ICM and *Satoumi* Special Session

Abstracts

Introduction of a new project
"Development of Coastal Management Method to Realize the Sustainable Coastal Sea (S-13 project)"
and discussion to sustainable ICM around the world

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DEVELOPMENT OF COASTAL MANAGEMENT METHOD TO REALIZE THE SUSTAINABLE COASTAL SEA

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The Ministry of Environment, Japan has begun the new research project "Development of Coastal Management Method to Realize the Sustainable Coastal Sea" (2014-2018, PI: T.Yanagi) in 2014. This project aims to propose the suitable ICM (Integrated Coastal Management) for realizing the sustainable coastal community. Three research fields (Seto Inland Sea as semi-enclosed coastal sea, Sanriku coastal seas for open character coastal sea and Japan Sea's coastal sea where the international management is necessary) are selected to clarify their natural characteristics from the viewpoint of physical, chemical and biological oceanography. Social and human scientists are also included to this trans-disciplinary project in order to clarify the economic and cultural aspects of the sustainable coastal community. We will develop the integrated numerical model which is useful for the policy decision in the coastal areas.

FATE OF SILTS AND CLAY FROM RIVER AND ITS CONTRIBUTION TO TRANSPARENCY

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Phytoplankton plays a key role as primary producer, forming the base of marine food webs. Knowledge in relation to permeability of light in water is important for the understanding of phytoplankton growth in the euphotic zone. In this study, we conducted laboratory experiments in relation to light attenuation using inorganic particle (silica particle) and field investigations in Osaka Bay. There was a positive correlation between the concentrations of the silica particle and integral values of the absorbance at photosynthetic active radiation (PAR: wavelength 400-700 nm) in the laboratory experiments. The highest integral value of the absorbance at PAR was observed for the particle size of 1.0 μm. In Osaka Bay, high contribution of the inorganic particle to light attenuation was observed compared to the organic particles. Multiple linear regression analysis using the particle size and the amount of total suspended solids (TSS: consisting of three component fractions; organic/inorganic tripton and phytoplanktons) showed that the particle size was an essential factor controlling the light attenuation in the coastal sea.

SATOUMI APPROACH FOR REALIZING SUSTAINABLE COASTAL USE IN A RIAS-TYPE BAY: A CASE OF SHIZUGAWA BAY IN SANRIKU COAST HIT BY THE HUGE TSUNAMI ON 11 MARCH 2011

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Rias-type bays are one of the most common coasts in Japan where aquacultures have been active due to sheltered geological shape with a deep bottom. The huge tsunami hit Sanriku Coast consisting of open rias-type bays near the epicenter facing Pacific Ocean on 11 March 2011. For recovering Sanriku Coast, it is important to include sustainability in its program. Satoumi is defined as the human use and management of coastal seas for high productivity while maintaining high biodiversity. Therefore, we proposed Satoumi approach to an open rias-type bay, Shizugawa Bay, in southern Sanriku Coast. We conducted scientific researches on mapping of coastal habitats and aquaculture facilities, hydrography, and material flows of nutrients, a minor element (Fe) and organic matters in the bay including those from the rivers and from the offshore waters. At the same time, Committee for Shizugawa Bay Management of Fishermen's Cooperative of Miyagi Prefecture decided to decrease in aquaculture facilities for sustainable development of aquaculture. Based on these data, a physical-biological coupling model

was used for calculating the number of aquaculture facilities that are suitable not only for yields but also for environments. These researches were established on strong collaborations among a fishermen's' cooperative, local governments and scientists. Results of this practice may help to realize sustainable coastal use of a rias-type bay.

MANAGEMENT FOR SUSTAINABLE USE OF INTERNATIONAL SEMI ENCLOSED SEA, JAPAN SEA

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New project "Development of Coastal Management Method to Realize the Sustainable Coastal Sea" started in 2014. The objectives are to study the appropriate status of the coastal area and to provide scientific information to policy makers for better coastal management. One of the target areas in this project is Japan Sea. Japan Sea is a semi-closed sea which is surrounded by the Eurasian continent and Japanese islands. This area is one of the most populated regions in the world and experiences a rapid economic growth. In addition, it is reported that the sea surface temperature has increased rapidly compared to other areas.

In our study, nutrient inputs and climate change are key drivers which influence the ecosystem of Japan Sea. Numerical models of the marine ecosystem were used for understanding and forecasting the impact and response mechanism of the ecosystem. Based on the study results, options for appropriate management will be proposed.

However, because of the long coastal zone along Japan, it is not appropriate to apply the same management options to all areas. Therefore, in this study, the coastal zone was divided into five sub-regions according to the characteristics of water mass. Surface water of Japan Sea is basically formed by Kuroshio water, Taiwan Current water, freshwater discharged in the East China Sea, freshwater discharged in Japan Sea and deep water of Japan Sea. Using physical numerical models, the mixing ratio of these five waters was calculated and options for regional management in each sub-region will be prepared.

THE INTEGRATED COASTAL ZONE MANAGEMENT BASED ON ECOSYSTEM SERVICES

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The Japanese term "Satoumi" inspires us to pursue sound coastal zone governance by taking sustainable development into consideration with "Establishment of Sato-umi in the coastal sea". The popular ICZM (Integrated Coastal Zone Management) shows us the potential approach toward a coastal area with harmonious interaction between human-being and natural environment. Seto Inland Sea which has undergone serious environmental degradation and anthropogenic changes. In order to recover and sustain its unparalleled values, rebuilding a sound environmental policy system from top to bottom is highly required. The ecosystem services and their monetary values are also estimated buy CVM necessary for sustainability assessment, due to their powerful roles in representing human-coastal zone relationship and supporting sustainability of a "Satoumi" system. The sustainability assessment framework for Seto Inland Sea, which consists of Inclusive Wealth, "Satoumi", and ecosystem service approach was developed.

MEASURES FOR ENVIRONMENT CONSERVATION IN ENCLOSED COASTAL SEAS

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Japan experienced severe water pollution problems throughout the period of the high economic growth in 1960s. With the concentration of population and industries, large quantities of pollutants flowed into the sea, and these caused health hazard and harmful algae blooms which damage fishery and living environment especially in the enclosed sea.
We have implemented various measures including drainage control and sewerage system expansion based on the Water Pollution Control Law. Total Pollutant Load Control System (TPLCS) has been implemented in Tokyo Bay, Ise Bay, and the Seto Inland Sea from 1979. TPLCS is designed to reduce the total amount of pollutant loads (target items; chemical oxygen demand, total nitrogen, total phosphorus) flowing into enclosed sea. As a result of efforts including TPLCS, the amount of pollutant loads have been reduced steadily, water quality has a tendency to improvement as a whole. On the other hand, algae bloom and oxygen deficient water mass were still observed. Besides, these situations were different by respective sea area. Moreover, in a concept of вЂњBountiful SeaвЂќ, we also recognize the importance of bio-diversity and bio-productivity.To resolve these problems, it is necessary to effort of pollutants reduction flowing from the land, and to cooperate among entities in local communities. Moreover, we need to promote comprehensive measures such as preservation of tidal flat and seaweed bed as well as installation of bio-friendly revetments.

ENSURING SUCCESSFUL AND SUSTAINABLE RESTORATION AND PROTECTION OF COASTAL WATERS: THE CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD PLAN

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The Chesapeake Bay is the largest coastal bay in North America with a watershed spanning 6 states and Washington, D.C. (the "watershed jurisdictions"). Restoration of the Bay has been the focus of nearly 40 years of restoration effort. Significant progress has been made, but the Bay still does not meet water quality standards. In 2010, as required by the federal Clean Water Act, the U.S. Environmental Protection Agency (EPA), in cooperation with the watershed jurisdictions, established a legally enforceable limit on the levels of pollution called a Total Maximum Daily Load (TMDL). The TMDL sets limits on pollutant loading and divides the responsibility for meeting those limits among the watershed jurisdictions and 6 “source sectors” – agriculture, urban stormwater, wastewater, onsite sewage systems, forest land and atmospheric deposition. Each of the watershed jurisdictions developed a detailed plan to meet the TMDL limits, describing the pollution control actions each sector will take and the deadline for action. The TMDL limits must be achieved by 2025. In addition, to ensure that the restoration stays on track to achieve the 2025 goal, the TMDL includes 2-year Milestone goals that must also be achieved. The TMDL and Milestone goals are being enforced and progress is reported to the public by the EPA. Enforcement is essential to the success of the restoration so that all jurisdictions and sectors meet their commitments and are assured that others are meeting theirs as well.

DEVELOPING AN ENVIRONMENTAL HEALTH REPORT CARD FOR LAGUNA DE BAY, PHILIPPINES

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Laguna de Bay is the largest inland waterbody in the Philippines and the third largest in South East Asia. Laguna de Bay is connected to Manila Bay via the Pasig River, which flows through metro-Manila and is a tidal estuary. It has a has a surface area of 900 km2, with an average depth of 2.5 meters and an elevation of about 1 meter above sea level. The watershed population is over 8 million people. Laguna de Bay features distinct regions. The West Bay watershed is the most populated and heavily developed, mainly because it includes part of Metro Manila, while the East Bay is the least. The West and Central Bays are separated by Talim Island, the biggest and most populated island. This first ecosystem health report card is designed to provide a better understanding of the current ecosystem health, particularly as water quality improvement strategies are developed. Two workshops were conducted to develop a framework for the report card, identified the target audience, developed indicators and thresholds, and determined the key messages. Overall Laguna de Bay scored a low passing mark, 76%, a C-, in water quality and an F in fisheries weith regional scores also developed. Laguna de Bay consistently is within national water quality guidelines in DO, BOD, nitrate, and total coliform but consistently scored poorly for chlorophyll a and phosphate. Water quality and fisheries are negatively impacted by high population and industrialization. Laguna de Bay scored an F for fisheries due to catch

per unit effort, invasive species, and zooplankton ratios. Overall, these scores are not only a cause of concern for fisheries, but the whole community supported by Laguna de Bay.

IMPLEMENTATION OF SUSTAINABLE AQUACULTURE AS A MODEL OF SATO UMI TO IMPROVE PRODUCTIVITY WITHIN COASTAL AREA OF INDONESIA

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The development of sustainable model of aquaculture by applying Sato Umi concept within coastal area of Indonesia has expanded from the center of first experiment in the northern coastal area of west Java to central Java (western Indonesia) and Bantaeng in the South Sulawesi of central Indonesia. The similar program has also been proposed for Maluku Province in the eastern part of Indonesia. In the next 5 years, Indonesia is developing the Techno Parks Program in some areas, in which aquaculture and fisheries activities development on the base of Sato Umi concept in the coastal area are involves in this program. The development of Techno Parks are directed as a center application of technology to stimulate the economy in the regency, and a place of training, apprenticeship, technology dissemination center, and center business advocacy for the public. Hopely, Sato Umi concept that has a similar spirit with Techno Park can be applied to support the implementation of Techno Park program in Indonesia

DEVELOPMENT OF THE BASIC CRITERIA FOR RUSSIAN COASTS TYPIFICATION

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There are many types of coasts classifications that indicate main coastal features. As a rule, the "static" state of the coasts is considered regardless of their evolutionary features and ways to further transformation. Since the most part of the coastal zone studies aimed at ensuring of economic activity, it is clear that the classification of coast types should indicate total information required by the users. Accordingly, the coast classification should include the criterion, characterizing as dynamic features of the coast and the conditions and opportunities of economic activity. The coast classification, of course, should be based on geomorphological coast typification. Similar typification has been developed by leading scientists from Russia and can be used with minimal modifications. The authors propose to add to basic information (geomorphological type of coast) the evaluative part for each coast sector. It will include the estimation of the coast changes probability and the complexity of the coast stabilization for economic activity. This method will allow to assess the dynamics of specific coastal sections and the processes intensity and, as a result – the stability of the coastal area.