportunity costs, it may be effective as a "tip" in generating positive incentives over activities that are socially desirable (Kosoy et al., 2007). While we acknowledge that our collective payment treatment was not successful in yielding higher conservation donations, it is nevertheless possible that PES could be part of the short-run solution to Riau's carbon problem, particularly if payments are both high enough, and combined with community welfare investment.

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Carbon Sequestration
Name	Tim Rixen, Francisca Wit
Institution	Leibniz Center for Tropical Marine Ecology (ZMT) – Fahrenheitstrasse 6, 28359 Bremen, Germany
E-mail	tim.rixen@leibniz-zmt.de / francisca.wit@leibniz-zmt.de

The impact of disturbed peatlands on river outgassing in Southeast Asia

Wit F.[1], Müller D. [1,2] , Baum A. [1], Warneke T. [2], Pranowo W.S. [3], Müller M. [4], Rixen T. [1]

1) Leibniz Center for Tropical Marine Ecology (ZMT) – Fahrenheitstrasse 6, 28359 Bremen, Germany
2) Institute for Environmental Physics, University of Bremen, Otto-Hahn-Allee 1, 28359 Bremen, Germany
3) Research & Development Center for Marine & Coastal Resources (P3SDLP), Gedung II BALITBANGKP, Jalan Pasir Putih II, Ancol Timur, Jakarta, 14430, Indonesia
4) Swinburne University of Technology, Sarawak Campus, Jalan Simpang Tiga, 93350 Kuching, Sarawak, Malaysia
5) Institute of Geology, University of Hamburg, Bundesstrasse 55, 20146 Hamburg, Germany

Corresponding author: francisca.wit@leibniz-zmt.de

Abstract

River outgassing has proven to be an integral part of the carbon cycle. In Southeast Asia, river outgassing quantities are uncertain due to lack of measured data. Here we investigate six rivers in Indonesia and Malaysia, during five expeditions. CO_2 fluxes from Southeast Asian rivers amount to 66.9±15.7 Tg C yr^{-1}, of which Indonesia releases 53.9±12.4 Tg C yr^{-1}. Malaysian rivers emit 6.2±1.6 Tg C yr^{-1}. These moderate values show that Southeast Asia is not the river outgassing hotspot as would be expected from the carbon enriched peat soils. This is due to the relatively short residence time of dissolved organic carbon (DOC) in the river, as the peatlands, being the primary source of DOC, are located near the coast. Limitation of bacterial production, due to low pH, oxygen depletion or the refractory nature of DOC, potentially also contributes to moderate CO_2 fluxes as this decelerates decomposition.

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Carbon Sequestration
Name	Dr. Joko Samiaji et al
Institution	University of Riau, Pekanbaru, Indonesia
E-mail	Joko_samiaji@yahoo.com

Physical Oceanography Study of East Sumatra Marine Waters During the Wet Season

Joko Samiaji [(1)], Elizal[(1)], Dessy Yoswaty[(1)], Musrifin Ghalib[(1)], Tim Rixen[(2)], Herbert Siegel[(3)], Thomas Pholmann [(4)] and Berhard Mayer [(4)]

Joko_samiaji@yahoo.com

The assessment on physical oceanography along the eastern coast of Sumatra has been conducted in the wet season in 2013 during Indonesian-German SPICE cruise. The study area was divided into four sites stretching from the marine waters of Bangka-Belitung Islands in south to Rokan estuary of Malacca Strait in the north. The method used in this study was a survey method. Data of the depth, salinity, temperature, current speed and transparency were collected on site. The results showed that the measured parameters were in the range of as follows: water depth 9.2 - 64.6 m, salinity 23.07 - 31.84 ‰, temperature 29.77 - 31.55 ˚C, current speed 0.15 - 1.44 m/s, and transparency 0.74 - 5.08 m. These values were still in the ranges for tropical marine ecosystem features over the rainy season. Lower salinity ranges were recorded mainly in the estuarine systems and or along the sites close to the shoreline. The differences among the values of the depth and speed currents were primarily related with the tidal cycle and topographical characteristic of the sea floor.

Keywords: physical oceanography, East Sumatera, marine waters, wet season

---

1). Department of Marine Science of Fisheries and Marine Science Faculty of Riau Univesity, Pekanbaru, Indonesia
2). Centre for Tropical Marine Ecology (ZMT) - University of Bremen, Bremen, Germany
3). Warnemunde Institute of Marine Science (IOW), University of Rostock, Germany
4). Institute of Marine Science (IfM) - University of Hamburg, Hamburg, Germany

SPICE final conference

January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Carbon Sequestration
Name	Dr. Mutiara Rachmat Putri
Institution	Research Group of Oceanography, Faculty of Earth Science and Technology, Institute Technology of Bandung (ITB)
E-mail	mutiara.putri@fitb.itb.ac.id

Hydrodynamic Modeling of Karimata Strait during 2010-2014

Putri, M.R.[1], Anwar, I.P.[1], Setiawan A.[2]

[1] Research Group of Oceanography, Faculty of Earth Science and Technologi, Institute of Technology Bandung – Jalan Ganesha 10 Bandung, INDONESIA

[2] R&D Centre for Marine & Fisheries Tech. Agency for Marine & Fisheries R&D, Ministry of Marine Affairs & Fisheries (MMAF), Jalan Pasir Putih 1, Ancol Timur, Jakarta Utara 14430, INDONESIA

corresponding author: mutiara.putri@fitb.itb.ac.id

Abstract

Bangka and Belitung seawaters are located in the Karimata Strait, between Sumatra and Kalimantan Islands. Musi River and the other rivers from the east coast of Sumatra flow to the Bangka Strait (between Sumatra and Bangka Island) with large river discharge. The rivers from east coast of Sumatra and Kalimantan contribute fresh water to Bangka, Gaspar (between Bangka and Belitung Islands), and Karimata Straits, as well as north part of Java Sea. Furthermore tidal influence also the dynamic of ocean current in this area. A nested model technique is applied in this study by setting up a smaller model area covering the Bangka, Gaspar, and Karimata Straits. The simulation results shows that the ocean current in the Karimata Straits flows dominantly due to the monsoon and the residual current flows into Java Sea.

SPICE final conference
January 20 & 21, 2016

Proposal	
Affiliated to topic (Session 1- 8)	Carbon Sequestration
Name	Herbert Siegel
Institution	Leibniz- Institute for Baltic Sea Research Warnemünde
E-mail	Herbert.siegel@io-warnemuende.de

Impact of river discharge on the carbon cycle in marine ecosystems of Indonesia based on satellite and in-situ data

Stottmeister, I.[1], Siegel, H. [1], Samiaji, J.[2]

[1] Leibniz- Institute for Baltic Sea Research Warnemünde, Seestrasse 15, 18119 Rostock-Warnemünde
[2] Department of Marine Science of Fisheries and Marine Science Faculty of Riau Univesity, Pekanbaru, Indonesia

corresponding author: iris.stottmeister@io-warnemuende.de

Abstract

Sumatra is known for the world's highest rate of natural forest loss in particular by deforestation of peat swamp forests, degradation and burning of deep peat soils, which release carbon in huge quantities. Bio-optical water quality studies based on satellite and in-situ data investigated the response of the river dominated coastal ecosystem on the changing environmental conditions of East Sumatra. We characterize the main sources of coastal discharge by water color and optically active water constituents and determined transport directions and influenced coastal areas. The enormous amounts of suspended matter, phytoplankton biomass and colored dissolved organic material (CDOM), the optically measurable component of dissolved organic matter (DOM) influence the water quality and reduce the euphotic depth in the estuaries to 0.25 m. The Siak River System is the main carbon source with CDOM absorptions of 51.7 m^{-1} and is one of the world's largest riverine DOC sources for the ocean.

The standard ocean color CDOM algorithm for MODIS (Moderate-resolution Imaging Spectroradiometer) is insufficient for Indonesian coastal waters. The in-situ bio-optical datasets were used to derive a regional CDOM algorithm based remote sensing reflectances (Rrs) at wavelengths considering the spectral influence of CDOM absorption, chlorophyll and suspended matter. The MODIS satellite data, processed with this algorithm, delivered more realistic distributions of CDOM for this region. The approach was also used to estimate the concentration of DOC based on the relationship between measured DOC and CDOM (correlation coefficient, $R^2 = 0.89$).

CDOM provided a synoptic view of surface variations and the extent of river influences into the Indonesian waters. Our established algorithm is applicable for climatological analyses. The La Niña Event 2010/11 is associated with higher SSTs and precipitation in Indonesia, which enhances the coastal discharge and support the transport of CDOM into the coastal seas towards coral reefs.

SPICE final conference
January 20&21, 2016

Proposal	
Affiliated to topic (Session 1-8)	Carbon Sequestration
Name	Anna Ida Sunaryo Purwiyanto
Institution	Marine Science Program Study, Sriwijaya University
E-mail	anna.ida3@gmail.com

ASSESMENT OF CARBON STATUS IN PAYUNG ISLAND WATERS (MARINE PROTECTED AREA), SOUTH SUMATERA PROVINCE, INDONESIA

Purwiyanto, AIS [1,2], Agustriani, F [1]

[1] Marine Science Program Study, Sriwijaya University – Palembang Prabumulih Street, Km. 35, Inderlaya, Ogan Ilir, South Sumatera Province, Indonesia

corresponding author: anna.ida3@gmail.com

Abstract

Payung Island is one of MPA (Marine Protected Area) area in South Sumatera Province, Indonesia. This island is located in the mouth of Musi River and Telang River. Besides that, almost of this entire area filled with mangrove. This resulted Payung Island was able in controlling CO2 (absorb and release CO2) and providers of fishery resources. This study is an early stage in an effort to provide status on Payung Island waters as a sink or source of CO2. The study was conducted in June until August 2015 by taking 15 sampling points around the entire area Payung Island. The research stages include surface water sampling, measurement of the CO2 content of the air, the analysis of the concentration of dissolved inorganic carbon (DIC) and alkalinity (TA) in the laboratory. Calculation of pCO2 in the waters performed using software CO2Calc. The concentration of CO2 in the air and in the waters pCO2 calculation used to determine the status of the carbon sink and source waters Payung Island. The results showed that the content of DIC and TA on the 15th point of the station has a distribution pattern that is similar, i.e high in areas close to the river, and getting lower in the area which are closer to the sea. The comparisons between pCO2 air and pCO2 waters showed that Payung Island waters generally act as a carbon sink. However, the area adjacent to the river in the Payung Island waters act as a carbon source.

Keywords: carbon, marine protected area, Payung Island waters