Part One: Project Summary (14 columns: 2 pages)

Column 1:

Title of proposed project: "Seagrass-Mangrove Ecosystems: Bioshields Against Biodiversity Loss and Impacts of Local and Global Change Along Indo-Pacific Coasts" (The Seagrass-Mangrove Bioshield Project, **SMBP**)

Column 2:

Proponent's Name and Title:	Miguel D. Fortes, Professor
Name of Institution:	Marine Science Institute CS, University of the Philippines
Address:	1 Velasquez St., Univ. of the Philippines Campus, Diliman, Quezon City 1101
Telephone:	632 9223958; **Fax:** 632 9247678
Email:	migueldfortes@gmail.com; Website: http://www.msi.upd.edu.ph

Column 3:

Amount requested from the APN for 2011/12: US$	46,540
Duration of Proposed Project: No. of Years:	3
Funding secured from other sources: US$	(Largely in kind, e.g. use of equipment, facilities)
Total amount of APN funding requested: US$	121,750

Column 4:

Has the proponent or collaborators been awarded APN Grant(s) in the past? If yes, provide details.   NO

Column 5:

Provide a concise abstract (100 words): In Indo-Pacific, coastal management vis-à-vis environmental change mitigation and adaptation overly focuses on control of Malthusian over-fishing in coral reefs. We argue in favour of a growing consensus, which places seagrass-mangrove system conservation as priority, developing a model of the ecosystem health, which is the natural biological protector ('bioshield') in mitigating local and global changes along the region's coasts. To be tested and promoted, this model will support decision-making and will be used to build capacity of stakeholder communities and governments so that they could utilize more efficiently ecosystem goods and services while adapting to environmental changes.

Column 6

How is the project relevant to the APN <u>Goals</u>, <u>Science Agenda</u> **and to** <u>Policy Processes</u>**?** It intends to identify, explain and predict impacts of coastal changes on seagrass and mangrove ecosystem goods and services via a science-based understanding of the systems' strengths and vulnerabilities. This knowledge will be used as base of an integrated decision support system to promote research on habitat response to local and global change. The support system, in turn, is the framework of capacity development and policy decisions to enhance ecosystems' integrity and sustainable use.

Column 7:

Outline the activities to be conducted and state why you believe these activities are necessary: Phase 1: Assess and monitor seagrass-mangrove essential site parameters and inter-habitat connectivities, trophic dynamics and specific local human interferences; investigate the impacts of forcing factors on plant photosynthetic efficiency and their ecosystem services; and synthesize the data as inputs into models that would be the backbone of a coastal 'shield' or protection. Phase 2: Assist partner institutions use the knowledge and skills to improve academic, research and extension services through a Marine Emergency Contingency Policy (MECP) and an exit strategy. This 'end-to-end approach' makes the project activities interdependent and necessary. The knowledge and the science-policy connection are a 'missing link' in natural coastal resource conservation and management in Indo-Pacific countries.

Column 8:

Provide information, including contact details, of the APN member and/or approved countries involved. Strengths/ weaknesses of partner countries: Australia (eric.wolanski@jcu.edu.au) and Japan (yamamuro@k.u-tokyo.ac.jp; mukaih@kais.kyoto-u.ac.jp; asaeda@mail.saitama-u.ac.jp), database, instrumentation and modelling, but needs site-based applications of data; Philippines (migueldfortes@gmail.com), India (rramesh_au@yahoo.com), Indonesia (W.Kiswara@nioo.knaw.nl), and Sri Lanka (asaeda@mail.saitama-u.ac.jp), with vast areas of seagrass and mangroves, but lacks scientific knowledge and weaker in the application of this knowledge to improve governance, coastal protection and management, and resource use.

Column 9:

Summarise the proposed project methodologies: *Phase 1* (Science Establishment, 2 yrs): Sampling – Quarterly along depth, nutrient, ecosystem gradients: photosynthetic efficiency (PAM fluorometry); recruitment/mortality (seedling, permanent quadrats); CO_2, CH_4, water quality (chromatography, spectrophotometry), biodiversity (combined SeagrassNet-NaGISA protocol, remote sensing GIS); dugong feeding behaviour (in situ observations); 2. Laboratory analysis – continuous: trophic dynamics (stable isotopes); 3. Monitoring: Quarterly, of observable site parameters,

secondary data sources; environmental impacts, ecosystem services (continuous, interviews); 4. Data synthesis/Analysis (Regularly, SPSS); 5. Model and decision support system development, verification (focused group discussions, consultation); and 6. Reporting. *Phase 2* (Capacity Building, 1 yr): consultative workshops, training needs analysis, training, advocacy, policy formulation, exit strategy, publications.

Column 10:

Describe the mode of operation of the project team (i.e. what is the specific role of each team member?) and provide evidence from country-team members that they have agreed to carry out these roles: The Australian and Japanese partners will do most of the laboratory analyses and model development. Fortes coordinates project activities, and lead quarterly sampling in the Philippines and Mukai will look at the population dynamics of *Dugong dugon* (sea cow) in the country. Ramesh will measure CH_4 and CO_2 from ecosystem air-water interface and lead coastal management activities in India, while Kiswara will look at water quality and conditions for seagrass transplantation and recolonization. Yamamuro will monitor the average nutrient condition (nitrogen and phosphorus) of sediments and seagrass leaves, analyze the trophic dynamics and anthropogenic eutrophication with stable isotope technique, and test the effectiveness of pack test for monitoring water quality by local people. With the data, Asaeda (Japan), with students and colleagues from Sri Lanka, will develop the model for physical-chemical-biological processes in mangroves in the country, while Wolanski (Australia) will develop a novel model of ecosystem health for the sites. All country team leaders will be resource persons in the workshops and training courses. They have signified their willingness and ability to join the project, evidenced by the specific role each would like to perform. This was the major part of the email exchanges, which totalled 76 emails (Apr – July 2010).

Column 11:

What are the expected outcomes/products, and how sustainable will the activities be upon completion of an APN Grant, if awarded? (1) Updated repository of local and regional knowledge on the functions of seagrass-mangroves vis-à-vis impacts of environmental changes; (2) ecosystem models enabling testing of scenarios of various decision on human impacts combined with climate change; (3) a framework for a local Marine Emergency Contingency Policy (MECP); (4) a system to support and enhance local governance; (5) students trained in practical, state-of-the-art technique for water quality monitoring, and trophic dynamics; and (6) peer-reviewed publications including 2 posters and a guidebook. The mentoring of the students will ensure that, after training, expertise would be available to continue critical aspects of the project. The MECP will be translated into policy regulations through an Integrated Decision Support System, which will be developed. All these efforts will be supported and promoted by an Information Education and Communication campaign, culminating in an exit strategy to prepare, adapt communities.

Column 12:

How will these outcomes/products be relevant to and/or mainstreamed into policy-processes? Importance of the ecosystems' functions with digital data can enable policy maker to beef up their coastal conservation, development and protection plans. The ecosystem model will be used to test the impact on ecosystem health of various scenarios for human development in the catchment combined with climate change. In the end, findings will be incorporated in existing local government codes, MPA regulations and school projects and curricula.

Column 13:

How will team evaluations be performed to ensure project objectives are being met? Because we cannot test the coastal environment to prove the validity of our model, our performance would be evaluated with the submission of papers to the international scientific journal and the distribution of ecosystem knowledge to the younger generation in the area. They can also be evaluated in relation to the outcome (obtained via questionnaires) of the use of pack test in improving knowledge of the environment on the part local stakeholders and of the mentoring exercise of students for each study site with collaborators in this Project.

Column 14:

Provide a concise literature review for the proposed project: While the Indo-Pacific has the world's most diverse seagrasses (Fortes 1991, 2001; Green & Short 2003; Hori et al. 2009) and mangroves (McLeod & Salm 2006; Lieth et al. 2008), it also has the most rapid rates of degradation of these habitats (seagrass: Fortes 1988; 1990; Orth et al. 2006; Hughes et al. 2009; Unsworth et al. 2009; Waycott et al. 2009; mangroves: McLeod & Salm 2006; Lieth et al. 2008). With climate change, healthy seagrass and mangroves have recently been recognized to play major mitigating roles (IUCN/UNEP 2009). The predicted dismal environmental and economic scenarios (McCarthy 2009) favour the need to better understand the nutrient and trophic dynamics of the coastal ecosystems (Yamamuro et al. 2004a,b; Yamamuro & Kanai 2005) and develop models of the biophysical processes (Tan Hung et al. 2006; Asaeda & Kalibbala 2010) and their health (Perillo et al. 2009), which are the key natural biological protectors ('bioshields') in mitigating local and global changes along the region's coasts. These models would support decision-making, be tested, and used to build capacity of local stakeholder communities and governments so that they could utilize more efficiently ecosystem goods and services and adapt to environmental changes (Richardson & Poloczanska 2008; Granek et al. 2010).

Part Two: Project Duration and Funding Requirements (3 columns: 1 page)

Column 1: Timeline

Project Activities	YR1 Q1	Q2	Q3	Q4	YR2 Q1	Q2	Q3	Q4	YR3 Q1	Q2	Q3	Q4
Plan Finalization (virtual)	■											
Communications plan dev/impl	■											
Community Consultation (6 sites)	■			■				■		■		
Sampling/Monitoring												
Indonesia (1 site)												
W. Kiswara	■	■	■	■	■	■	■	■	■			
M.D.Fortes				■	■							
India (2 sites)												
R. Ramesh	■	■	■	■	■	■	■	■	■			
M.D.Fortes												
Philippines (3 sites)												
M.D.Fortes	■	■	■	■	■	■	■	■	■			
E. Wolanski	■	■		■		■			■			
H. Mukai												
M. Yamamuro										■		
Sri Lanka(1 site)												
T. Asaeda + 3 collaborators		■	■	■								
Laboratory Work/Data Analysis	■	■									■	
Model Development/Verification			■		■		■		■		■	
Study applications/refinements			■		■		■		■			
Training Course (4 sites)	■			■			■					
Local Policy wrksp/recommendation		■					■					■
Report writing/submission			■									■
Results dissemination												■
APN Project & financial reporting				■				■				■

Proposed project period starts 01 April 2011 and ends 31 March 2014

Column 2: Budget

BUDGET ITEMS	YEAR 1	YEAR 2	YEAR 3	TOTAL
Personal Services	2,400	2,400	2,400	7,200
Travel	12,880	15,480	5,710	34,070
Other costs	31,260	26,260	22,960	80,480
TOTAL	46,540	44,140	31,070	121,750

Please refer to *Appendix 2A-C* for the *Detailed Budget Estimate*

Column 3: Leverage of support being sought

Provide details of the support being sought from other collaborating countries and institutions and details of the contributions from the project leader's institution: Japan: Water quality analysis (chromatography), trophic dynamics (stable isotopes), model development, verification, plus access to literature. Australia: access to literature, model development and application. India, Indonesia, Philippines, Sri Lanka: Largely 'in-kind', i.e., logistical support and chance to work in their seagrasses and mangroves. The University of the Philippines: counterpart 'virtual' support (equipment, vehicles, facilities, including phone and water use). All partners: man-hours, ca. 20-30 % each official time). A high probability exists wherein more counterpart support could be tapped in 2011-2013.

Part Three: Proponent CV/Resume (please follow format below – one page only)

PERSONAL DETAILS

❑ **Full Name and Title:** Miguel D. Fortes
❑ **Date of Birth:**   29 September 1947
❑ **Nationality**:   Filipino
❑ **Country of Residence:**   Philippines
❑ **Institution:**   Marine Science Institute CS, Univ. of the Philippines, Diliman, QC 1101
❑ **Contact Details (telephone, facsimile and email):** 632 922 3958, 632 9247678, migueldfortes@gmail.com

PROFILE

Skilled researcher (1970-present) & professor (since 1976) with doctorate in seagrass ecology. Strong background in coastal biodiversity science & integrated coastal management. Experienced in managing single- and multi-country projects from conception to completion.

EDUCATION

Doctorate of Philosophy	1986

University of the Philippines
Dissertation topic: Taxonomy and Ecology of Philippine Seagrasses

Master of Science	1976

University of the Philippines
Thesis topic: Algal Epiphytes on the Mangroves of Puerto Galera, Oriental Mindoro, Philippines

Bachelor of Science	1973

University of the Philippines
Achievements: Working student (scientific illustrator, research & teaching assistant), president, vice-president & member of 3 student organizations, student columnist in college news bulletins

PUBLICATIONS

Doctoral Dissertation
Indo west Pacific affinities of Philippine seagrasses. *Botanica Marina. 31*:237 242. 1988
Master's Thesis
Structure of algal communities epiphytic on the mangroves of Pto. Galera. *Philipp. J. Sci. Monogr. 17*:43 54,1987.
Recent Peer reviewed Publications in the last 5 years
(1) Marba N, Duarte CM, Terrados J, Halun Z, Gacia E, Fortes MD. Effects of Seagrass rhizospheres on sediment redox conditions in SE Asian coastal ecosystems. *Estuaries & Coasts, 33 (1)*: 107-117 (2010). **(2)** Izuka, H., Tamura H, Pokavanich T, Rubio-Paringit MC, Nadaoka K, Fortes MD. Highly skewed tidal circulation pattern and water quality in Puerto Galera Bay, Mindoro Island, Philippines. *Coastal Engineering Journal 4,* 341-361. (2009)**. (3)** Fortes, MD. Ecological changes in seagrass ecosystems in Southeast Asia. Pp. 131-136 In: N. Mimura (ed), Chapter 3, "Asian-Pacific Coasts: States of Environments and Their Management ". States of Environment. Springer. 365 p. (2008). **(4)** Gacia E, Kennedy H, Duarte CM, Terrados J, Marba N, Papadimitriou S, & Fortes MD. Light-dependence of the metabolic balance of a highly productive Philippine seagrass community. *Journal of Experimental Marine Biology & Ecology 316*: 55-67. (2005).
Invited Papers/Presentations in the last 5 years
(1) *Keynote Lecture*: "Science-based seagrass ecosystem management in Asian regions"**,** International Seagrass Biology Workshop 9, Trang, Thailand, 27-30 Nov 2010**;** (2) *Plenary Lecture:* Seagrass Science and Research in East Asia: Are We Going in the Right Direction? World Seagrass Conference, Phuket, Thailand, 21-25 Nov. 2010; (3) *Plenary Lecture*: "Seagrass Factor in Biodiversity Conservation and Climate Change Mitigation In Southeast Asian Coasts, International Conference on Biodiversity and Climate Change, Manila, Philippines, 19-21 Nov 2010; (4) *Plenary Lecture*: "Seagrass-Mangrove Connection as Climate Change Mitigation & Adaptation Factor in East Asian Coasts", International Symposium on Integrated Coastal Management For Marine Biodiversity in Asia, Japan, 14-15 Jan 2010.

EXPERIENCE

• Currently managing one internationally sponsored research and development program, from conception through development planning, budgeting, scheduling, promotion;	Oct 1999-present

- Coordinating day-to-day project technical and managerial functions, process design;
- Helping develop decision support system, present results at technical and executive fora;
- Advising graduate students (3 MSc and 2 PhD) and teaching courses in Seagrasses and Mangroves, Marine Biodiversity and Special Topics in Marine and Environmental Science

Part Four: The Main Body of the Full Proposal (Calibri; 10.5-point text)

1. **Project Title**

    "Seagrass-Mangrove Ecosystems: Bioshields Against Biodiversity Loss and Impacts of Local and Global Change Along Indo-Pacific Coasts" (The Seagrass-Mangrove Bioshield Project, **SMBP**)

2. **Fully Detailed Proposal**

    a. **Description of the entire proposed project**

    In Indo-Pacific, coastal management vis-à-vis environmental change mitigation and adaptation overly focuses on control of Malthusian over-fishing in coral reefs. It is well documented that among the coastal tropical ecosystems, coral reefs are the most popular, mangroves the most disturbed, and seagrass meadows, the least studied. Seven respected scientists and a number of collaborators from 6 countries (Australia, Japan, India, Indonesia, Philippines, Sri Lanka) propose to implement, for 3 years (2011-2013), the SMBP. Six sites from the four latter countries have been selected to demonstrate that a seagrass bed and mangrove forest –singly or as interlinked systems, serve as natural 'bioshield', sustaining system goods and services against local and global human and natural stressors. Adopting the Integrative Science for Society and the Environment (ISSE) framework, SMBP is phased in a way to first establish the scientific base (Phase 1: Science Establishment, 2 years) and link this with academic programs and governance policies to ensure sustainability of the benefits gained (Phase 2: Capacity Building, 1 year).

    Hence, we argue in favour of a growing consensus, which places seagrass-mangrove system conservation as priority, developing models of the ecosystems' functions and health, which are the natural biological protector ('bioshield') in mitigating local and global changes along the region's coasts. To be tested and promoted, these models will support decision-making and will be used to build capacity of stakeholder communities and governments so that they could utilize more efficiently ecosystem goods and services while adapting to environmental changes.

    b. **Detailed work plan**

    SMBP will be implemented in 4 countries: India, Indonesia, Sri Lanka, and Philippines. In the last 3 countries, seagrass is virtually unknown and in all 4, the rate of its disappearance and degradation (together with mangroves), is one of the highest in the world, and so peoples' dependence upon them for survival. In India, measurement of CH_4 and CO_2 nutrient fluxes and ecosystem goods and services in seagrass will be done in the Gulf of Mannar and in mangroves, in Pichavaram, both in Tamil Nadu); In Indonesia, measurement of *Enhalus* seedling growth and survival, seagrass biomass and production, litter fall and ecosystem goods and services will be undertaken in Jakarta Bay and Kepulauan Seribu); In the Philippines, dugong feeding behavior will be observed and population dynamics done in Davao Gulf; water quality, benthic biodiversity, photosynthetic efficiency and seagrass-mangrove ecosystem goods and services will be measured in Bolinao, northern Philippines and Davao Gulf and Laguindingan, in the south); and in Sri Lanka, nutrient cycling, salinity and mangrove plant biodiversity and density will be investigated in Ambalantota). The work is planned in two phases, each characterized by measurement of specific parameters and implementation of relevant activities. With the methodologies, these parameters and activities are given below:

    Phase 1 (Science Establishment, 2 yrs, 2011 and 2012) - *Assessment and monitoring* of seagrass-mangrove essential site parameters and inter-habitat connectivities (e.g. changes in sea level, water temperature, nutrients (N, P), carbon sink/source, wave and wind patterns); faunal migration (e.g. *Dugong dugon*, *Siganus* spp.), trophic dynamics and specific local human interferences (e.g. intensive aquaculture, unsustainable fishing and tourism); *Investigation of the impacts* of forcing factors on seagrass and mangrove photosynthetic efficiency and their ecosystem services (as shields or buffers, nurseries and food sources); and *Synthesis of the data* as inputs into models that would be the backbone of a coastal 'shield' or protection network (in coordination with existing research and monitoring systems). The numerical model will be useful as a predictive tool in the scientific and policy making process, thereby reducing the need of science 'experts' in developing countries. Meanwhile, the predictions emanating from the models can be used to explain various scenarios made understandable by the general public. The specific activities of Phase 1 include:

1. Sampling – Quarterly (Philippine, Indian, and Indonesian partners; continuous 3 months in Sri Lanka) and at last semi-annually (Australian and Japanese partners), along depth, nutrient and ecosystem gradients.
   A. Seagrass-mangrove production efficiency – mid-day fluorescence measurements using fluorometry;
   B. Mangrove recruitment/mortality – seedling tagging for growth, density inside permanent 5x5m quadrats
   C. Water quality (including CO_2, CH_4 and nutrients) and trophic level representative species – standard water, species sampling techniques;
   D. Biodiversity assessment –biota inside cores (combined SeagrassNet-NaGISA protocols for seagrass) and inside permanent plots at selected sites (mangroves); remote sensing GIS for areal extent and distribution;
   E. Dugong feeding behavior and populations dynamics – continuous *in situ* observations by local partners; frequency, number of trails, GPS locations, time of day;
2. Laboratory analysis – continuously when samples are made available, at the Japanese partners' laboratories;
   A. Water quality, including – CO_2, CH_4 and nutrients - using ion/gas chromatography
   B. Trophic dynamics – stable isotopes in seagrass (producer), urchin (grazer), siganids (herbivore), dugong (top herbivore), turtle (top omnivore)?
3. Monitoring
   A. Quarterly, of observable parameters (sea level, temperature, salinity, storminess, etc) – Sea level change by satellite altimetry; quarterly, using temperature loggers, refractometer, secondary sources;
   B. Environmental impacts – continuous (subcontracted); quarterly (UPMSI), interviews of fishermen, coastal gleaners, entrepreneurs; photo-documentation;
   C. Ecosystem services – Quarterly, interviews of fishermen, entrepreneurs, photo-documentation;
   D. Data synthesis/Analysis – Regularly, applying the appropriate statistical package from SPSS;
   E. Model development – As needed, by Australian and Japanese partners (e.g. dynamic modelling of physical-chemical-biological processes (Asaeda) and ecosystem health (Wolanski);
   F. IDSS development – semi-annually (Yr 1), quarterly (yrs 2-3: consultation with project partners and key community stakeholders;
   G. Report writing – last two quarters, extensive email exchanges among partners

Phase 2 (Capacity Building, 1 yr, 2013) – *Assisting partner institutions* use the knowledge and skills to improve academic, research and extension services (training courses at 4 sites, 4 workshops, 1 set of posters); *Development of a framework* for a localized Marine Emergency Contingency Policy (MECP) via public consultation); *Providing* the basis of a science-based decision support system integrated with socio-economic drivers; and *Implementation of an exit strategy* whereby local partners and communities are 'sensitized' to understand the necessity of independence and self-help in adopting and sustaining the 'best practices' resulting from the project. Specific activities include:

1. Consultative workshops – First quarter of the first 2 years and last quarter of third year; key project players and local stakeholders as participants;
2. Training courses (in 4 countries) – on pack test for water quality monitoring and on topics to be determined by Training Needs Analysis (TNA) on sites;
3. Marine Emergency Contingency Plan; Decision Support System – Third quarters of years 2 and 3, consultation with key community and local government unit officials;
4. IEC Planning/Advocacy – First quarter of each year, plus the last quarter of the last year (I part); consultation with key academic, community and local government unit officials;
5. Exit strategy – last two quarters, via public consultation by local Project Leaders.

   c. **Relationship to the APN's Third Strategic Plan (2010-2015)**
   a. Input to APN Science Agenda (p9 3SP)

Consistent with APN's four main themes and research interest under its Science Agenda, the SMPB intends to identify, explain and predict impacts of natural and human-induced coastal changes via application of a science-based understanding of the seagrass-mangrove system strengths and vulnerabilities. In the end, this knowledge is used as a base of an integrated decision support system to promote research in the context of the habitat response to local and global change especially at the local level. The support system, in turn, is the framework of capacity development and policy decisions to enhance ecosystem integrity and sustainable use of its resources. Clearly then, the proposed SMBP ensures effective transfer of scientific skills to stakeholders,

enhancing the interface in linking science with policy, while encourages the full participation of developing countries. Hence, SMBP addresses directly the APN Science Agenda and policy processes, recognizing their interrelatedness and interdependence.

b. Institutional Agenda (p12 3SP)

Products emanating from the project (e.g. knowledge, skill, models, expert system linkages) will eventually be owned by the local stakeholders of member countries. By all indications, this value or sense of ownership, developed by the project, will ensure that these countries will sustain and promote the benefits because these will be for their best interest in protecting and managing their coasts in the face of environmental changes. Inevitably, local partnerships and networks will be developed to further enhance and promote APN's agenda and strategies. This will be most encouraging in the face of the availability of meager local financial resources (despite abundance of natural assets) and depauperate scientific expertise.

3. **Scientific Contribution of each Participating Country**

Australia

The focal person from Australia (Eric Wolanski) will be on field in the Philippines and in Sri Lanka to gather first-hand data on coastal parameters needed to apply his model of ecosystem health to the study sites. This model looks at the whole marine ecosystem by quantifying the connectivity through energy fluxes between seagrass, mangroves, tidal flats, the coastal waters, and the river/watershed, including estimating climate change impacts. A new component that will be added to the model is the impact of wind-driven waves absorption in these habitats, one habitat thus protecting another one and thus raising the health of the whole ecosystem. In input from the other focal persons, he will consolidate and synthesize data and information into the project 'bioshield' model.

India

The country will be participating in the quarterly sampling of both seagrass and mangrove parameters in Tamil Nadu, as well as in the measurement of water quality and of CO_2 and CH_4 by making available to the project its spectrophotometer, gas chromatograph, and ample laboratory facilities. In biodiversity monitoring, it intends to contribute via use of remote sensing and GIS capabilities. Its focal person (Ramesh Ramachandran) will lead coastal management activities in India, in preparing an Ecosystem Health Report Card for the seagrass and mangrove surrounding waters and will be in-charge of writing the local reports.

Indonesia

With a PhD student and staff from related projects, the focal person of Indonesia (Wawan Kiswara) will be monitoring quarterly water quality (nutrient), and growth and survival of *Enhalus* seedlings in Jakarta Bay and Kepulauan Seribu. In addition, he will determine seagrass biomass and production, litter fall and identify the biota on the transplant units. This is made possible by the support of his local institution (LIPI) in providing limited use of some equipment, chemicals, and facilities, as a counterpart support from a massive rehabilitation effort of the Indonesian government in the area. Wawan Kiswara will be in-charge of writing the local reports.

Japan

Represented by 3 well-known scientists, Japan will contribute to the project via a contribution to coastal management activities at the 3 sites in the Philippines, in addition to monitoring water quality and seagrass system parameters and looking at the population dynamics of *Dugong dugon* (sea cow) at Davao Gulf in the country (Hiroshi Mukai); development of the nutrient analysis with pack test in Japan, determine stable isotopes from collected samples, training on the use of the pack test at the sites and how to collect samples for stable isotope analysis (Masumi Yamamuro); and, with 3 collaborators from Sri Lanka who are currently in Japan (Mr. Baniya Mahendra Bahadur, Dr. Harun Or Md.Rashid and Ms.Champika Ellawala), the development of a numerical growth model to describe mangrove forests as a function of latitudes, salinity, etc., and the processes of environmental quantities, such as organic matters and nutrients. The model will be applied to the area where such a model is required to estimate the ecosystem services, conservation planning and rehabilitation (Takashi Asaeda). All 3 Japanese partners will be in-charge of writing their own parts in the reports of the project.

Philippines

Miguel D. Fortes, the Philippine representative, ensures country contribution by leading the quarterly sampling and monitoring of the ecophysiological parameters of seagrasses and mangroves and the capacity building and sustainability activities at 3 sites in the country. In addition to the coordination and

management of the day-to-day activities of the project, which would take him to other partner countries, writing the proposal and finalization of all reports will be the main concerns of the Philippines.

Sri Lanka

The Coast Conservation Department (CCD) of Sri Lanka will provide the secondary data regarding the mangrove system species, biomass, water and sediment quality, gradual degradation, human disturbance etc. taken in previous years. The institute will also provide guide to access the mangrove system.

The entire team, in collaboration with local experts and representatives of concerned agencies, will develop the integrated decision support system. All country focal persons will be directly involved as resource persons in the focused workshops and training courses.

4. **Capacity Building for Global Change Research**

At both national and regional levels in the Indo-Pacific, Global Change Research is commonly misconstrued as an endeavour that could only be addressed at the global or at least at the regional level. Worse, that it could only be implemented with huge amount of funds, which normally poor countries in the region could not have, much less consider a priority side by side with poverty alleviation and health concerns. The result of a small World Bank funded project ("Community-based Climate Change Mitigation in the Philippines") and a few similar activities in the region clearly point out that Global Change Research, especially focusing on the impacts of CC on coastal communities, could effectively be implemented at the level of communities dependent upon coastal ecosystems (coral reefs) for survival. The project being proposed is a significant follow-up of these endeavours. However, different from the latter, we here aim at providing more simple, more relevant, and solid scientific foundations toward a clearer, more complete understanding on the part of coastal inhabitants of seagrass and mangrove ecosystems, their structure and functions, from which goods and services they provide emanate, and how desirable changes in these properties are linked directly to better and effective changes in coastal ecosystem conservation policies.

5. **Relevance to Policy Processes and Sustainable Development**

At the study sites in general, coastal resources conservation and management policies are promulgated either as stop-gap measures, for short-term economic benefits (e.g. tourism, mariculture), are virtually non-existent, or, if these exist, are largely ignored and unimplemented. One major reason is that these policies are practically unrelated to specific local needs, not addressing local priority issues. We propose to initially review these policies and plans within an environmental and climate change adaptation context. Then, we will identify gaps, and provide technical inputs in preparation for community, municipal and provincial ordinances and policies to support implementation of an ecosystem-based adaptation plans, using spatially explicit characterization of the habitats at the sites. The model developed will help determine how the intensity of risk can be modulated by existing policies or guidelines related to the changes, as well as, by any proposed interventions for hazard mitigation or existing measures for habitat protection. Hence, ensuring early local participation, incorporating science in institutional decisions, and being involved in doing the necessary actions, we aim towards sustainability, giving stakeholders knowledge-based options in their efforts to use resources and mitigate and adapt to the impacts of environmental changes.

6. **Administrative support, in-kind contributions and co-funding consideration**

As the lead institution, the University of the Philippines will be providing counterpart support to SMBP in terms of: (1) use of all equipment needed, (2) shared laboratory and office space at the Seagrass Mangrove Ecosystem Analysis Laboratory of the Marine Science Institute, (3) facilitation in getting local collection permits, (4) electricity and water, and phone bills, (5) vehicles for field use, (6) limited office supplies and materials, and (7) reproduction costs. Co-funding will be provided by an in-house project granted by the Commission on Higher Education in the form of salary of one Research Assistant (US$ 6,400 annually) but only for one site in the Philippines. The Philippine focal person will be spending 25% (roughly US$350) of his monthly official time to the project.

The other collaborating institutions will basically provide, where applicable, similar support to SMBP. In Indonesia, Philippine, and Japan, students at the MSc, PhD and Post-Doctoral levels are likely to be involved in either or both field or laboratory work.

7. **Relationship between Global Change Research Programmes and Networks**

The Philippine focal person has been involved in activities sponsored by DIVERSITAS, START, LOICZ, and WCRP, subscribing to the new information and future activities of these bodies, particularly in the area of biodiversity and ecosystem services as these relate to climate change. The Australian and Japanese partners have had activities related to those of IGBP, LOICZ, and IHDP. However, there are no formal relationships or collaboration between these organizations and the project being proposed, since the latter is not yet approved.

8. **Related Research Work**

Bjork et al. (2008) and Waycott et al. (2009) gave the latest accounts relating seagrass directly to climate change, reporting the different components of global change that may potentially affect seagrass habitats in the world. They further mentioned the possible adaptations of the plants to environmental change. Waycott et al. (2007), on the other hand, reported the vulnerability of seagrasses in the Great Barrier Reef to climate change. Duarte (2002) attempted to forecast the future of seagrasses in relation to the impacts of both climate change and increasing human population, while Hughes et al. (2009) reported a general declining seagrass and associated dependent species worldwide. All the climate-related accounts, however, while non-tropical, are unempirical, simply postulating that seagrasses, on account of their known functions, could protect the coast from human-induced and climate change impacts in terms of their physical interactions with the water and sediments, not directly saying that the plants could do so in terms of their health and the ensuing quality goods and services they then provide, much less as a 'bioshield' against coastal biodiversity loss and impacts of climate change. Among a few others, it was the vast areal extent of seagrass in the continental shelf of the world and its ability to absorb 166 gC per sq m per yr that engendered the most recent, significant, and high-level statement about seagrass vis-à-vis climate change: "…when healthy, mangrove forests, saltwater marshlands and seagrass meadows are extremely effective at storing atmospheric carbon, thereby mitigating climate change" (UNEP/IUCN 2009).

The state of knowledge on mangroves vis-à-vis climate change in Indo-Pacific is almost similar to that of seagrass. Gilman et al. (2008), in a review of the state of knowledge of mangrove vulnerability and responses to predicted climate change, averred that mangrove ecosystems are threatened by climate change, and consider adaptation options. McLeod and Salm (2006) reviewed the ways to manage mangroves for resilience to climate change. It was Alongi (2007) who made a review to assess the resilience of mangrove forests to large, infrequent disturbance (tsunamis) and their role in coastal protection, and to chronic disturbance events (climate change) and the future of mangroves in the face of global change.

What makes this proposed project novel? In both seagrass and mangroves, the very few current works relating them to climate change focus almost solely on the value of the scientific knowledge generated, simply implying their usefulness in mitigating the impacts of coastal disturbances. None directly and unequivocally mentioned, much less averred, that these functions directly link science and coastal conservation policy, useful in building research capacity and improving governance on the part of local governments and users of the goods and services the ecosystems provide.

In addition, the approach, which integrates micro-molecular, cellular, organismal, community and ecosystem levels in understanding natural coastal processes and responses and adopting this to address coastal environmental change make the project a novelty in the region. To our knowledge, it would be the first time that such project will be conducted especially in the partner developing countries. While we admit that our literature search may have missed some related works, we would consider this not as duplication, but as a great opportunity for complementation in addressing issues of mutual concern.

9. **Communications, Publications and Open Access to Data**

The SMBP communications and networking plan has been developed in attaining long-term project targets, i.e. the introduction strategic impacts in the form of new knowledge and skills to stakeholders or the acceptance of these knowledge and skills by the general public. Furthermore, the plan helps improve the collaboration and getting project overviews. An important factor in the plan is the management of the media channels in both directions: inbound and outbound. Information, updates and feedback especially from the field will be inbound, whereas publishing and disseminating information to target groups will be outbound. Initially, access to data will be restricted, dependent upon the nature of involvement of the recipient. After the project, an open access to data will be adopted.

Outlined below is the SMBP plan for communicating project results and other related information:

Dissemination Objectives: Providing updates, Announcing general information, Improving communications, Improving collaboration;

Dissemination Content: Technical, Societal, Research staff/Organizational

Dissemination Channels: Website (to be developed), eMail/Internet messages, Targeted phone calls, Workshops, Conferences, Training Courses, Print publications (posters and peer-reviewed papers;

Dissemination Methods: Providing information on the website, Providing press releases and images for download; Managing an Information Distribution List;

Target Audiences: Project country partners and staff, Local partner institutions, Civil society, Research community, Academe, Industry.

Appendix 1

Full timeline for the entire duration of the proposed project. An example can be downloaded from the APN website at this **link**.

Timeline for Year 1 (2011-2012)

Project Activities	Year 1 (2011/2012) (from 01 April 2011 – 31 March 2012)											
	1	2	3	4	5	6	7	8	9	10	11	12
Plan Finalization Meeting (virtual)	▓											
Communications Plan Dev't/Implem	▓	▓										
On-site Community Consultation*	▓											
Data collection**/Monitoring			▓	▓	▓	▓				▓		▓
Laboratory work			▓	▓	▓	▓				▓		
Data analysis			▓	▓	▓	▓				▓		
GIS & temporal database			▓	▓	▓	▓	▓	▓	▓	▓	▓	▓
Model Development/Verification			▓	▓	▓	▓	▓	▓	▓	▓	▓	
Study applications and refinements							▓	▓	▓	▓	▓	▓
Training Course (on pack test)			▓									
Policy workshop (MECP)										▓		
Draft Year 1 Annual Report**									▓	▓	▓	
Final Annual report/Dissemination										▓	▓	▓
APN project & financial reporting												▓

Date/Venue	Event	Participants
April 2011/In 4 countries	Community Consultation	20 at each
April 2011/Davao Gulf	Emergency Contingency Policy Workshop	20
June 2011/Bolinao, Philippines	Water Quality Training Course	15

* By Local Project Leader; **, T. Asaeda: Data collection in Jul-Sept 2011, Draft Final Report in Dec 2011-March 2012;

Timeline for Year 2 (2012-2013)

Project Activities	Year 2 (2012/2013) (from 01 April 2012 – 31 March 2013)											
	1	2	3	4	5	6	7	8	9	10	11	12
Revisiting Project Plan (virtual)	▓											
Communications Plan Implement	▓			▓			▓			▓		
Data collection/Comm Consultation*			▓	▓					▓			▓
Policy Workshop (by local PL)												▓
Laboratory work	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓		
Data analysis	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓		
GIS & temporal database			▓	▓	▓	▓	▓	▓	▓	▓		
Model Development/Verification			▓	▓			▓			▓		
Study applications and refinements			▓	▓			▓			▓		
Training Course (Water Quality)			▓									
Draft Year 2 Annual Report											▓	
Final Annual report**/Dissemination	▓	▓										
APN project & financial reporting												▓

*, Done informally during sampling period; **, Report submission in April-May 2012 by T. Asaeda only

Date/Venue	Event	Participants
April 2012/Tamil Nadu	Emergency Contingency Policy Workshop	15
June 2012/India	Water Quality Training Course	15

Timeline for Year 3 (2013-2014)

Project Activities	Year 3 (2013/2014) (from 01 April 2013 – 31 March 2014)											
	1	2	3	4	5	6	7	8	9	10	11	12
Revisiting Project Plan (virtual)	▓											
Communications Plan Implement	▓			▓		▓			▓			
Data collection/Comm Consultation*			▓				▓			▓		
Policy Recommendation (by local PL)											▓	
Laboratory work	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓		
Data analysis	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓		
GIS & temporal database				▓					▓			
Model Development/Verification			▓					▓				
Study applications and refinements			▓				▓					
Training course (water quality)			▓									
Draft Final Project Report										▓	▓	
Final Project Report/Submission												▓
Results Dissemination**												▓
APN project & financial reporting												▓

*, Done informally during sampling period; **, Via Communications Plan implementation

Date/Venue	Event	Participants
March 2013/Laguindingan	Water Quality Training Course	15

Appendix 2A

Detailed budget estimate ….YEAR 1

Budget Estimate: YR 1 (2011/2012, requested from APN)

PERSONAL SERVICES					Total, US$
Casual labor (on-site, 6 x US$20/day x 5 days/Q x 4Q)				2,400	**2,400**
	Round-trip Airfare	Per diem		No. of Participants	
		Accommodation/ no. of days	Allowance/ no. of days		
TRAVEL					**12,880**
Tokyo-Colombo	770	240/4	120/4	3	3,390
Tokyo-Manila	650	420/7	210/7	1	1,280
Tokyo-Manila	650	420/7	210/7	1	1,280
Townsville-Manila	1,550	420/7	210/7	2	4,360
Jakarta-Manila	520	420/7	210/7	1	1,150
Chennai-Manila	790	420/7	210/7	1	1,420
OTHER COSTS					**31,260**
Local transportation/airport transfer					4,600
Communication					200
Rentals					
In situ instruments (in Colombo only)					5,000
Scuba (outside the Philippines only)					2,500
Stable isotope analysis (in Japan only)					4,000
Carbon, methane, nutrient analysis					6,000
Reports, copying/printing					300
Consumables					300
Workshop & proceedings					2,360
Water Quality (pack test) training					4,000
Community consultation					2,000
				Total	**46,540**

Appendix 2B

Detailed budget estimate ….YEAR 2

Budget Estimate: YR 2 (2012/2013, requested from APN)					
PERSONAL SERVICES					**Total, US$**
Casual labor (on-site, 6 x US$20/day x 5 days/Q x 4Q)				2,400	2,400
	Round-trip Airfare	**Per diem**		**No. of Participants**	
		Accommodation/ no. of days	**Allowance/ no. of days**		
TRAVEL					**6,920**
Tokyo-Manila	650	420/7	210/7	2	2,560
Townsville-Manila	1,550	420/7	210/7	2	4,360
OTHER COSTS					**26,260**
Local transportation/airport transfer					4,600
Communication					200
Rentals					
Scuba (outside the Philippines only)					2,500
Stable isotope analysis (in Japan only)					4,000
Carbon, methane, nutrient analysis					6,000
Reports, copying/printing					300
Consumables					300
Workshop & proceedings					2,360
Water Quality (pack test) training					4,000
Community consultation					2,000
				Total	**35,580**

Appendix 2C

Detailed budget estimate ….YEAR 3

Budget Estimate: YR 3 (2013/2014, requested from APN)					
PERSONAL SERVICES					**Total, US$**
Casual labor (on-site, 6 x US$20/day x 5 days/Q x 4Q)				2,400	2,400
	Round-trip Airfare	**Per diem**		**No. of Participants**	
		Accommodation/ no. of days	**Allowance/ no. of days**		
TRAVEL					**5,710**
Tokyo-Manila	650	420/7	210/7	1	1,280
Manila-Chennai	1,620	420/7	210/7	1	2,250
Townsville-Manila	1,550	420/7	210/7	1	2,180
OTHER COSTS					**22,960**
Local transportation/airport transfer					4,600
Communication					200
Rentals					
Scuba (outside the Philippines only)					2,500
Stable isotope analysis (in Japan only)					
Carbon, methane, nutrient analysis					6,000
Reports, copying/printing					500
Consumables					500
Workshop & proceedings					2,360
Water Quality (pack test) training					4,000
Community consultation					2,000
				Total	**31,070**

Appendix 3

Fully updated CV of Proponent
Full CV of the Proponent expanding, where necessary, on the one-page resume in the four-page template.
(**Maximum of four pages**)

Publications in International Peer-reviewed Journals

Marbà Núria, Carlos M. Duarte, Jorge Terrados, Zayda Halun, Esperança Gacia, Miguel D. Fortes. 2010. Effects of Seagrass Rhizospheres on Sediment Redox Conditions in SE Asian Coastal Ecosystems. Estuaries and Coasts, 33 (1): 107-117.

Izuka, H., Tamura, H., Pokavanich, T., Rubio-paringit, M.C., Nadaoka, K., Fortes, M.D. (2009): Highly skewed tidal circulation pattern and water quality in Puerto Galera Bay, Mindoro Island, Philippines. Coastal Engineering Journal 4, 341-361.

Fortes, M.D. (2008). Ecological changes in seagrass ecosystems in Southeast Asia. Pp. 131-136 In: N. Mimura (ed), Chapter 3, "Asian-Pacific Coasts: States of Environments and Their Management ". States of environment. Springer. 365 p.

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Olesen, B., Marba, N., Duarte, C.M., Savela, R.S., & Fortes, M.D. (2004). Recolonization dynamics in a mixed seagrass meadow: The role of clonal versus sexual processes. Estuaries 27: 770-780.

Gacia, E., Duarte, C.M., Marba, N., Terrados, J., Kennedy, H., Fortes, M.D., & Tri, N.H. (2003). Sediment deposition and production in SE-Asia seagrass meadows. Estuarine Coastal & Shelf Science 56: 909-919.

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Pedersen, O., Borum, J., Duarte, C.M., & Fortes, M.D. (1998). Oxygen dynamics in the rhizosphere of Cymodocea rotundata. Marine Ecology-Progress Series 169: 283-288.

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Appendix 4
Short 2-page CVs of all Major Collaborators
Details of all major collaborators (names, organisations, contact details, etc.). (**Maximum of two pages each**.)

1. PROFESSOR TAKASHI ASAEDA

Name:	**Takashi Asaeda**
Date of Birth:	30th April 1953 **Age**: 57
Nationality:	Japanese
Employed by:	Department of Environmental Science
	Graduate School of Science and Technology,
	Saitama University
	(address) 255 Shimo-okubo, Sakura, Saitama, Japan
	(postal code) 338-8570
	(TEL) +81-48-858-3563
	(e-mail) asaeda@mail.saitama-u.ac.jp
Position & Title:	Professor
	B., Ms., Dr. of Engineering
Education:	March 1976
	Bachelor of Engineering,
	Department of Civil Engineering, The University of Tokyo
	March 1978
	Master of Engineering,
	Department of Civil Engineering, The University of Toky
	December 1983
	Doctor of Engineering,
	Department of Civil Engineering, The University of Tokyo
Employment:	April 1980 – January 1984
	Research Associate, Department of Foundation Engineering,
	Saitama University
	February 1984 – June 1984
	Research Associate, Department of Civil Engineering,
	The University of Tokyo
	July 1984 – June 1989
	Associate Professor, Department of Civil Engineering,
	The University of Tokyo
	July 1989 – March 1996
	Associate Professor, Department of Civil Engineering,
	Saitama University
	April 1996 – March 2000
	Associate Professor, Department of Environmental Science and Human Engineering,
	Saitama University
	April 2000 –
	Professor, Department of Environmental Science and Human Engineering,
	Saitama University
	April 2003-March 2004
	Visiting Professor, Department of Mechanical Engineering and Mechatronics, The University of Sydney
	September 2004-2006
	Conjoint Professor, The School of Applied Science, The University of Newcastle

Prizes awarded: Incentive Prize (JSCE) 1983
Karl Emil Hydraulic Prize (ASCE) 1983
APD-IAHR Awards (IAHR) 1986
Dam Engineering Society Prize (Japanese Society of Dam Engineering) 1999

International Leadership Awards (American Biographical Institute) 2000
International Order of Merit (International Biographical Center) 2001
Dam Engineering Society Prize (Japanese Society of Dam Engineering) 2004
Japan Society of Civil Engineers Prize 2005

Editorial board:

Wetlands Ecology & Management,
Limnology,
Landscape & Ecological Engineering (Chief Editor)
Journal of Ecology and Civil Engineering

Social Activities:

Chairperson of four committees of Japanese Ministry of Land, Infrastructure and Transport (Taroemon-region Natural Restoration, Yammba dam environmental report,etc.)
Committee member of Japanese Inland Fisheries Cooperative Union (Environmental Monitoring of Ayu Fisheries)
Member of five committees of Japanese Ministry of Land, Infrastructure and Transport (Arakawa River Management Plan, Azuma River Water Quality, Sawada Spring, Watarase Basin Restoration of Nature, Water Quality Monitoring Committee of Watarase Retarding Reservoir,etc.)
Member of Prefectural Committees of Kanagawa (Sagami and Shiroyama Reservoirs, Kanagawa peoples meeting)
River Counselor of Sagami River and Arakawa River, Ministry of Land, Infrastructure and Transport etc.

2. DRS. WAWAN KISWARA

1.a). Full name   : Wawan Kiswara
   b). Degree held   : Doktorandus (Drs)
2. S e x   : Male
3. Date of birth   : 6 August 1951
4. Place of birth   : Cimahi, West Java-Indonesia
5. Address, phone and fax   :
   a). Office   : Jl. Pasir Putih No. 1 Ancol Timur, Jakarta Utara, Indonesia
                              Tel. : xx.62.21.64713850   Fax. : xx.62.21.64711948
   b). Private   : Jl. Amonia F10 Kav. PT Pupuk Kujang, Beji Timur-Depok
                               Indonesia 16422
                               Tel. : xx.62.21.7775046
6.E-mail   : w.kiswara@nioo.knaw.nl;wkiswara@indo.net.id
7. Present job   : Researcher
8. Institution   :
   a). N a m e   : Research Centre for Oceanography – Indonesian
                               Institute of Sciences
   b). Address   : Jl. Pasir Putih No. 1 Ancol Timur, Jakarta Utara, Indonesia

Relevant publications:

Kiswara, W., T.J. Bouma, A.H.L. Huiskes and P.M.J. Herman, 2010. Survival and development transplant single shoots of Enhalus acoroides L.f. ROYLE in different morphological types at Banten Bay, Indonesia. Paper will be presented at the World Seagrass Conference, 21-25 November 2010 Phuket, Thailand.

Kiswara, W., T.J. Bouma, A.H.L. Huiskes and P.M.J. Herman, 2010. Survival and development transplant single shoots of *Enhalus acoroides* L.f. ROYLE in different morphological types at Banten Bay, Indonesia. Paper will be presented at the World Seagrass Conference, 21-25 November 2010 Phuket, Thailand.

Kiswara, W. 1980. Effect of collecting fry of milkfish (*Chanos chanos*) on the coastal areas of Baluran National Park, East Java, Indonesia. Master thesis, Padjadjaran University, Bandung Indonesia (in Indonesian).

Kiswara, W., M.H. Azkab and L.H. Purnomo, 1997. Komposisi jenis dan sebaran lamun di Kawasan Laut Cina Selatan. Atlas Oseanologi Laut Cina Selatan. P3O-LIPI, Jakarta.

3. PROFESSOR HIROSHI MUKAI

PERSONAL DETAILS

❑ **Full Name and Title: Hiroshi Mukai**
❑ **Date of Birth: 24 January 1944**
❑ **Nationality: Japan**
❑ **Country of Residence: Japan**
❑ **Institution: Field Science Education and Research Center, Kyoto University**
❑ **Contact Details (telephone, facsimile and email): TEL =075-753-6425; FAX=075-753-2263; e-mail= mukaih@kais.kyoto-u.ac.jp**

PROFILE

Studied on marine benthic community, particularly seagrass communities including herbivore like dugong. Currently studied on interactive interactions between terrestrial and coastal marine ecosystems. Now concerned with education for integrated coastal management and conservation of biodiversity.

EDUCATION
Doctor of Science   197

Hiroshima University

Dissertation topic:

Master of Science   1968

Hiroshima University
Thesis topic:

Bachelor of Science   1966

Hiroshima University
Achievements:

PUBLICATIONS
Doctoral Dissertation

   Mukai, H.: Ecological studies on distribution and production of some benthic animals in the coastal waters of central Inland Sea of Japan. J. Sci. Hiroshima Univ., Ser.B, Div.1(Zoology), 25:1-82., 1974

Master's Thesis

 Mukai, H.: The phytal animals on the thalli of *Sargassum serratifolium* in the *Sargassum* region, with reference to their seasonal fluctuations., Mar. Biol., 8:170-182., 1971

Recent Peer reviewed Publications/Invited Papers/Presentations in the last 5 years

Sasil-Orbita, M.L.W. and H. Mukai : A comparative study of the photosynthetic activity among temperate seagrass species in Akkeshi Bay, Hokkaido, Japan. Marine Ecology, 27: 388-396, 2006

Ueno, Y., M. Hori, T. Noda and H. Mukai : Effects of material inputs by the Grey Heron, Ardea cinerea, on forest-floor necrophagous insects and understory plants during the breeding season. Ornithological Science, 5:199-209, 2006

Hasegawa, N., M. Hori and H. Mukai : Seasonal shifts in seagrass bed primary producers in a cold-temperate estuary : Dynamics of eelgrass *Zostera marina* and associated epiphytic algae. Aquatic Botany, 86:337-345, 2007

Sasil-Orbita, M. L. W. and H. Mukai : Ontogenic change in the seedling photosynthetic activity of four temperate seagrass species in Northern Japan. Asia Life Sciences, 18:99-110, 2009

Sasil-Orbita, M. L. W. and H. Mukai : Effects of epiphyte density on seagrass leaf turnover rate. Philippine Journal of Science, 138:75-80, 2009

Kasim, M. and H. Mukai : Food sources of the oyster (*Crassostrea gigas*) and the clam (*Ruditapes philippinarum*) in the Akkeshi-ko estuary. Plankton and Benthos Research, 4:104-114, 2009

EXPERIENCE

Current Position: Project-specific Professor   Oct 2008-present

Division of Integrated Coastal Management, Field Science Education & Research Center, Kyoto University
Manage project for an externally sponsored education program
❑ Manage education programs for Liberal Arts students by the idea of connectivity of Forest-Human-Marine ecosystems
❑ Manage projects from conception through "Connectivity of Forest-Human-Marine", budgeting, and scheduling; supervise technicians; present program highlights at executive conferences.
❑ Researches on land use impact and marine community variation.

4. PROFESSOR RAMESH RAMACHANDRAN

PERSONAL DETAILS

❑ **Full Name and Title: Prof. Dr. Ramesh Ramachandran**
❑ **Date of Birth: 1st May 1958**
❑ **Nationality: Indian**
❑ **Country of Residence: India**
❑ **Institution: Anna University, Chennai, India**
❑ **Contact Details (telephone, facsimile and email):** Work Phone: +91 44 2230 0108;
   Fax: +91 44 2220 0158; Email: rramesh_au@yahoo.com

PROFILE
A marine biogeochemist with a doctorate in environmental sciences and a second doctorate in marine biogeochemistry. Strong background in marine ecological processes, climate change issues in coastal systems, biogeochemical budgets, coastal management and water quality assessments. Experienced in executing and managing national and international projects from conception to completion.

EDUCATION
Doctorate of Philosophy   1990

McGill University, Montreal, Canada
Dissertation topic: Geochemical and Mineralogical Characteristics of the Post-glacial Sediments of the St. Lawrence Lowlands

Doctorate of Philosophy   1985

Jawaharlal Nehru University, New Delhi, India
Dissertation topic: Geochemical and Mineralogical Characteristics of the Post-glacial Sediments of the St. Lawrence Lowlands

Master of Philosophy

Jawaharlal Nehru University, New Delhi, India   1983
Dissertation topic: Some Geochemical Investigations of a Salt Farm near Madras

Master of Science   1981

University of Madras, India

Bachelor of Science

University of Madras, India   1979
Achievements:

PUBLICATIONS

Recent Peer reviewed Publications/Invited Papers/Presentations in the last 5 years

- Laxmi Priya, S., Senthilkumar, B. Hariharan, G. Paneer Selvam, A., Purvaja, R., and Ramesh, R Bioaccumulation of Heavy Metals in Mullet (Mugil Cephalus) and Oyster (Crassostrea Madrasensis) from Pulicat Lake, South India. Journal of Toxicology and Industrial Health (2010)

- Rixen, T., Purvaja, R., Lehnhoff, L., Dasbach, D., Urban, B., Ramesh, R. and Ittekkot, V. Impact of monsoon-driven surface ocean processes on a coral off Port Blair on the Andaman Islands and their link to North Atlantic climate variations. Global and Planetary Change (2010)

- Voss, M., Purvaja, R., Ramesh, R and Rixen, T. Internal cycling of nitrogen and nitrogen transformations. Treatise on Estuarine and Coastal Science". Ed. Remi Laane and Jack Middelburg (2010)

- Sowmya, M., Senthilkumar, B. Seshan, B.R.R., Hariharan, G., Purvaja, R., Ramkumar, S. and Ramesh, R. Natural radioactivity and associated dose rates in soil samples from Kalpakkam, South India. J. Radiation Protection Dosimetry doi: 10.1093/rpd/ncq169 (2010)

- Ramesh, R., Shivkumar, K. Biksham Gujja, Srinivasalu, S. and Purvaja, R. (2010) REE Geochemistry of river sediments: An indicative of sedimentary processes in Godavari River and Delta, India. Earth Surface Processes and Landforms (Accepted for publication)

- Ramesh, R., Ahana Lakshmi, and Purvaja, R. Integrated Coastal and Estuarine Management in South and Southeast Asia. Treatise on Estuarine and Coastal Science. Ed. Wolanski, E and McLusky, D. (Accepted for Publication)

- Kunz, A., Freschen, M., Ramesh, R and Urban, B. Luminescence dating of late holocene dunes showing remnants of early settlement in Cuddalore and evidence of monsoon activity in south east India. Quaternary International, doi:10.1016/j.quaint.2009.10.042 (2009)

- Gupta, P.K., Gupta, V., Sharma, C., Das, S.N., Purkait, N., Adhya,T.K., Pathak, H., Ramesh, R., Baruah, K.K., Venkataraman, L., Gulab Singh, Iyer, C.S.P. Development of CH_4 emission factors for Indian paddy fields and estimation of National Methane Budget. Chemosphere, Volume 74(4), 590-598 (2009)

- Nirmal Rajkumar, A, Barnes, J, Ramesh, R. Purvaja, R. and Upstill-Goddard, R.C. Methane and nitrous oxide fluxes in the polluted Adyar River and estuary, SE India. Marine Pollution Bulletin, 56, 2043-2051 (2008)

- Vibha Sharma, Ramesh, R and Ramachandran, S. Coastal land use and land cover mapping of Puri to Konark coastal stretch of Orissa. The Indian Geographical Journal, Vol. 82(1) 37-42 (2008)

- Purvaja, R, Ramesh, R., Shalini, A., and Tim Rixen. Biogeochemistry of Nitrogen in Seagrass and Oceanic Systems. Memoir Geological Society of India Vol. 73, 435–460 (2008)

- Purvaja, R, Ramesh, R, Ray, A.K., and Tim Rixen. Nitrogen Cycling: A review of the processes, transformations and fluxes in coastal ecosystems. Current Science Vol.94(11) 1419-1438 (2008)

- Krithika, K., Purvaja, R and Ramesh, R. Fluxes of CH4 and N2O from an Indian mangrove. Current Science 2008 Vol. 94, No. 2, 25 January 218-224 (2008)

- Senthilkumar B, Purvaja R and Ramesh R. 'Seasonal and Tidal dynamics of Nutrients and Chlorophyll a in a Tropical Mangrove Dominated Estuary, Southeast Coast of India', Indian Journal of Marine Sciences, Vol. 37(2), pp. 132 – 140 (2008)

- Gowri, V.S., Ramachandran, S., Ramesh, R and Pramiladevi, I.R.R., Krishnaveni, K. Application of GIS in the study of mass transport of pollutants by Adyar and Cooum Rivers in Chennai, Tamil Nadu. Environmental Monitoring and Assessment Vol. 138, 41-49 (2008)

- Sundareshwar, P.V. Murtugudde, R., Srinivasan, G., Singh, S., Ramesh, K. J., Ramesh, R., Verma, S. B., Agarwal, D., Baldocchi, D. Baru, C. K., Baruah, K. K., Chowdhury, G. R., Dadhwal, V. K., Dutt, C. B. S. Fuentes, J., Gupta, P.K., Hargrove, W. W., Howard, M., Jha, C. S. Lal, S., Michener, W. K., Mitra, A. P. Morris, J. T., Myneni, R. R.,. Naja, M., Nemani, R. Purvaja, R., Raha, S., Santhana Vanan, S. K., Sharma, M., Subramaniam, A., Sukumar, R. Twilley, R. R. and P. R. Zimmerman. Environmental Monitoring Network for India. Science 316 (5822), 204 – 205 (2007)

- Arvind K Jha., C.Sharma, Nahar Singh, Ramesh, R., R.Purvaja, Prabhat K Gupta. Greenhouse gas emissions from municipal solid waste management in Indian megacities: A case study of Chennai landfill sites. Chemosphere, doi:10.1016/J Chemosphere 10.024 (2007)

- Ramesh, R. and Purvaja, R. Case studies on interlinked coastal and river basin management for Krishna River Basin: UNEP Case Book, UNEP-GPA 2006: 41-43 (2006)

- Barnes, J., Ramesh, R., Purvaja, R., Nirmal Rajkumar, A., Senthil Kumar, B., Krithika, K., Ravichandran, K., Uher, G. and R. Upstill- Goddard Tidal dynamics and rainfall control N2O and CH4 emissions from a pristine mangrove creek. Journal of Geophysical Research Letters Vol 33, L15405 d.o.i. 10.1029/2006GL026829

(2006)

- Shalini, A., Ramesh, R., Purvaja, R. and Barnes, J., Spatial and temporal distribution of methane in an extensive shallow estuary, South India. Journal of Earth System Science, Vol. 115 (4) 451-460 (2006)
- Ramesh, R. and Purvaja, R. Climate change and coastal ecosystems: An overview. Asian Journal of Water, Environment and Pollution, 1(1-2) 29-40 (2006)
- Ramesh R. and Purvaja R. Nutrient fluxes from coastal ecosystems of Tamil Nadu, India to the Bay of Bengal. SCOPE Publication (2005)
- Babu Rajendran, R., T. Imagawa, H. Tao and R. Ramesh. Distribution of PCBs, HCHs and DDTs, and their ecotoxicological implications in Bay of Bengal, India. Environment International 2005 Vol. 31(4):503-512
- Purvaja, R., Ramesh, R. and Frenzel, P. Plant-mediated methane emission from Indian mangroves. Global Change Biology 10, 1825-1834 (2004)

5. PROFESSOR ERIC WOLANSKI

-Adjunct Professor, Department of Marine and Tropical Biology; Chief Research Officer (40% time), Australian Centre for Tropical Freshwater Research, James Cook University of North Queensland, Townsville, Q. 4811, Australia. eric.wolanski@jcu.edu.au
-Associate Scientist, Australian Institute of Marine Science, Townsville, Qld., Australia. e.wolanski@aims.gov.au
-Consultant in freshwater ecohydrology, estuarine and coastal water ecosystems, environment impacts and management eric.wolanski@gmail.com
-Mobile: +61-417761404; Home: +61-7-47244776; Office: +61-7-47815513

Honours:

- Fellow, Australian Academy of Technological Sciences and Engineering.
- Fellow, The Institution of Engineers, Australia.
- Fellow, Academie Royale Belge des Sciences d'Outre-Mer, Belgium.
- Australian Centenary Medal.
- Doctor Honoris Causa, Catholic University of Louvain.
- EU Erasmus Mundus Scholar, 2006.
- Chief Editor, "Wetlands Ecology and Management", "Estuarine, Coastal & Shelf Science", and "Treatise of Estuarine and Coastal Science".
- Theme editor "UNESCO Encyclopedia of Life Supporting Systems".
- Member of the editorial board of "Continental Shelf Science", "Journal of Marine Systems", "Journal of Coastal Research", and "Ecohydrology & Hydrobiology"
- Queensland Information Technology and Telecommunications Award for Excellence
- Member, UNESCO-ROSTE estuarine and coastal water ecohydrology sub-programme.
- Member, Scientific and Policy Committee, Japan's International Center for Environmental Management of Enclosed Coastal Seas (EMECS).
- Member, Scientific Steering Committee, Land Ocean Interactions in the Coastal Zone (IGBP).

Languages: English and French (fluent), Swahili (some)

Qualifications

Postdoctoral fellow, hydraulics, California Institute of Technology, USA, 1973. Ph.D., Environmental Engineering, The Johns Hopkins University, Baltimore, Md. (U.S.A.) 1972; M.Sc., Civil and Geological Engineering, Princeton University, Princeton, N.J. (U.S.A.) 1970; Dipl. Civil Engineering, University of Louvain (Belgium) 1969.

- Present Position: Adjunct Professor at James Cook University.
  Estuarine and coastal oceanography, including the Great Barrier reef of Australia, cohesive sediment dynamics, and environmental impacts in lagoons, tropical estuaries including mangroves, and coastal waters (including seagrass and coral reefs) and papyrus wetlands arising from
  -dredging and dredge spoil disposal
  -heavy metals in turbid estuaries

-agriculture, land clearing, soil erosion and resulting biological impact on coral reefs, seagrass and mangroves
-foreshore, dams and hydro-power development
-farm and prawn farm effluent environmental impact
-coastal stabilisation by mangroves; mangrove reforestation
-global change implications for mangroves and coral reefs
-ecohydrology-based management of freshwater rivers and lakes in East Africa and Florida

Employment History

2007-2010: James Cook University; 1978-2007 Australian Institute of Marine Science: Leading Scientist, tropical estuarine and coastal oceanography. Applications in Australia, Micronesia, China, Japan, Vietnam, Tanzania, Thailand, and Papua New Guinea. 1976-1978 Snowy Mountains Engineering Corporation (SMEC): Consulting Engineer; hydrologic and hydraulic modelling for various rivers and estuaries in Indonesia, Papua New Guinea and East Africa ; 1974-1975 State Pollution Control Commission, Sydney: Engineer in charge of the water quality sub-branch; 1973: W.M. Keck Hydraulics Lab, CalTech, USA.

Overseas Experience

Micronesia –University of Hawaii, University of Guam, and PICRC: Environmental and societal impact of land-use management practices on coral reefs and their fisheries in several Pacific islands; Kenya – WMO: Mathematical model of the hydrologic regime of Upper White Nile Basin; Tanzania – TANAPA: papyrus wetlands management; impact on protected savannah ecosystems of water resources management upstream. Indonesia – World Bank: Cimanuk River basin development project – river and estuarine hydrodynamics and siltation, flood mitigation; Papua New Guinea – OTML: Fly River estuary and Gulf of Papua: oceanographic, cohesive sediment and heavy metal pollution field study and modelling; PNGSDP: sedimentation of the proposed Daru port. U.S.A. - Visiting professor, University of South Carolina, and USGS, Menlo Park, California; coastal dynamics and siltation; – University of Florida: eutrophication and remediation of Lake Apopka. University of Hawaii and University of Guam: watershed-coral reef science and management. China, Vietnam, Thailand and Malaysia - Cooperative research and development in coastal oceanography and sedimentation; France - coral reef oceanography in French Polynesia; Guinea - World-Bank: mangrove forestry management; Japan – EMECS-NILIM: invited expert for tropical coastal development environment impacts and climate change effects in coastal zones. Portugal – UNESCO: ecohydrology modeling of the Guadiana Estuary. Angola – TOTAL: dredging in mangroves.

Publications

327 publications, including seven books:
-Wolanski, E. (1994). Physical oceanography processes of the Great Barrier Reef. CRC Press, Boca Raton, Florida, 194 pp.
- Wolanski, E. (2001). Mangroven - Lebensraume zwischen Land und Meer. Filander Press, Furth, Germany, 205 pp.
-Wolanski, E. (2001). Oceanographic processes of coral reefs: Physical and biological links in the Great Barrier Reef, CRC Press, Boca Raton, Florida, 356 pp.
-Wolanski, E. (2006). The environment in Asia Pacific harbours, Springer, Dordrecht, 497 pp.
-Mazda, Y., Wolanski, E., Ridd, P.V. (2007). The role of physical processes in mangrove environments. A manual for the preservation and conservation of mangrove ecosystems. Terrapub, Tokyo, 593 pp.
-Wolanski, E. (2007). Estuarine Ecohydrology. Elsevier, Amsterdam, 157 pp.
-Perillo, G.M.E., Wolanski, E., Cahoon, D, Brinson, M. (2009). Coastal Wetlands. An Integrated Ecosystem Approach. Elsevier, Amsterdam, 941 pp.

6. PROFESSOR MASUMI YAMAMURO

Degree and Specialty – Doctor of Science in Geography, 1986-1991 ("Role of Filter-feeding Bivalve on Nitrogen Cycling in Eutrophic Brackish Water"), Department of Geography, Faculty of Science, University of Tokyo; Biogeochemical Cycling in Aquatic Ecosystems; Limnology.

Publications in the last 5 years

• Yamamuro, M., Hiratsuka, J., and Ishitobi, Y. (2010). What prevents Musculista senhousia from constructing byssal thread mats in estuarine environments? A case study focusing on Lake Shinji and nearby estuarine waters. Landscape and Ecological Engineering, 6(1), 23-28.

• Tabayashi, Y. and Yamamuro, M. (2009). Changes in the impact of anthropogenic effects on river water quality during the last 50 years in Japan. Wetlands Ecology and Management, 17(4): 409-415.

• Umezawa, Y., Komatsu, T., Yamamuro, M. and Koike, I. (2009). Physical and topographic factors affecting suspended particulate matter composition in a shallow tropical estuary. Marine Environmental Research, 68(2): 59-70.

• Yoshioka, K., Kamiya, H., Kano , Y., Saki, Y,, Yamamuro, M. and Ishitobi, Y. (2009). The relationship between seasonal variations of total-nitrogen and total-phosphorus in rainfall and air mass advection paths in Matsue, Japan. Atmospheric Environment, 43, 3496–3501.

• Bahar, M.M. and Yamamuro, M. (2008). Assessing the influence of watershed land use patterns on the major ion chemistry of river waters in the Shimousa Upland, Japan. Chemistry and Ecology, 24(5): 341–355.

• Yamamoto, M., Yamamuro,M., Tanaka, Y. (2007) The California current system during the last 136,000 years response of the North Pacific High to precessional forcing. Quaternary Science Reviews 26, 405-414

• Yamamuro, M., Hiratsuka, J., Ishitobi, Y., Hosokawa, S., Nakamura, Y. (2006) Ecosystem shift resulting from loss of eelgrass and other submerged aquatic vegetation in two estuarine lagoons, Lake Nakaumi and Lake Shinji, Japan. Journal of Oceanography, 62 (4), 551-558

• Kimura. H., J. Zhiwen., J. Cizdziel., Yamamuro. M., Hattori. K and K. Azmy. (2005) Integrated stratigraphy of the upper Neoproterozoic succession in Yunnan Province of South China: Re-evaluation of global correlation and carbon cycle. Precambrian Research, 138, 1-36

• Kayanne, H., Hirota, M., Yamamuro, M., Koike, I. (2005) Nitrogen fixation of filamentous cyanobacteria in a coral reef measured using three different methods. Coral Reefs, 24 (2), 197-200

• Yamamuro, M. and Kanai, Y. (2005) A 200-year record of natural and anthropogenic changes in water quality from coastal lagoon sediments of Lake Shinji, Japan. Chemical Geology, 218 (1-2), 51-61

• Yamamuro, M. and Chirapart, A. (2005) Quality of the seagrass Halophilla ovalis on a Thai intertidal flat as food for the dugong. Journal of Oceanography, 61 (1):183-186

Professional Achievements

• Senior researcher, Institute of Geology and Geoinformation, Geological Survey of Japan, AIST, 2004-2007.

• Senior Researcher at Institute for Marine Resources and Environment, Geological Survey of Japan, AIST (comprised of formerly independent agencies and organizations), 2001- 2004.

• Managing Editor of Limnology (http://link.springer.de/link/service/journals/10201/index.htm), 1999-2001.

• Senior researcher at Marine Geology Department, Geological Survey of Japan, 1991-2001.

The 2010 ARCP Checklist for Full Proposals
Use this list to check whether your proposal includes all of the required information.

Is your proposal within the **areas of interest** in the **APN's Third Strategic Plan and outlined in the present Guide**?

Is the proposal related to at least one of the **activities of interest** to APN? ☒

Have you provided detailed information on the **proposed activity(s)** to be funded, including all background supporting evidence? ☒

Have you submitted the requested information on all **previous activities** for which you received APN support? ☒

Are you based in an **APN member or approved country**? ☒

Does your proposal involves at least **3 APN member or approved countries**? ☒

Are at least **two developing countries** involved? ☒

Have you completed the **four-page summary sheet?** ☒

Have you completed the main body of the proposal in **five pages** or less? ☒

Are all names and contact details of **major collaborators** included together with their two-page CVs (resume ☒

As proponent, have you completed the one-page template CV on page 4 and included a more detailed version in the main body of the proposal? ☒

Have you included a **detailed budget estimate** in US Dollars and a **detailed timeline**? ☒

Have you included details on funds (in-kind or any other contribution) from sources other than APN? ☒

Have you completed all Sections (1-8) of the proposal and, particularly, have you addressed the following in detail? ☒
- ❏ Relationship to priority topics ☒
- ❏ Regional collaboration ☒
- ❏ Capacity building ☒
- ❏ Scientific contribution of each participating country ☒
- ❏ Policy-relevancy and sustainable development issues ☒
- ❏ Relationship between global change research programmes and networks ☒
- ❏ Related research work ☒
- ❏ A detailed literature review ☒
- ❏ A communications and networking plan ☒

Have you submitted your electronic proposal in WORD FORMAT either by email to **ARCP-Proposals@apn-gcr.org** or by CDROM? ☒