Global Targets Local Benefits

Setting the Sustainable Development Agenda for the Seas of East Asia beyond 2015

16-21 November 2015

Special Event

Technical and Policy Workshop on Sustainable Nutrient Management in support of the Asian Platform of Global Partnership on Nutrient Management (GPNM)

Supported by the GEF-Global Foundations for Reducing Nutrient Enrichment and Oxygen Depletion from Land-based Pollution, in Support of Global Nutrient Cycle - (GNC Project)

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Global Partnership on Nutrient Management (GPNM)

Technical and Policy Workshop on Sustainable Nutrient Management in support of the

Asian Platform

of the Global Partnership on Nutrient Management

Workshop Proceedings

18 November 2015
Furama Resort,
Da Nang City, Viet Nam

Supported under the
GEF-funded Global Foundations for Reducing Nutrient Enrichment and Oxygen Depletion from Land-based Pollution, in Support of Global Nutrient Cycle (GEF-GNC) Project

November 2015

Collaborators and organizing partners:

Background

The Global Partnership on Nutrient Management (GPNM) was launched in 2009 to address the global challenges faced by the mismanagement of nutrients and nutrient over-enrichment. It is a global partnership of governments, scientists, policymakers, private sector, NGOs and international organizations. It responds to the 'nutrient challenge' — how to reduce the amount of excess nutrients in the global environment consistent with global development. The GPNM reflects a need for strategic, global advocacy to trigger governments and stakeholders in moving towards more efficient and effective nitrogen and phosphorous use and lower losses associated with human activities. It provides a platform for governments, UN agencies, scientists and the private sector to forge a common agenda, mainstreaming best practices and integrated assessments, so that policy and investment responses/options are effectively 'nutrient proofed'. The GPNM also provides a space where countries and other stakeholders can forge more co-operative work across the variety of international and regional fora and agencies dealing with nutrients, including the importance of impact assessment work. The work of the GPNM is advanced by a Steering Committee, a sub-set of the Partnership members and is supported by the GPA Unit of the Marine and Coastal Ecosystems Branch of the Division of Environmental Policy Implementation of UNEP, which serves as the Secretariat to the Steering Committee.

The GPNM, in collaboration with the hosts of the 2015 East Asian Seas (EAS) Congress, the Government of Viet Nam through the Ministry of Natural Resources and Environment (MONRE) and Viet Nam Administration of Seas and Islands (VASI) and the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) hosted a Technical and Policy Workshop on Sustainable Nutrient Management. This workshop, convened within the EAS Congress on 18th of November 2015, showcased the main technical deliverables of the GEF-funded Global Nutrient Cycle Project, and focused on policy and mainstreaming of the nutrient management agenda within countries of the Asia sub-region under the aegis of an Asian Regional Nutrient Management Platform of the GPNM. The technical session of the workshop presented the state-of-the-art in the science and understanding of the global nutrient challenge and introduced management tools designed for technical (and policy) advisory personnel. The Policy session reviewed the relevance of the nutrient management challenge in relation to sustainable development, food security and environmental quality, presented the global agenda for nutrient management and its relationship to regional development agendas, and explored options for strengthening of the GPNM Asia Platform.

The workshop was attended by GEF-GNC Project technical partners, PEMSEA technical and policy country focal points, partners of the Asia Nutrient Platform and coordinators of the Regional Seas Programmes. Given that the workshop was an open session, it was attended by 'core'[1] participants but it also drew participation from several others from the wider Congress. The participant list is contained in Annex 1.

[1] These were participants who were specifically invited to the workshop.

The meeting was supported through financial contributions from the GEF-funded Global Foundations for Reducing Nutrient Enrichment and Oxygen Depletion from Land-based Pollution, in Support of Global Nutrient Cycle (GEF-GNC) Project.

Workshop objectives

The following were the primary workshop objectives:

- Raise awareness on the state-of-the-art in science, knowledge contributions and decision-making tools to enhance understanding and approaches to address the nutrient challenge in the Asia region;
- Gain consensus around modalities for strengthening the GPNM Asia Platform within existing regional development agendas and support frameworks;
- Secure commitments from governments (through national focal points) to participate in the Platform.

The workshop agenda is contained in Annex 2.

Proceedings - Technical Session

The technical session presentations were delivered in the morning and were intended to provide the audience with insights on the context and work of the Global Partnership on Nutrient Management (GPNM) and its partners, mainly through the implementation of the GEF-funded ***Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution, in support of Global Nutrient Cycle Project*** (GEF-Global Nutrient Cycling or 'GNC Project' for short)[2]. The session was co-chaired by Dr. Vu Si Tuan, Viet Nam Administration of Seas and Islands and Dr. Christopher Cox, UNEP.

The technical presentation abstracts have been compiled at the EAS Congress website at http://eascongress.pemsea.org/technical-and-policy-workshop-sustainable-nutrient-management-support-asian-platform-global.

Workshop participants in session

[2] GNC Project weblink at http://unep.org/gpa/gpnm/GEFProject.asp

The Nutrient Challenge in the Global Context

Dr. Christopher Cox, United Nations Environment Programme

Dr. Cox gave an overview of the global concerns associated with pollution of the marine environment, highlighting the issue of excess nutrient loading from various sources. He presented the 'nutrient cascade' and the pathways from generation, application and use of nutrients, and their fates through the nutrient cycle. He highlighted the concept of planetary boundaries in relation to nutrient loading into the environment and the capacity of the planetary biophysical and subsystems and processes to handle these loadings; the planetary boundary for nitrogen is exceeded while the boundary for phosphorus is being approached. Based on trends in global consumption of mineral fertilizers as the world's population grows, addressing the nutrient challenge will be paramount. He highlighted areas of the globe that has nutrient excess and discussed the implications in terms of food security and environmental impacts, particularly in terms of occurrence of eutrophic and dead zones. He outlined the five key areas threatened by excess nutrients in the environment: water quality, air quality, greenhouse balance, ecosystems and soil quality. He gave an overview of key global actions to address nutrient excess into the environment, particularly linked to the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), which is an Intergovernmental mechanism established in 1995. Other important global frameworks of relevance include the Convention on Biological Diversity's Aichi Target 8 and the Sustainable Development Goals (SDGs). The Global Partnership on Nutrient Management (GPNM) was established in 2009 to support advocacy for sustainable nutrient management, knowledge exchange on best practices and support capacity building at both national technical and policy levels. The GPNM is hosted by UNEP-GPA as the Secretariat.

Refer to presentation in Annex 3a.

Global perspective on Applied Research on Nutrient Management

Focus on harmful algal blooms (HABs), occurrence and impacts

Dr. Elisa Berdalet, Institute of Marine Sciences, Barcelona

Dr. Berdalet gave an overview of the status of harmful algal blooms (HABs) across the globe stressing the point that they are natural phenomena whose dynamics is modulated by factors operating from small scale to long-term natural cycles. It therefore follows that the occurrence of HABs cannot be realistically avoided. However, she noted that human activities can have significant influence on the occurrence and intensity of HABs in coastal environments. She provided examples of toxic and noxious HABs events in the Asia region. She emphasized the need to improve the understanding of the natural and anthropogenic factors involved in their occurrence.

Improved knowledge is fundamental to making management decisions regarding land-based control response measures, specially related to nutrient supply and coastal use. There is a need to continue working on developing tools to facilitate better planning and minimize risks to human health and impacts in the economy and to maintain the environmental quality. She concluded by suggesting that investments should be made in enhancing the ability to monitor HABs with the traditional and available methods, noting that efforts to improve automatic monitoring continue.

Refer to presentation in Annex 3b.

Assessment and Planning for Nutrient Management at the National Level

Application of an ecosystem health card approach in India

Dr. Ajit Pattnaik, Chilika Development Authority

Dr. Pattnaik gave an overview of the Chilika Lake ecosystem and described the process in the development of the Ecosystem Health Report Card (HRC). He stressed the importance of the HRC as a tool that bridges science-to-policy and decision-making, and is an effective format in communicating to diverse audiences. The Ecosystem Health Report Card is a method of integrating three broad indices of environmental quality: (i) water quality; (ii) fisheries; and (iii) biodiversity, to facilitate the process of communicating the state of the environment to a wide stakeholder audience. He outlined the methodology to develop the score card, taking into account the uniqueness of the environment and discussed the indicator thresholds for the score card and how the scores were derived. He presented the results for the 2014 score card, emphasizing those parameters which passed and failed according to the threshold values assigned. According to the 2014 Report Card, the ecosystem health of Chilika Lake attained a 'B' ranking based on the rating of the water quality, fisheries and biodiversity indices. He pointed out that in the 2014 evaluation was able to capture the impacts of the passage of Cyclone Phailin that made landfall just south of the lake as a 'severe' cyclone on 12 October 2013. Based on lessons learned some new parameters will be incorporated to improve product; this will include nutrient parameters, specifically nitrogen and phosphorus. In closing, he stressed the importance of the consultative process in not only the evaluation but in the communication of the results. (The 2012 Health Card is available at this link).

*Presentation at the East Asia Seas Congress: **L-R:** Dr. Ajit Pattnaik, CDA; Dr. Vu Si Tuan, Viet Nam Administration of Seas and Islands; Dr. Christopher Cox, UNEP*

Dr. Pattnaik made a formal presentation of the 2014 Report Card to the meeting hosts, the Government of Viet Nam and UNEP-GPA.

Refer to presentation in Annex 3c.

Assessment and Planning for Nutrient Management at the National Level

Application of an ecosystem health card approach in the Philippines

Ms. Lennie Santos-Borja, Laguna Lake Development Authority

Ms. Santos-Borja provided background on the Laguna de Bay, the largest lake in the Philippines and the environmental issues of concern that have led to the interventions currently underway to address the problems. She gave insights on the key problems associated with nutrient loading and consequent proliferation of macrophytes and algae in the lake. She highlighted the efforts made in investments in projects and strengthening partnerships with stakeholders and local governments. She noted that the lessons learnt from the development of the Ecosystem Health Card for Chilika Lake are being translated for application to Laguna de Bay and that a draft of a ecosystem health score card is now available. While the score card follows the logic of the Chilika Lake approach, there are differences in the parameters used; she provided insights of the parameters used in the development of the Laguna de Bay scorecard, noting that the approach built on existing parameters used and national thresholds for score assessment. The score card utilizes a visual colour scheme to code the assessment values. She gave insights on the results of the assessment. The overall water quality score was rated as 'C-' where phosphate loading and chlorophyll-*a* presence were of greatest concern. The fisheries indicator performed poorly due to the high occurrence of invasives within large areas of the lake. The Laguna Lake Development Authority is in consultation with major private sector enterprises to explore measures to reduce the influx of phosphates from detergents (in greywater) to the environment. She concluded by outlining how civil society has been engaged in the process, highlighting the role of students in making calls to action.

Refer to presentation in Annex 3d.

Assessment and Planning for Nutrient Management at the National Level

Application of nutrient load modelling and best management practice scenario evaluation to support improved watershed management planning - Manila Bay Case Study

Prof. Gil Jacinto, University of the Philippines

Prof. Jacinto advised on why Manila Bay was chosen as a demonstration area under the GEF-Global Nutrient Cycling Project, based on the complexity of issues related to nutrient management and loading into the receiving environment. An important milestone that led to attention to the issue was a civil case brought against the government line agencies by civil society that compelled the relevant authorities to

clean up the bay, a decision that was upheld by the Supreme Court. The court ruling mandated that all line agencies report on progress on a quarterly basis on the interventions being made, and on progress achieved in meeting the Supreme Court ruling. He presented the nutrient load modelling work for the Manila Bay target area under the GEF-GNC Project, noting that much of the basis for this work was built on a paper by Moree et al, 2013[3]. He highlighted the main elements and inputs to the model. The model generates nutrient load emission values that are location-specific. He provided insights on the initial results of modelled loadings from different source classes. The research team is also looking at scenario analysis to 2050 from a 2010 baseline year for N and P discharges into Manila Bay. Selection of the 2010 base year was based on the fact that this is the most recent data set available from the National Statistics Office. He stressed that a large part of the challenge is pollution influxes associated from discharges from the surrounding urban environment that has been rapidly expanding. He outlined the key emerging recommendations from the work, particularly focusing on water quality standards and criteria for nutrients, and the removal of phosphorus in detergents as part of a main strategy to address the overall issues. This may be considered a "low hanging fruit" given that phosphates can be eliminated from detergents in the supply chain as they have been done in other parts of the globe. Moreover, the move can capitalize on the announcement made in January 2014 by Procter and Gamble, a major supplier of detergents in the Philippines, that it will remove phosphates in their detergents within two years (http://www.theguardian.com/sustainable-business/proctor-gamble-remove-phosphates-laundry-soap).

Refer to presentation in Annex 3e.

Technical and Policy Support Tools for Sustainable Nutrient Management

Mr. Cy Jones, World Resources Institute

Mr. Jones provided participants with an overview of the various components of the Nutrient Management Toolbox that was developed under the GEF-Global Nutrient Cycling Project. The Toolbox is a compilation of best management field and policy practices that includes a series of case studies on sustainable nutrient management. The Toolbox also includes a nutrient calculator designed for scenario evaluation that allows users to input data on management conditions and interventions which then allows one to estimate the nitrogen and phosphorus losses to the receiving environment. He illustrated the content of the Toolbox through screenshots of various key input and output features. He gave insights on the feedback received to date on the use of the nutrient calculator feature of the Toolbox from stakeholders, and the suggestion that consideration be given to facilitating enhanced definition of user inputs to the calculator; this should be based on specific site conditions that may not be 'pre-programmed' into the nutrient calculator. In addition, there should also be the capability to allow for evaluation of multiple BMPs to determine outcomes in terms of nutrient losses,

[3] See paper *Exploring global nitrogen and phosphorus flows in urban wastes during the twentieth century* at http://onlinelibrary.wiley.com/doi/10.1002/gbc.20072/full

where currently the calculator only allows for single BMP regimes to be evaluated at a time. He highlighted the need to continue to receive input from stakeholders as the tool is used in this testing phase and into the future.

Refer to presentation in Annex 3f.

Question and answer

Q: In view of excess nitrogen and phosphorus exceeding the planetary boundary limits, is there any policy at the global level to address this issue? Should the GPNM not promote an international convention to gain global consensus?

> **R:** The new Sustainable Development Goals (SDGs) is an emergent framework that encapsulates many elements of the nutrient management agenda in an 'aspirational' framework. This may be the key pathway for the time being as it is difficult to come up with a targeted global framework given the very wide variability in country circumstances across the various productive sectors that have implications for nutrient management. There are some key SDGs that are of relevance to nutrient management and countries should be cognizant of the linkages to these SGDs in defining national pathways to meet these goals. The GPNM can be a facilitator in this regard.

Q: How does one access the GPNM nutrient management toolbox where there may be interest in validating the tool?

> **R:** The toolbox is still under active development and has not been launched for public user access, although the link to the toolbox can be available to interested persons.

This concluded the morning technical session proceedings.

Proceedings - Policy Session

The participants were welcomed to the afternoon policy session by the co-chairs, Mr. Vu Thanh Ca, Director of International Cooperation of the Viet Nam Administration of Seas and Islands and Dr. Christopher Cox, UNEP. Dr. Cox provided a brief overview of the purpose of the policy session, its objectives and expected outcomes. He noted that the desire was to get agreements out of this policy session to be included within the overall Congress proceedings, and as a statement for consideration within the Ministerial session of the Congress.

The GPNM and its Mandate

Dr. Christopher Cox, United Nations Environment Programme

Dr. Cox gave an overview of the Global Partnership on Nutrient Management, in the context of the scope of the global issues related to nutrient management and impacts on the marine environment. He outlined the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) that is hosted by UNEP, its mandate and its relationship to the GPNM in its role as host to the Secretariat for the GPNM. He detailed the key roles of the GPNM and the main areas of strategic focus that constitutes the workplan for the partnership. There are four main strategic work areas of the GPNM: (i) knowledge generation; (ii) piloting innovative solutions and best practices; (iii) awareness raising; and (iv) partnership strengthening. He highlighted key achievements of the GPNM and the contributions of the GEF-funded Global Nutrient Cycling (GEF-GNC) Project. He concluded by acknowledging some of the key GPNM partners, noting that the partnership is growing with the expectation for broadened partnerships in the Asia region within the Asia Regional Platform.

Refer to presentation in Annex 3g.

The next session featured brief contributions from the country delegates specifically invited to share perspectives on the challenges of nutrient management, the main efforts underway to implement solutions at both technical (on-ground) and policy levels, and highlight the priority areas that require attention.

The Asian Regional Policy Context for Nutrient Management
Country reflections on challenges, achievements and gaps

The Philippines
Dr. Domingo Bravo, Department of Environment and Natural Resources

There is a network of organizations that carries out research with focus on the local level; however there is a need to mainstream nutrient management within all levels. There is recognition that various agencies have different responsibilities and there is need to ensure that there is effective collaboration. In the Philippines, there is a problem with the expansion of informal settlements along rivers causing problems with respect to pollution. There needs to be rehabilitation of degraded coastal areas. The ongoing work in Manila Bay is at a high level of priority to the government.

China
Dr. Wen Quan, State Oceanic Administration

There is on-going work on development of models and toolboxes to support decision-making on nutrient management and mitigating pollution. There are strong monitoring systems in place for coastal waters. Parts of the country have been experiencing red and green tides particularly since 2008. It has been 20 years since the government has introduced a policy to restrict the use of phosphate detergents. There is need to evaluate the outcomes of such policy measures and back up by more research which where needed. The county has in place a policy to encourage good organic production practices and environmentally sound livestock management. There is also a strict policy on industrial point sources of pollution and there are measures in place to address pollution of fresh and coastal waters. Atmospheric contributions to pollution stand at 30%. There is interest in gaining more information and knowledge on best management practices especially on organic approaches.

Republic of Korea
Dr. Jungho Nam, Korea Maritime Institute

The issue of nutrient management in the Republic of Korea has been receiving significant attention at the national level since 1995 when a massive red tide seriously affected the fishing and tourism sectors. This prompted the government to effect policies for a land-based approach for pollution control. In 1996, the government instituted a wide-ranging response creating the Ministry of Ocean and Fisheries with a distinct pollution control mandate. The government followed up

with the designation of special management area systems for watershed and coastal areas. Carrying capacities for each coastal area was defined based on the attributes of the special management area. Limits/controls on activities have been set based on these carrying capacities at the watershed level; all entities that may have pollution potential need to demonstrate how compliance to limits/standards may be met. The country has put in place a total pollution load management system and is moving to control N and P discharge to the environment. The government is also strengthening the science-policy integration where it concerns nutrient management. Community-based councils are the key mechanism through which science-policy integration systems are being elaborated. It is of interest to note that based on the implementation of policy and on-ground measures, in some areas the environment has become oligotrophic and there is now consideration of measures to achieve the correct balance through the re-introduction of nutrients.

Thailand

Mr. Sakanan Plathong, Prince of Songkla University

Discharge of untreated wastewater is a significant challenge in Thailand with respect to nutrient loading to the environment. There is generally an unwillingness to pay for wastewater treatment and pollution mitigation. There are generally no regulations for smaller properties and investments to facilitate good practices. There are major issues when it comes to livestock husbandry and there is limited attention paid to cleaner production methods. At the national level pig farms and shrimp farms along with industrial parks are recognized as significant contributors. There have been recent occurrences of coastal eutrophication at some major touristic areas which is cause for concern. The government is now giving attention to wastewater management solutions and there are many proposed interventions. The wastewater management authority has been newly installed with targets set for wastewater treatment.

Viet Nam

Dr. Vu Thanh Ca, Viet Nam Administration of Seas and Islands

The situation for Viet Nam is similar as that described for Thailand. Almost all farmers in north of the country practice relatively poor habits in terms of waste discharge; in the past, wastewater used to be diverted for agriculture but is now generally discharged into the rivers. Domestic wastewaters also used to be treated using traditional on-site means, but now unhindered discharge to waterbodies constitutes a serious pollution problem. Large rice paddy production systems have heavy reliance on fertilizers, in some cases without good nutrient conservation measures. In south Viet Nam, the situation is somewhat better from a pollution discharge point of view, given that there have been efforts to relocate populations away from rivers. There are problems with coastal eutrophication, notably around Hanoi. In the city of Da Nang, there have been advancements in wastewater treatment, attributable to the investments in tourism and heavy use of the waters for recreation. There are good laws on the books aimed at pollution control but implementation is not

where it should be. All major facilities must have wastewater solutions but in many cases these facilities do not function adequately due to costs for operation and maintenance; consequently there are illegal discharges. Red tides occur in some areas; eutrophication has affected corals in some areas where they have receded. The country is investing in pilot activities on integrated coastal management (ICM) for implementing improved practices.

Indonesia

Dr. Ario Damar, Bogor Agricultural University

Many areas do not have wastewater treatment and both domestic and agricultural contributions are significant. There is a challenge with respect to institutional coordination, both vertical and horizontal. Vertical coordination is between local to central government while horizontal challenges are within institutions in local government. National standards and laws exist, but enforcement is still a challenge. In general, community awareness is lacking and this is coupled with lack of adequate infrastructure to address needs. The Ministry of Environment and Forestry (MoEF) is the main regulator for matters in this area, which includes for nutrient pollution. However, at the central government level, infrastructure related to waste-nutrient management is not only handled by MoEF but also by other ministerial agencies, such as the Public Works Ministry and the Fisheries and Marine Affairs Ministry. The main goal as articulated within government policy is the improvement of water quality in coastal areas. Many local governments have been establishing their own standards based on central government directives. These standards are tailored to be site-specific; of relevance to location. There are pilot projects underway in various areas with focus on domestic waste management, with emphasis on work at the community level. The country has good cooperation with international institution such as with JICA, COBSEA and PEMSEA. The recent program with PEMSEA is focusing on river pollution and coastal area management in respect to liquid and solid waste management. The main challenges to be addressed in the near future include enhancing and strengthening law enforcement, facilitating better coordination among institutions related to waste management, improving waste management infrastructure (especially for domestic waste infrastructure) and enhancing community awareness.

Refer to presentation in Annex 3h.

Relevant Regional Level Initiatives

Overview of work of regional seas programmes and regional partners

South Asia Co-operative Environment Programme (SACEP)

Dr. Muhammad Khurshid, SACEP Secretariat

Dr. Khurshid provided an overview of the South Asia Co-operative Environment Programme which is an intergovernmental organization (regional seas programme), its member countries and governance structure. He elaborated the key elements of the South Asian Seas Programme (SASP), the regional setting and issues faced, and the collaborating partners. He provided an overview of the main programme activities with focus on the recent study on nutrients that was carried out in collaboration with the Bay of Bengal Large Marine Ecosystem (BOBLME) Project and UNEP-GPA. The study sought to make an inventory of pollutions sources to the marine environment, estimate the impact of nutrient enrichment, propose activities to reduce nutrient influx into the environment and develop a regional action plan. This study was validated at a stakeholders meeting in May 2014[4], and will be presented to the 6th SACEP Ministerial meeting to be convened in March 2016. He highlighted the key findings of the study and presented the way forward which entails policy adoption by the countries and development of a strategic approach for controlling nutrient loading to the environment. Within this framework approach, UNEP is requested to assist with the development of market-based instruments to facilitate engagement of the private sector to support necessary investments in this area; the shipping industry will need to be a primary target in this effort. SACEP is also interested in the establishment of a GIS database for the region that will serve as a repository and information hub for relevant information.

Refer to presentation in Annex 3i.

[4] The report Sub-Regional Workshop to Validate the Scoping Study of Nutrient Pollution on the Coastal and Marine Systems of South Asia is available at http://www.boblme.org/documentRepository/BOBLME-2014-Ecology-16.pdf

Coordinating Body on the Seas of East Asia (COBSEA)

Reynaldo F. Molina, COBSEA Secretariat

Mr. Molina gave an overview the Coordinating Body on the Seas of East Asia, which is a UNEP-administered Regional Seas Programme. COBSEA has a membership of 9 countries. The significant initiative under the programme was the UNEP-GEF South China Seas Project that ran between 2002 and 2008 (see the project website at http://www.unepscs.org/). The SCS Project led to the development of a Strategic Action Programme (SAP)[5] for the region. UNEP developed a Project Identification Form (PIF) to access some US$15 million in funding from the Global Environment Facility (GEF) for the implementation of the SAP across six countries, namely, Cambodia, China, Indonesia, Philippines, Thailand and Viet Nam (with an additional estimated US$56 million in co-financing). Under the SAP Implementation Project, Component 2 is closely related to nutrient management and an overview was provided. Overall, the project intends to help countries fulfill their GPA commitments to develop policies to reduce and control wastewater, marine litter and pollution from fertilizers through the development and implementation of national goals and plans. The main areas for collaboration within the GPNM Asia Nutrient Platform that can be linked to the project includes capacity development, investment in nutrient and pollution modelling tools and pilot activities in best management practices.

Refer to presentation in Annex 3j.

Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)

Nancy Bermas-Atrigenio, PEMSEA

Ms. Bermas-Atrigenio outlined the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) adopted by 14 countries between 2003 and 2006, which is linked to key relevant frameworks that includes the Aichi Biodiversity Targets, the Sendai Framework on Disaster Risk Reduction and the UN Sustainable Development Goals. The SDS-SEA is comprehensive in its outlook, and is composed of 7 strategies that address 23 objectives, and to be implemented over some 268 action programs. She provided an insight on areas of relevance for nutrient management under the SDS-SEA noting that there are a total of 57 priority sites across various countries in the region that are being targeted for improved Integrated Coastal Management (ICM), and implementation of remedial actions. Further details were provided on the priority sites in seven countries in terms of the proposed investments and indicators, and avenues for mainstreaming GPA and GPNM objectives into SDS-SEA regional, national and local plans. This is being supported by policies, state of the coast

[5] Available at http://www.unepscs.org/remository/startdown/1965.html

reporting, documentation of best practices, promotion of networking and the convening of an annual country forum to facilitate reporting on progress within scope of implementation plan. Under the SDS, the intention is to replicate and share best practices and lessons learnt, all of which will be uploaded to knowledge management (web-based) platforms.

Refer to presentation in Annex 3k.

Questions & comments

Q: In arriving at harmonized implementation across wide areas within-country, how does one rationalize and design approaches that are relevant across varying socio-political and economic situations at the local government level?

> **R:** An approach may be illustrated at the national level for the Philippines. In the case of Manila Bay, a Coastal Strategy has been developed and adopted by government, private sector, financing institutions and other stakeholder groups in 2001. The Coastal Strategy provides a comprehensive environmental management framework, targeted outcomes and a series of action programs that requires the involvement of various agencies and sectors, including the local governments in its implementation. The Manila Bay Coordinating Office plays an important role in coordinating, compiling and reporting the progress made in the implementation of the Coastal Strategy to the Supreme Court. This mechanism allows for coordination from local government to the level of national government across many stakeholder bodies, including the private sector. Through the scaling up of ICM across the 4 provinces encompassing Manila Bay, including the National Capital Region, covering in the process a larger area, harmonization of plans and programs is facilitated.

Q: How might countries become involved in the programmes and work of PEMSEA and COBSEA?

> **R:** Countries become engaged formally via the intergovernmental mechanisms that grants membership to the country. The country is then represented through a designated institutional focal point.

Q: How can the GPNM strengthen its role as a focal point in driving policy in sustainable nutrient management?

> **R:** The GPNM's main role is one of advocacy through its network of partners, and at the global level should have lead visibility for information-sharing and guidance to countries. The GPNM regional platforms for nutrient management such as the one for Asia will be important nodes, supported by regional agencies to assist in knowledge sharing and formulating policy at the national level, to drive change.

The GPNM should also provide a mechanism for validation of the assessments generated under the GEF-Transboundary Waters Assessment Programme (TWAP)[6]. The project developed and utilized an indicator-based assessment methodology. Such an effort for example, can expand the role of the GPNM beyond just being an information portal.

Q: Implementation of policy and technical measures for controlled nutrient flows have in some cases resulted in changes in the nutrient balance that may be adverse to downstream ecosystems such as when conditions shift from eutrophic to oligotrophic. How do we arrive at a common understanding of what will be the 'allowable' nutrient flux and management conditions to sustain ecosystem needs?

R: This is something that needs to be looked at based on local circumstances. In the case of Chilika Lake, there was a policy driver that specified as a goal to bring back the ecosystem to an acceptable historical 'pragmatic' benchmark.

In general it is difficult to establish absolute rules as each ecosystem is different, as are the conditions of human pressures and physical conditions. One needs to know what the 'natural' nutrient levels are; there is also need to have time series data to determine the baseline and nature of the nutrient fluxes before arriving at conclusions that will drive a decision and management intervention. In short, need to continue to build the science where required.

Q: Might the focus in nutrient management be more on active conservation of phosphorous because it is a finite resource compared to nitrogen?

R: Engineering controls are available for conservation/capture of phosphorus; for example iron can be added in wastewater management systems to precipitate out the phosphorus. There are wastewater systems in Europe that use such processes. This is not the case for nitrogen however.

Progress toward an Asia Platform of the GPNM
Plenary discussion

This session solicited reflections from participants on the progress made toward the operationalization of the GPNM Asia Platform and how efforts may be strengthened. Participants were asked to reflect on what the platform delivers and how does it, or how it might meet expectations. The following are the points raised in the plenary discussion.

- Asian countries may have diverse development agendas but the priority issues with respect to nutrient management are quite similar, particularly as concerns land-based activities and influences in the marine environment (the exception is Lao People's Democratic Republic which

[6] Link to the Transboundary Waters Assessment Programme (TWAP) at http://www.geftwap.org/

is land-locked, but there are considerations relating to riverine discharges that will be of concern to downstream environments in neighboring countries).

- The extreme range of diversity between country environments, physiography and socioeconomic circumstances need to be considered in design and harmonizing policy approaches; the region includes small island developing states to very large island states and continental land masses.
- The priority issues related to nutrient management varies between countries in the region. In the case of the Maldives for example, nutrients from wastewater discharges to the marine environment is more of a priority; in Lao People's Democratic Republic, the nutrient management issue is more linked to agriculture. Sri Lanka is one of the countries in the region with the highest N application rates in agriculture.
- A need in moving forward is to prioritize the needs of the countries. The GPNM through its network could provide the needed information in making such a priority assessment.
- At the country level there are already many relevant initiatives in progress; need to pull these experiences together in some type of coherent structure so that countries can better learn from collective experiences and how benefits are being derived.
- Relevant agencies of government have a significant role to play in active advocacy and demonstrating best practice. There has to be engagement of stakeholders at various levels across different sectors.
- It is agreed that governments need to have some type of formal representation on the GPNM Asia Nutrient Platform. SACEP can use its intergovernmental mechanisms to support this process through the Governing Council in formalizing national engagement with the Platform. Further, SACEP can assist the Platform with resource mobilization, although mindful of challenges of raising resources, and how to make meaningful impact at the country level given the large scale of the issues that need to be addressed.
- It is recommended that the GPNM Platform should focus on assisting to strengthen monitoring systems in polluted hotspots. The GPNM Platform and partners need to be more closely linked with implementation of regional and national projects.
- In China, there is a national action project to support the more sustainable use of pesticides and fertilizers by 2020. Guidelines have been released on "zero increases" on the use of these. This is an example of an intervention that can be linked to what the GPNM should to showcase and advocate for other countries in the region.
- It is necessary to have regular meetings of the Platform to review accomplishments across the region and plan for approaches and methods to replicate experiences.

Cooperation Framework for the GPNM Asia Platform
Plenary discussion

This session was aimed at proposing a cooperation framework for the GPNM Asia Platform that will serve to raise its relevance and prominence in the region and strengthen its mandate as a recognized partner in supporting countries in the region to improve nutrient management practice. The session was an open discussion around a draft Discussion Paper prepared by the GPNM Secretariat (that was circulated to workshop participants in advance), contained in Annex 4. Dr. Cox presented the key elements of the draft paper to gain further suggestions for improvement, and arrive at agreement on recommendations in the moving the process forward. It was anticipated that the main recommendations from the discussions will be summarized in a statement that will form part of the overall Congress proceedings and encapsulated in a statement to be carried to the Ministerial Session on the final day of the Congress. The following are the main points of discussion and agreements.

- Make use of existing regional mechanisms for hosting the Asia Platform. The UNEP Regional Seas Programmes and other non-UNEP administered programmes such as SACEP should be considered as primary entry points given that they are inter-governmental mechanisms with formal governmental constituents. The Large Marine Ecosystem (LME) programmes within the region need to be engaged within the cooperation framework. It is advised that there is no need to create new administrative mechanisms for the Platform. It is noted that COBSEA developed a regional action plan on behalf of the countries for marine litter. A similar process can be employed for nutrient management. The Northwest Pacific Action Plan (NOWPAP) currently hosts the regional node for marine litter and will be in a position to support nutrient management within its portfolio as required. NOWPAP has already been engaged in relevant work on harmful algal blooms (HABs).
- The Regional Seas Programmes may host the Nutrient Platform for their specific country groupings; meaning in effect, three nodes for: (1) South Asia; (2) East Asia; and (3) Northwest Pacific. This is more practical than trying to have a single Platform node for all the countries across the entire Asia region, as there is no existing mechanism that has such coverage within which the agenda may be embedded.
- The Platform needs to seek out opportunities for joint hosting of special events where the mandate of the GPNM may be presented, and avenues for cooperation solicited and strengthened.
- The countries, in guiding the work of the Platform, need to agree on the priority areas (perhaps along thematic lines) of common interest. Emphasis needs to be on building on existing initiatives, where more support is needed to realize synergistic impact and cost savings in pooling and harmonizing efforts.

The workshop was brought to a close following these discussions. The session co-chairs thanked the participants for their inputs into what was considered an informative and productive workshop. The GPNM Secretariat will consolidate the workshop proceedings for circulation within the course of December for comment (from participants) and finalization.

****

Post workshop — Summarized recommendations presented to the overall Congress proceedings

Refer to Annex 5 for the full summary

Country representation within a GPNM Asia Regional Platform: The GPNM needs to continue efforts to realize a Regional Platform for Asia that helps countries share lessons and coordinate efforts in addressing the various aspects of the nutrient challenge. The Regional Seas Programmes (RSPs), specifically the South Asia Cooperative Environment Programme (SACEP) , the Coordinating Body on the Seas of East Asia (COBSEA) and the Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP) should be entry points for the GPNM Asia Nutrient Platform. This will facilitate more formal engagement and commitment by countries within the Asia Platform through the formal governing council and implementation mechanisms of the regional seas programmes. The Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) is a key partner to the GPNM contributing technical and scientific inputs to advance best management practices. This cooperation should be expanded under the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) framework.

Asia Regional Platform within GPNM global advocacy: There should be country representatives from each of the regional seas regions, namely South Asia, East Asia and the Northwest Pacific on the GPNM global Steering Committee to enhance global leadership and advocacy that will reflect the positions of the Asia region. The designates from each of these sub-regions will provide representation on behalf of their respective sub-regional country groupings.

Defining the work of the Asia GPNM Platform: The Regional Platform should work closely with the GPNM and its Secretariat within the UNEP-GPA Coordination Office to develop a Work Plan based on priority themes, endorsed by the Platform member countries. This work plan will need to integrate the work on nutrient management across overall and sectoral developmental plans within relevant national and regional strategy frameworks.

A summary paragraph was submitted for consideration within the Ministerial session (Annex 6).

Workshop participants – resource persons and some of the country representatives

L-R: Nguyen Trung Thang (Vietnam), Yinfeng Guo (PEMSEA), Vu Thanh Ca (Vietnam), Ajit Pattnaik (India), Sakanan Plathong (Thailand), Mohd Khanif Bin Yusop (Malaysia), Elisa Berdalet (Institut de Ciències del Mar, CSIC, Barcelona), Isabelle Vanderbeck (UNEP), Lennie Santos-Borja (Philippines), Gil Jacinto (Philippines), Sarath Premalal Nissanka (Sri Lanka), Cy Jones (World Resources Institute), T.K. Adhya (India), Christopher Cox (UNEP)

Annex 1

List of core participants

(not including participants from the wider congress in attendance)

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Annex 2

Workshop agenda

EAST ASIAN SEAS CONGRESS 2015

PROGRAMME

TECHNICAL SESSION

1030 – 1035	**Welcome Remarks** **Dr. Vu Si Tuan**, Vietnam Administration of Seas and Islands (VASI) and **Dr. Christopher Cox**, Global Partnership on Nutrient Management (GPNM) Secretariat
1035 – 1045	**Participant Introduction**
1045 – 1100	**The Nutrient Challenge in the Global Context** **Dr. Christopher Cox**, GPNM Secretariat
1100 – 1115	**Global perspective on Applied Research on Nutrient Management** **Dr. Elisa Berdalet**, Institute of Marine Sciences, Barcelona
1115 – 1145	**Assessment and Planning for Nutrient Management at the National Level** **Dr. Ajit Pattnaik**, Chilika Development Authority and **Ms. Lennie Santos-Borja**, Laguna Lake Development Authority
1145 – 1200	**Assessment and Planning for Nutrient Management at the National Level** **Prof. Gil Jacinto**, University of the Philippines
1200 – 1220	**Question and Answer**
1220 – 1240	**Technical and Policy Support Tools for Sustainable Nutrient Management** **Mr. Cy Jones**, World Resources Institute
1240 – 1250	**The Nutrient Challenge Portal** **Dr. Christopher Cox**, GPNM Secretariat
1250 – 1300	**Question and Answer**
1300 – 1400	**Lunch Break**

POLICY SESSION

1400 – 1405 **Welcome Remarks**
Dr. Vu Si Tuan, Vietnam Administration of Seas and Islands (VASI) and
Dr. Christopher Cox, Global Partnership on Nutrient Management (GPNM) Secretariat

1415 – 1425 **The GPNM and its Mandate**
Dr. Christopher Cox, GPNM Secretariat

1425 – 1500 **The Asian Regional Policy Context for Nutrient Management**

TBD, MOE, Cambodia
TBD, MEWR, Singapore
Dr. Ario Damar, Bogor Agricultural University, Indonesia
Dr. Domingo Bravo, Department of Natural Resources and Environment, Philippines
Dr. Wen Quan, State Oceanic Administration, PR China
Dr. Jungho Nam, Korea Maritime Institute, RO Korea
Dr. Sakanan Plathong, Prince of Songkla University, Thailand
Dr. Nguyen The Chinh, Institute of Strategy and Policy on Natural Resources and Environment, MONRE, Vietnam

1500 – 1530 **Relevant Regional Level Initiatives**
Dr. Muhammad Khurshid, SACEP Secretariat
Reynaldo F. Molina, COBSEA Secretariat
Nancy Bermas, PEMSEA Resource Facility

1530 – 1545 **Coffee Break**

1545 – 1600 **Progress toward an Asia Platform of GPNM**
Dr. Anjan Datta, Consulting Expert

1600 – 1630 **A Cooperation Framework for the GPNM Asia Platform**
Dr. Anjan Datta, Consulting Expert and **Dr. Christopher Cox**, GPNM Secretariat

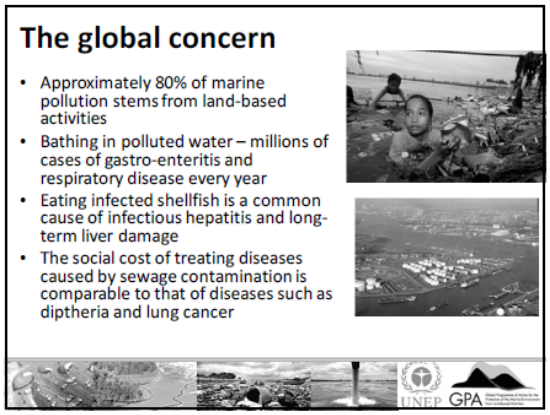
1630 – 1730 **Plenary Discussion**

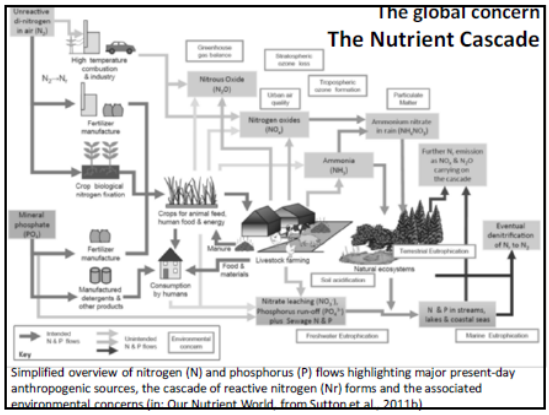
1730 – 1800 **Agreement on Key Action Points**
Dr. Christopher Cox, GPNM Secretariat

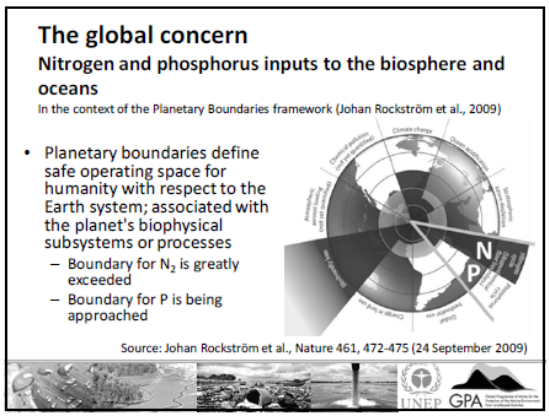
Annex 3

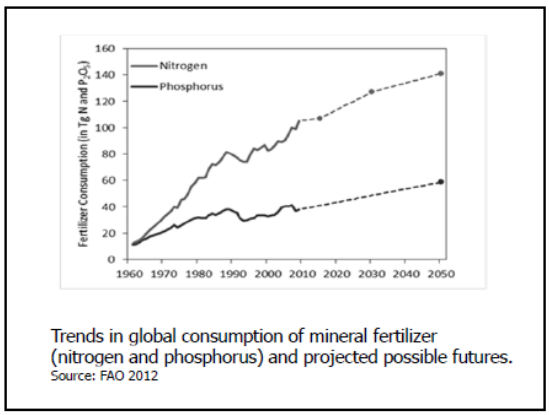
Presentations

Annex 3a – Christopher Cox





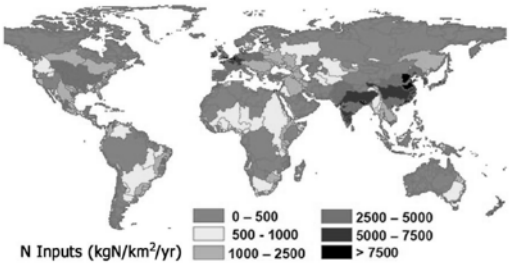




Cox

The global concern

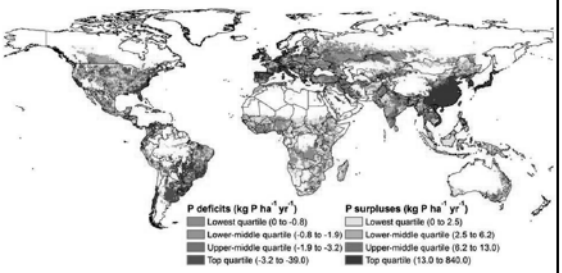
Too Much and Too Little Nutrients: regional variations in Nitrogen



Estimated net anthropogenic nitrogen inputs according to the world's main river catchments (Source: Our Nutrient World 2013).

The global concern

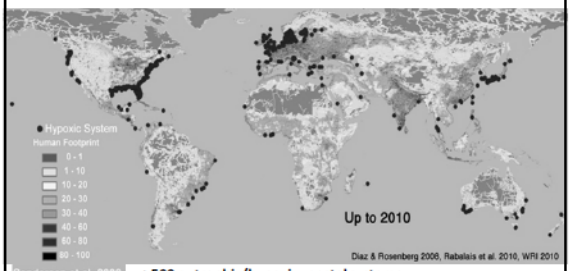
Too Much and Too Little Nutrients: regional variations in Phosphorous



Estimated global phosphorus surplus and deficit.
Source: Our Nutrient World, 2013, citing (MacDonald et al., 2011)

The global concern

Impacts of nutrient loading
mortality of benthic organisms, collapse of fisheries and shellfish poisoning



>500 eutrophic/hypoxic coastal systems
>245,000 km² of water area worldwide
Global loss of ecosystem services =USD 200 billion/year

The five key threats of excess nutrients

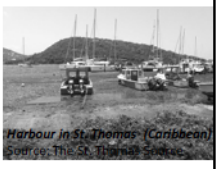
The **WAGES** of too much or too little N and P

Water quality
Air quality
Greenhouse balance
Ecosystems
Soil quality

Modified from the European Nitrogen Assessment (2011)

Water quality

- Climate change drivers?
  - Warmer ocean temperatures, chemistry, circulation patterns
    - Sargassum proliferation (Caribbean, West Africa); Harmful algal blooms (worldwide)
    - Under active research


Harbour in St. Thomas (Caribbean)
Source: The St. Thomas Source


HAB and fish kills in Seychelles
Source: Seychelles News Agency


Qingdao, China, province of Shandong

Air quality & Greenhouse balance

- Climate drivers also important in land-atmosphere interactions with respect to pollution through emissions of greenhouse gas nitrous oxide (N_2O) and ammonia (NH_3) to the atmosphere
- N_2O contributes to stratospheric ozone depletion, increasing the risk of skin cancer from UV-B radiation

Soil quality and land degradation

- Nutrient deficits in parts of the globe – African continent of note
  - Extraction of nutrients without replenishment, physical erosion
  - Land degradation and declining yields
- Climate change will exacerbate conditions
  - Deeping land degradation with changes in temperature and moisture/water regimes

Towards global action…

The Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA)

- Washington Declaration
  - Over 108 governments declared commitment to protect and preserve the marine environment from impacts of land-based activities
  - **GPA adopted in 1995**
    - Only global intergovernmental mechanism explicitly addressing the linkages between freshwater, coastal and marine environments.
    - Voluntary, action-oriented, intergovernmental programme led by UNEP
  - GPA designed to address accelerating degradation of the world's oceans and coastal areas

Towards global action

- **UN SG's Oceans Compact** calls for "reducing pollutants from sea and land-based activities, including ..... litter, harmful substances and nutrients from wastewater, industrial and agricultural runoff entering the world's oceans"
- **CBD Aichi Target 8:** calls for action to reduce pollution, including from excess nutrients, to levels that are not detrimental to ecosystem function and biodiversity, and the sustainable development goals.
- **Sustainable Development Goals:**
  - Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
  - Goal 6: Ensure availability and sustainable management of water and sanitation for all
  - Goal 12: Ensure sustainable consumption and production patterns
  - Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Global Partnership on Nutrient Management (GPNM)

- Established in 2009
- Key roles:
  - Catalyze strategic advocacy and co-operation at the global and regional levels
  - As a knowledge platform to support science policy interaction and translating science for policy makers
  - To provide information and enhance capacities to address the growing problem of nutrient over-enrichment and eutrophication
  - To position nutrient issues as part of the international sustainable development agenda
    - advance Sustainable Development Goals, in particular under **Goal 14 on conservation of the oceans and Goal 2 on sustainable agriculture**

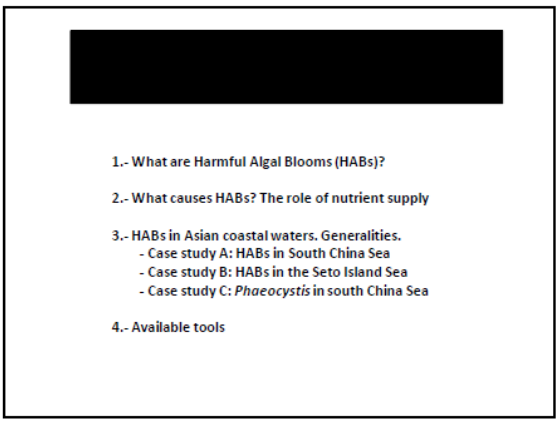
GPNM Steering Committee, December 2014

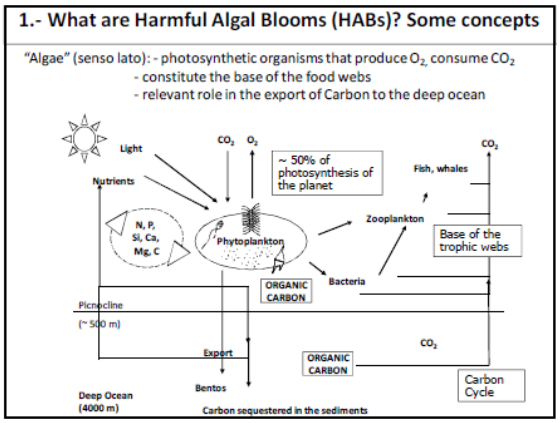
Thank you

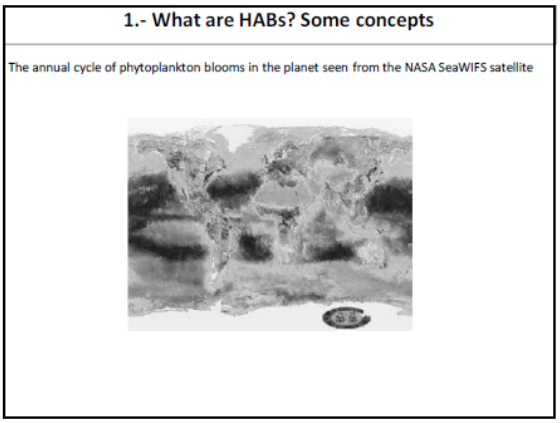
Christopher Cox
E-mail: Christopher.cox@unep.org

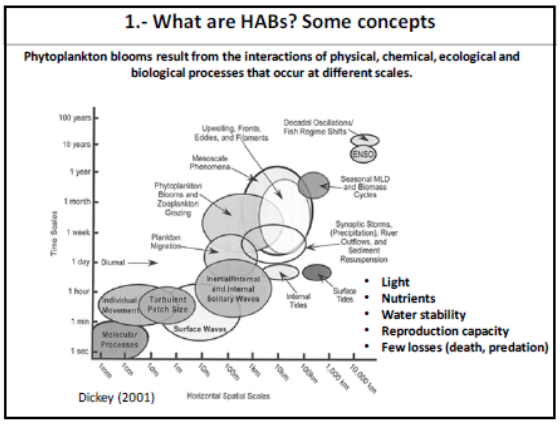
www.nutrientchallenge.org
http://unep.org/gpa/default.asp

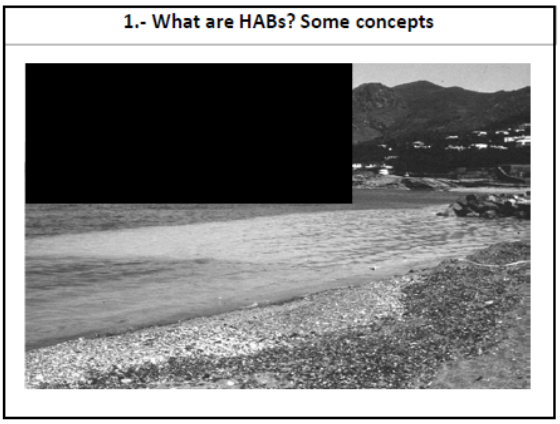
Annex 3b - Elisa Berdalet





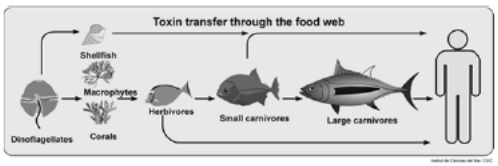






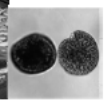
1.- What are HABs? Some concepts

Some microalgae produce toxic substances to humans and aquatic organisms



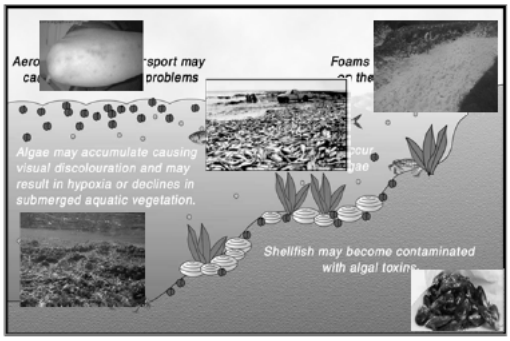
Dinophysis,
Diarrheic Shellfish Poisoning,
Closure of shellfish harvesting

Gambierdiscus,
Ciguatera fish poisoning
Endemic in the tropics



1.- What are Harmful Algal Blooms (HABs)? Some concepts

HABs events have different impacts on human health and wellbeing

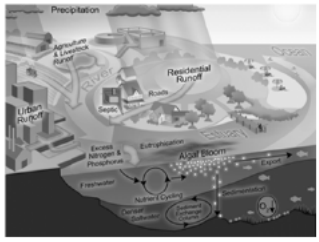


2.- What causes HABs?

HABs are natural phenomena, controlled by the same factors than phytoplankton blooms.

However, some human activities can favor them:

- **Eutrophication: anthropogenic nutrient enrichment leading to excess phytoplankton production that can result in undesirable disturbance to water quality and the balance of organisms.**
- **Alteration of water circulation patters by harbors (retention areas)**
- **Spread of harmful organisms through ballast waters or transport of cultured organisms**



3.- HABs in Asian waters. Main HAB taxa

Ichtyotoxic, high biomas

Cochlodinium polykrikoides

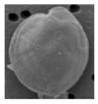
Karenia mikimotoi

Heterocapsa circularisquama

Diarrheic Shellfish Poisoning (DSP)

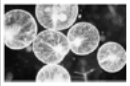
Dinophysis spp.

Ciguatera Fish Poisoning (CFP)



Gambierdiscus

High biomass, hypoxia, non toxic

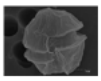


Noctiluca scintillans

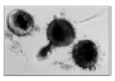
Scrippsiella trochoidea

Prorocentrum donghalense

Paralytic Shellfish Poisoning (PSP)



Alexandrium minutum



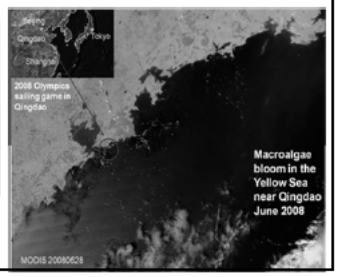
Pyrodinium bahamense v. compressum

3.- HABs in Asian waters. General view

In Asia, HABs have important **impacts on**:

1) **Human health:** a high diversity of harmful syndromes and causative organisms occur;
2) **Economy:** the highest production of aquaculture fish and shellfish in the globe; thus, economic impacts are high;
3) **Ecosystems:** regional anthropogenic eutrophication favor high biomass HAB events that result in hypoxia in the water column and alters the food webs composition.

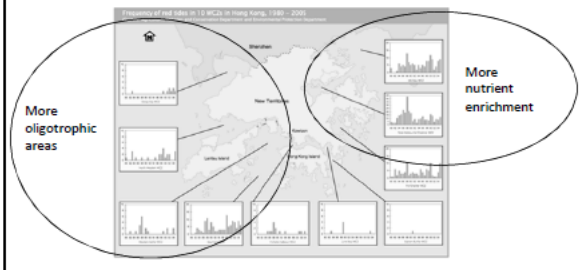
Tiger shrimp, *Penaeus monodon*, extensively cultured on the coast of Cam Ranh Bay, Vietnam. (Y. Fukuyo).



3.- HABs in Asian waters. Case A. Hong Kong coastal waters

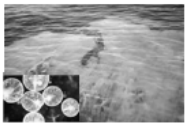
Time series showed marked changes in the occurrence of HABs depending on the areas and periods. (Wang et al. 2008. *Hydrobiologia* 596, 79.)

Which is the role of anthropogenic nutrient enrichment on HABs occurrence?

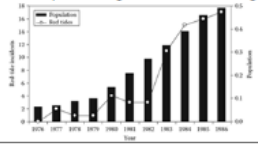


Source: ***20 years of marine Water Quality Monitoring in Hong Kong.***
http://www.epd.gov.hk/epd/misc/marine_quality/1986-2005/eng/13_appendices_menu.htm

3.- HABs in Asian waters. Case A. Hong Kong coastal waters



Noctiluca scintillans bloom in Tolo Harbor. Heterotrophic dinoflagellate. Feeds on microalgae

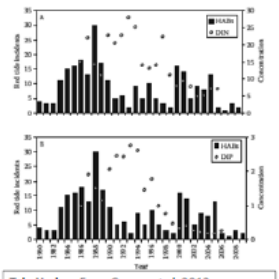


Tolo Harbor. Lam & Ho 1989 (In Okaichi et al. (eds)

1980s – 1990s: HABs events increased with population related sewage

Most events: high biomass, no toxic, hypoxia

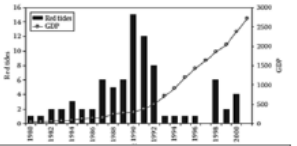
1996 – 1998: Large sewage diversion



Tolo Harbor. From Gowen et al. 2012.

1990s – 2000s:
HABs decrease before sewage diversion

3.- HABs in Asian waters. Case A. Hong Kong coastal waters



In contrast, no direct link in the Guangdong Province

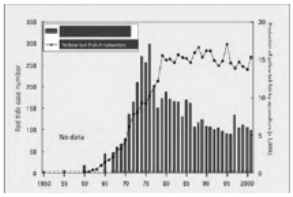
Karenia mikimotoi **exceptional bloom in 1998, coinciding with the most intense El Niño** in the 20th century. It was advected from offshore coastal water. Associated to massive fish fills.

Other factors interacting with nutrient availability in Tolo Harbor: hydrodynamics & physical factors

- Long flushing time: 15 days – 1 month
- Small dimension: 50 km²
- Narrow sea inlet, shallow (max 12 m depth)
- Water column stratified during most part of the year
- Unbalanced Silicate supply: less diatoms, more flagellates
- 1988: max HABs probably related to small short-lived typhoons (wind speed ca. 2 m/s)
- 1993: min HABs, probably related to 9 long-lived active typhoons (wind speed >3 m/s)
- Monsoon dynamics and Pearl River plume influence

3.- HABs in Asian waters. Case B. Seto Island Sea

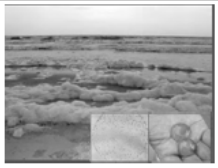
Fish cage culture of yellow tail (*Seriola quinqueradiata*) in the Seto Inland Sea, Japan. Photo by Suisan Aviation. *Chattonellla antiqua* caused major fish kills in the 1970s, before waste-water treatments were applied.



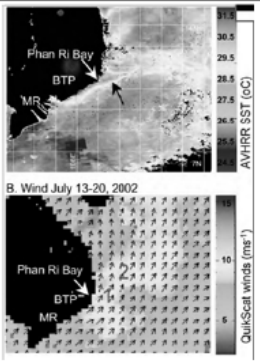
Parallel increase of red tide occurrences and yellowtail fish aquaculture industry in Seto Inland Sea, Japan. (Y. Fukuyo.)

- Anthropogenic nutrients (fish cages, industry, sewage): important factor promoting HABs
- A highly productive area due, in part, to hydrodynamic conditions:
  - seasonal stratification, frontal boundaries
  - Semi-enclosed, residence time 1.2 years
  - 600 small islands, small bays, narrow channeles
  - Weak estuarine circulation in most areas (low freshwater input in general)
- **Hydrodynamics favor high productivity and HABs**
- 1996: **Legislation** to control effluent (total N, reduce N & P): improved water quality

3.- HABs in Asian waters. Case C. *Phaeocystis*



Phaeocystis globosa dense bloom, sea surface waters are often covered by thick foam. South Vietnamese coast. (N.N. Lam; Y.Z. Qi).

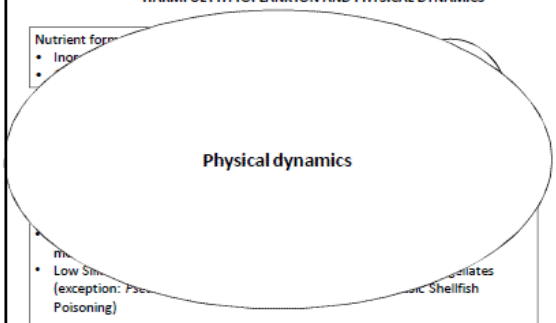


- Blooms associated with nutrients supplied by upwelling during the southwest monsoon (Tang et al. 2004).
- Ecological changes in the composition of the food web (competition)
- Changes in nutrient stoichiometry (N:P)
- Wind-forced upwelling controlled by monsoon dynamics

Blooms of *Phaeocystis*, *Prorocentrum donghaiense* and *Karenia mikimotoi* are modulated by physical forcing, no caused by anthropogenic nutrient enrichment

4.- Available tools. Fundamental research

INTEGRATED UNDERSTANDING OF THE LINKS BETWEEN NUTRIENTS, PHYSIOLOGY OF HARMFUL PHYTOPLANKTON AND PHYSICAL DYNAMICS

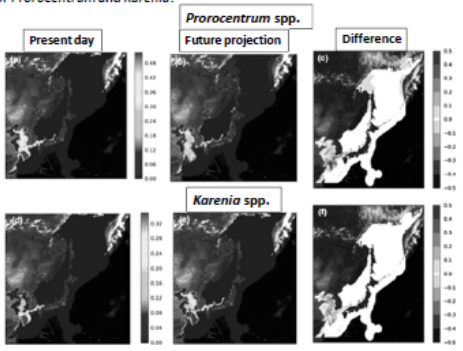


MULTIPARAMETER TIME SERIES (MONITORING)

4.- Available tools. Modelling

Potential effects of nutrient loading and climate change.

Projections in NE Asia: expansion in area and/or number of months annually conducive to development of *Prorocentrum* and *Karenia*.

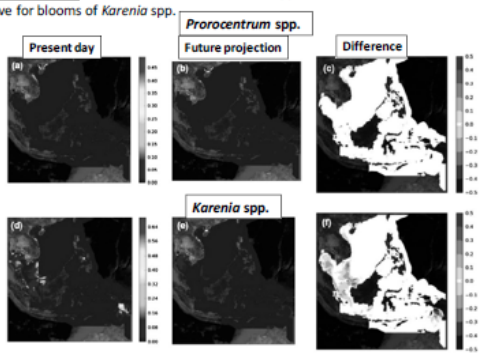


Gilbert et al. 2014. Global Change Biology 20, 3845-3858

4.- Available tools. Modelling

Potential effects of nutrient loading and climate change.

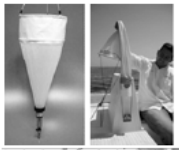
Projections in SE Asia: no expansion of *Prorocentrum* spp., contraction in area and months conducive for blooms of *Karenia* spp.

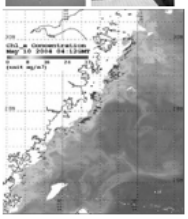


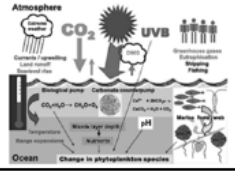
Glibert et al. 2014. Global Change Biology **20**, 3845-3858

4.- Available tools. Monitoring

- **Monitoring the causative species and/or the presence of biotoxin in seafood** in real time to prevent contaminated shellfish reaching the markets, currently the only effective **way to protect human health.**
- **Multidisciplinary monitoring**: including nutrients and physical and meteorological variables can help ascertain the effects of nutrient enrichment and climate and other environmental changes on HAB occurrences and their impacts. **Most data series are not long enough to draw clear conclusions.**



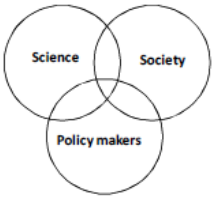




- Satellites help tracking high-biomass blooms. *P. donghaiense*, East China Sea. CCAR/HKUST.

4.- Available tools. Management

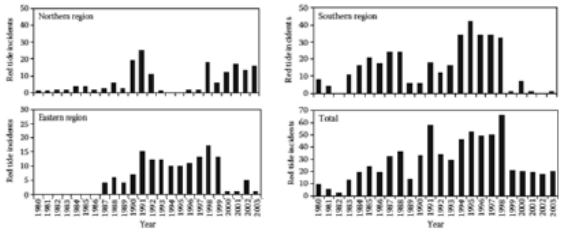
There is a need to maintain and reinforc initiatives and local and international **policies** to reduce human pressures on the marine environment that may increase the occurrence of HABs and the severity of associated events.



EAS Congress 2015
16-21 November 2015 • Furama Resort, Da Nang, Viet Nam

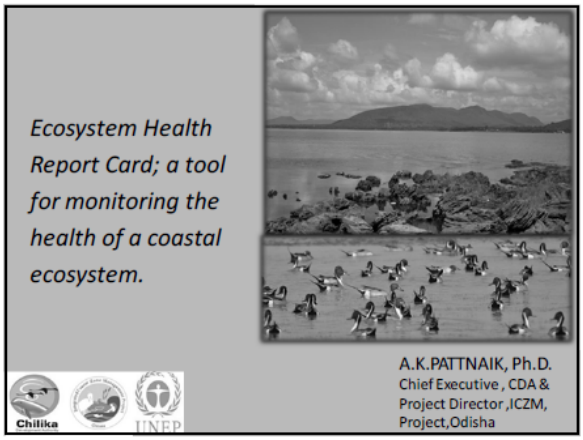
3.- HABs in Asian waters

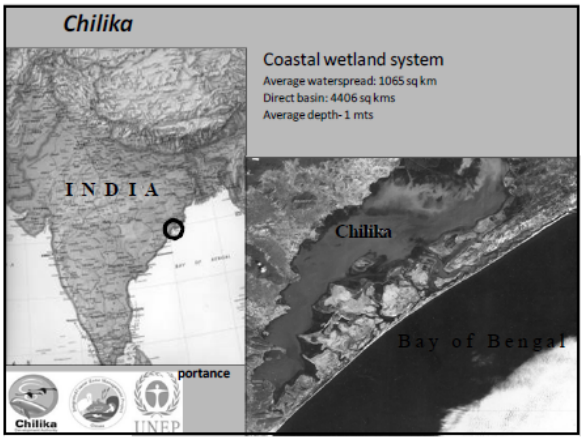
Changes in HAB events in 4 coastal regions of the South China Sea.
(Wang et al. 2008. *Hydrobiologia* **596**, 79.

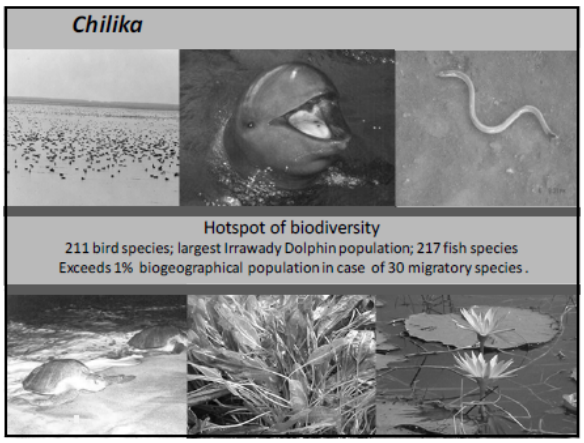


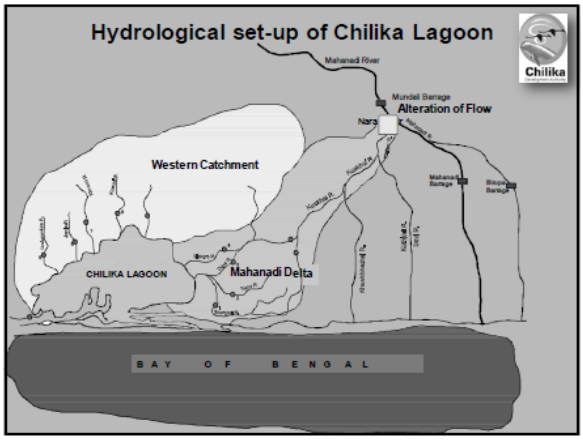
* Time series showed marked changes in the occurrence of HABs.

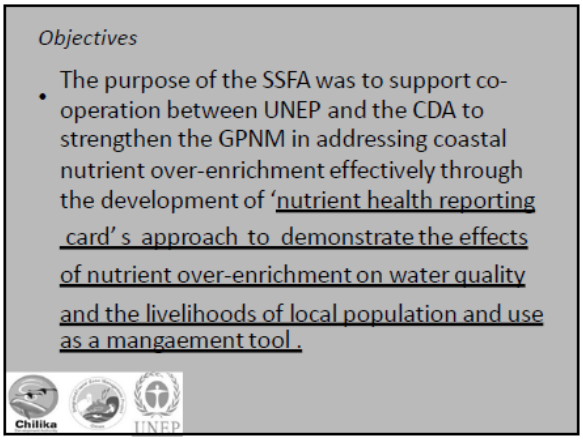
Annex 3c - Ajit Pattnaik









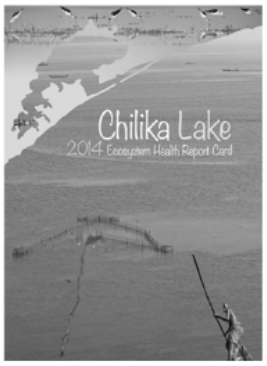


Goals

- Develop an **integrated ecosystem health assessment** for the Chilika Lake and its tributaries using the identified reporting indicators.
- Create a **ranking valuation scheme** to compare ecosystem health assessments both geographically and over time (annual assessments).
- Effectively **communicate the integrated ecosystem health assessments** with spatially explicit maps and rigorous scientific analyses to all stakeholders (i.e., the policy makers, managers, resource users and the larger community members whose actions impact the health of the Chilika Lake.

Ecosystem Health Report Card

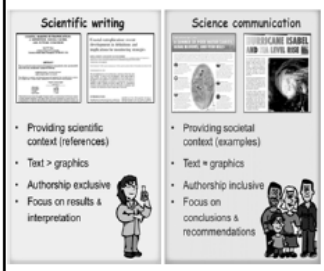
- Environmental report cards are transformative assessment and communication products that compare environmental data to scientific or management thresholds and are delivered to a wide audience on a regular basis.
- To facilitate science to become policy relevant .



Core Objectives

- Define the basic indicators and their values to ascertain the health of the lake for the report card .
- Understand the role of river-catchment and freshwater nutrient input and associated nutrient fluxes to Chilika Lake
- Determine the transport of nutrient from the major/ minor rivers into the lake
- Assess the biogeochemical coupling of nutrient inputs with other physical components of the Chilika Lake system
- Analyse and carry out modelling of existing data in support of bridging data gaps in the report card.

Effective communication to catch the imagination of wide audience



Methodology

- Understanding the environmental characteristics
- Identify key parameters, pressure & values .
- Making of graphic presentation with the knowledge of Ecosystem environment and activities in and around the Lake.
- Deciding indicators based on Values and Pressures
- Fixing of thresholds based on professional judgment form long term data set
- GRADINGS: By comparison of the observed present data with threshold values
- Presentation can be seasonal, Annual, sectoral depending on the spatio-temporal variability of environmental parameters.

Methodology: Thresholds

Category	Indicator	Desired condition
Water Quality	Water clarity	≤ 30 NTU
	Dissolved oxygen	≥ 5 mg/L or 60% sat.
	Total chlorophyll	≤ 5 µg/L
Fisheries	Total catch	% deviation above or below maximum sustainable yield (11,500 t/yr)
	Commercial species diversity	Ratio of species landed:desired (45 sp. desired)
	Size	Proportion of species landed above a sustainable size limit. *M. caphalus*: 219 - 461 mm; *P. monodon*: 116 - 197 mm; *S. serrata*: 87 mm
Biodiversity	Bird count and richness	Ratio to maximum bird count and diversity recorded since 2003
	Dolphin abundance	Ratio to maximum dolphin count recorded since 2001
	Benthic infauna diversity	Simpson's Index of Diversity (1-D)
	Phytoplankton diversity	Simpson's Index of Diversity (1-D)

Chilika Health Report Card (HRC) is used as a management tool for sustained monitoring of the lake ecosystem .

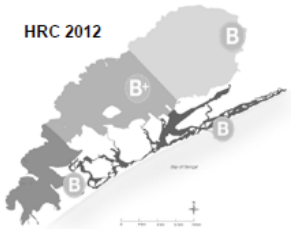
Quantitative health rankings of 4 sectors on an biannual basis

Biological, physical, and chemical data (water quality index, biotic index) from monitoring stations was compared with threshold values to assess Chilika health

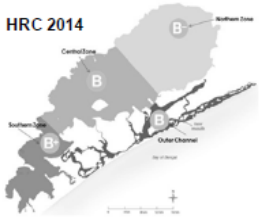
Score was assigned to calculate health report card grades (A to F)

Grades
- A 100-80%
- B 80-60%
- C 60-40%
- D 40-20%
- F 20-0%

HRC 2012



HRC 2014



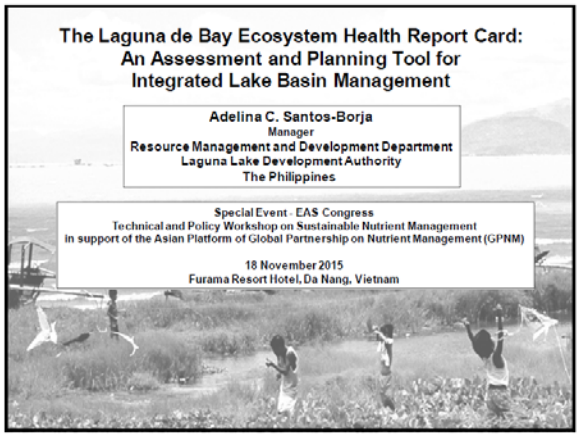
Outcomes

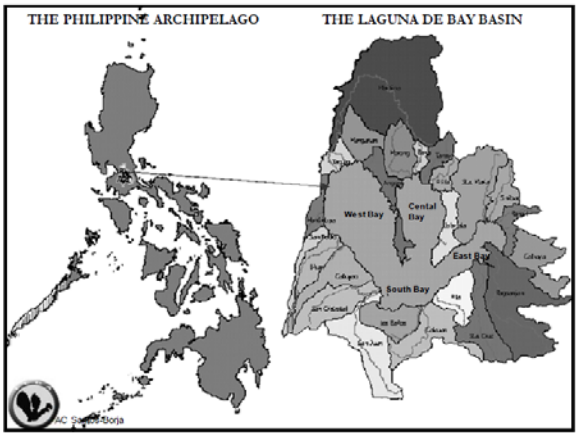
- Overall, Chilika Lake scored "B" for ecosystem health based on performance of fisheries, and biodiversity indices.
- The Lake as a whole displayed excellent **(A)** dissolved oxygen concentrations, water clarity, total fishery catch and size, and benthic infauna diversity.
- The Lake failed, however, for chlorophyll concentrations **(F)**, based on desired conditions.
- The 2014 Chilika Lake Report Card provides a different perspective of lake health compared to the 2012 report card, as this follows an extreme climatic event i.e. the severe tropical cyclonic storm , *Phailin*.
- It severely impacted the biodiversity and ecosystem.
- Interestingly the lake recovered from the impact of *Phailin* within two years as captured in HRC .
- This demonstrates the resilience of the lake ecosystem.

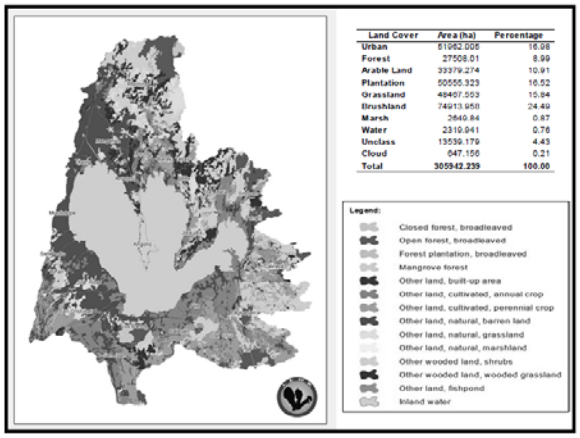
Way forward

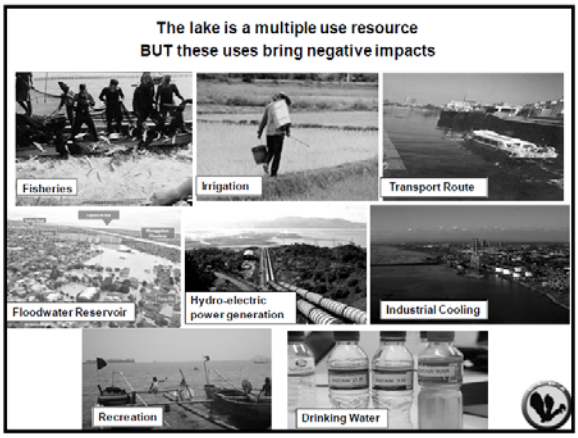
- During preparation of the 2012 health report card, it was identified that a few parameters such as chlorophyll-a , total nitrogen, total phosphorous could be better indicators of ecological health.
- As a first step in this endeavor, chlorophyll-a has been assessed in this report card.
- Total Nitrogen and total Phosphorous would be better indicator (could not be used as time series data was not available) it would be used for next report card.
- Based on the intensive study of the benthic community of the lake "Indicator species" are identified which could be used in the next HRC once the validation is completed .

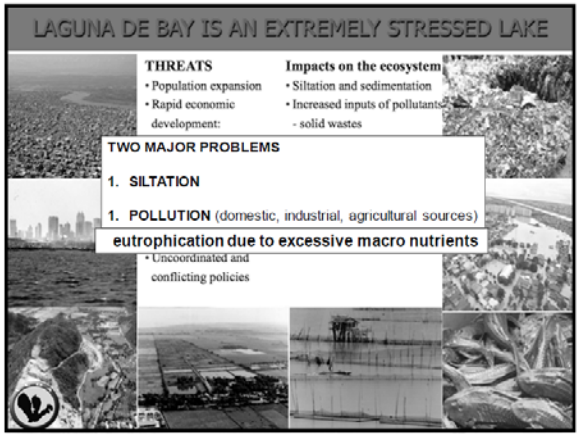
Annex 3d - Lennie Santos-Borja

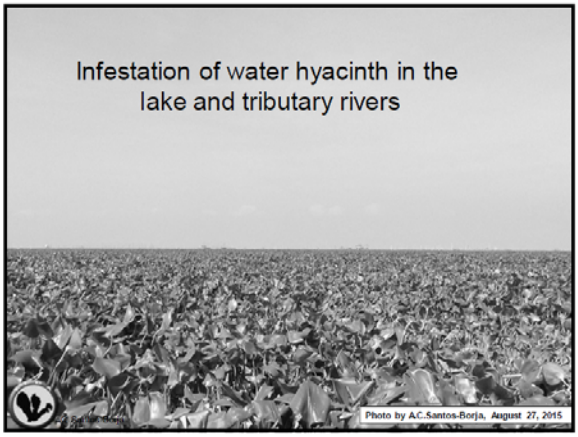












Harmful Algal Bloom

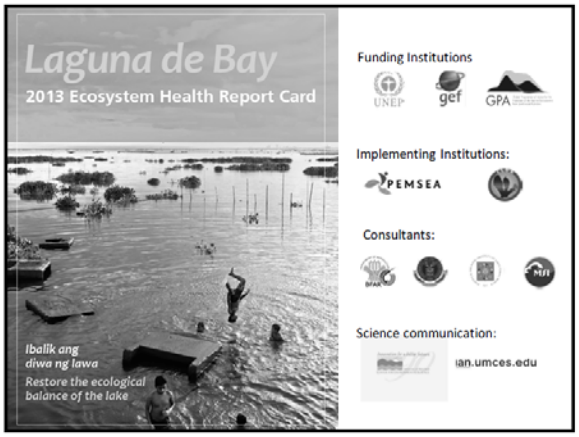
The LAGUNA LAKE DEVELOPMENT AUTHORITY

- The only lake basin management authority in the Philippines
- Created through Republic Act 4850 (1966) as amended by Presidential Decree 813 (1975)
- Promulgates rules and regulations with quasi-judicial functions
- Monitors the water quality of the lake and the tributary rivers

- ***Transform the technical data into a simple and easy to understand language***
- ***Use an effective communication tool to enjoin the stakeholders in taking responsibility to conserve the resources of the lake and its watershed***

THE FIRST LAGUNA DE BAY ECOYSTEM HEALTH REPORT CARD

- Funded by the United Nations Environment Programme (UNEP/GEF) through the project on Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of Global Nutrient Cycle;
- Jointly implemented by the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA Resource Facility) and the Laguna Lake Development Authority (LLDA);
- Aimed at providing stakeholders, decision makers and policy makers a simple yet scientifically developed assessment of the Ecosystem Health of Laguna de Bay;
- Expected to be an effective tool for communication and for planning actions by various stakeholders to improve the ecosytem health.



Partnerships in Environmental Management for the Seas of East Asia: *Mr. S. Adrian Ross (not in photo), Ms. Nancy Bermas, Ms. Daisy Padayao*
Laguna Lake Development Authority: *Ms. Adelina Santos-Borja, Ms. Jocelyn Sta. Ana, Ms. Rose Bonifacio, Mr. Neil Varcas, Mr. Ireneo Bongco, Ms. Rosemary Cabrera, Mr. Gregory Alexis Ongjoco, Ms. Marilyn Apacionado*
Experts: *Dr. Adelaida Palma* (Bureau of Fisheries and Aquatic Resources)
Dr. Gil Jacinto (University of the Philippines – Marine Science Institute)
Dr. Macrina Zafaralla (University of the Philippines – Los Banos)
Dr. Rey Donne Papa and Milette Mendoza (University of Santo Tomas)
University of Maryland Center for Environmental Science: *Mr. David Nemazie, Dr. Simon Costanzo, Ms. Vanessa Vargas, Ms. Jane Hawkey (not in photo)*

Laguna de Bay: Values and Threats

Outcome of the Stakeholders Consultation on December 12-13, 2013

Water Quality Indicators

Nitrates in excess amounts cause dramatic increases in aquatic plant growth and changes in the types organisms that live in the lake. Sources include fertilizers, drainage from livestock feeds, as well as domestic and industrial discharges.

Phosphates come from agricultural runoff, animal waste and sewage.

Chlorophyll a measures the amount of phytoplankton that can cause algal blooms. Algal blooms by blue-green algae are an indicator of deteriorating water quality and polution.

Dissolved oxygen (DO) is vital for the survival of fish and benthic organisms in the lake.

Biological oxygen demand (BOD) is the amount of oxygen required by microorganisms for stabilizing biologically decomposable organic matter in water under aerobic conditions. High BOD levels are associated with organic pollution, such as sewage.

Total coliforms is a measure of animal bacteria that enters the lake by direct deposition of waste in the water and runoff from areas with high concentrations of animals or humans.

How are the scores calculated?

- Measured the indicators for water quality and fisheries in the West, Central, East and South Bays (2004-2013).
- Six water quality indicators: nitrate, phosphate, chlorophyll *a*, dissolved oxygen and biochemical oxygen demand were compared to the National Water Quality Criteria (DENR-DAO 34), Class C water (for fisheries) which were combined and then represented as a percent score for each bay.
- The 3 Fisheries indicators: zooplankton ratio, native fish species and catch per unit effort (CPUE) were calculated as ratios or percentage that are then combined for each bay. The scores are then normalized to form a fisheries index.

Philippine Grading Scale

1.00 - 1.24	96.00 -100.0	Excellent	A+
1.25 - 1.49	94.00 - 95.99	Superior	A
1.50 - 1.74	91.00 - 93.99	Very Good	A-
1.75 - 1.99	89.00 - 90.99	Good	B+
2.00 - 2.24	86.00 - 88.99	Very Satisfactory	B
2.25 - 2.49	83.00 - 85.99	High Average	B-
2.50 - 2.74	80.00 - 82.99	Average	C+
2.75 - 2.99	77.00 - 79.99	Fair	C
3.00 - 3.99	75.00 - 76.99	Pass	C-
4.00 - 4.99	70.00 - 74.99	Conditional	D
5.00 - 5.00	0.00 - 69.99	Failing	F

What do the grades mean?

A All the indicators meet desired levels. Quality of water in these locations tends to be very good, most often leading to preferred habitat conditions for aquatic life.

B Most indicators meet desired levels. Quality of water in these locations tends to be good, often leading to acceptable habitat conditions for aquatic life.

C There is a mix of good and poor levels of indicators. Quality of water in these locations tends to be fair, leading to sufficient habitat conditions for aquatic life.

D Some or few indicators meet desired levels. Quality of water in these locations tends to be poor, often leading to degraded habitat conditions for aquatic life.

F Very few or no indicators meet desired levels. Quality of water in these locations tends to be very poor, most often leading to unacceptable habitat conditions for aquatic life.

Water Quality

Region	Indicator	Score	Overall Score	Grade
West Bay	Nitrate	100	76	C-
	Phosphate	56		
	Chl a	0		
	DO	100		
	BOD	100		
	Total Coliforms	98		
Central Bay	Nitrate	100	71	D
	Phosphate	25		
	Chl a	0		
	DO	100		
	BOD	100		
	Total Coliforms	100		

**Based on DENR Class C water quality criteria (DAO 34):*
Nitrate: 10mg/L Phosphate: 0.05mg/L Chl a: 10ug/L DO: 5mg/L BOD: 7mg/L Total coliforms: 5000MPN/100ml

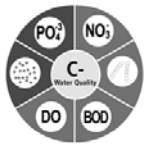
Water Quality

Region	Indicator	Score	Overall Score	Grade
East Bay	Nitrate	100	81	C+
	Phosphate	92		
	Chl a	0		
	DO	100		
	BOD	100		
	Total Coliforms	96		
South Bay	Nitrate	100	77	C
	Phosphate	63		
	Chl a	0		
	DO	100		
	BOD	100		
	Total Coliforms	100		

**Based on DENR Class C water quality guidelines:*
Nitrate: 10mg/L Phosphate: 0.05mg/L Chl a: 10ug/L DO: 5mg/L BOD: 7mg/L Total coliforms: 5000MPN/100ml

Water Quality - Total Score

Region	Indicator	Score	Overall Score	Grade
Laguna de Bay	Nitrate	100	76	C-
	Phosphate	59		
	Chl a	0		
	DO	100		
	BOD	100		
	Total Coliforms	99		



**Based on DENR Class C Water Quality Criteria:*
Nitrate: 10mg/L Phosphate: 0.05mg/L Chl a: 10ug/L DO: 5mg/L BOD: 7mg/L Total coliforms: 5000MPN/100ml

Fisheries Indicator

Zooplankton ratio can be used to indicate changes in the trophic state of the lake, level of eutrophication and warming history. Decreasing calanoid to cyclopoid ratio indicates deteriorating trophic state; the lower the calanoids, the higher the trophic state of the lake. In Laguna de Bay, the only remaining calanoid copepod is the invasive *Arctodiaptomus dorsalis*, which has already displaced previously recorded native calanoid species in the lake.

Native fish species composition measures the proportion of native against introduced/invasive species in major catch composition.

Catch per unit effort (CPUE) is computed from the average total daily catch and the total number of fishing hours.

Fisheries

Region	Indicator	% Score	% Sub Score	Grade
West Bay	Percent composition of Fish Native Species	47	39	D
	Zooplankton ratio	35		
	CPUE	35		
Central Bay	Percent composition of Fish Native Species	59	40	C-
	Zooplankton ratio	33		
	CPUE	27		

**Graded using a Fisheries Index; scores subject to change pending additional data and data normalizatio*

Fisheries Index A 80-100% B 60-80% C 40-60% D 20-40% F 0-20%

Fisheries

Region	Indicator	% Score	% Sub Score	Grade
East Bay	Percent composition of Fish Native Species	26	17	F
	Zooplankton ratio	22		
	CPUE	3.4		
South Bay	Percent composition of Fish Native Species	24	25	D-
	Zooplankton ratio	29		
	CPUE	21		

**Graded using a Fisheries Index; scores subject to change pending additional data and data normalizatio*

Fisheries Index A 80-100% B 60-80% C 40-60% D 20-40% F 0-20%

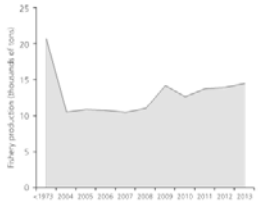
Fisheries – Total Score

Region	Indicator	% Score	% Sub Score	Grade
Laguna de Bay	Percent composition of Fish Native Species	39	30	D
	Zooplankton ratio	29.75		
	CPUE	21.6		

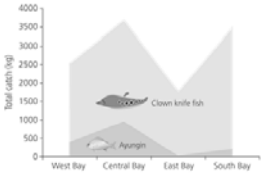
**Graded using a Fisheries Index; scores subject to change pending additional data and data normalizatio*

Fisheries Index A 80-100% B 60-80% C 40-60% D 20-40% F 0-20%

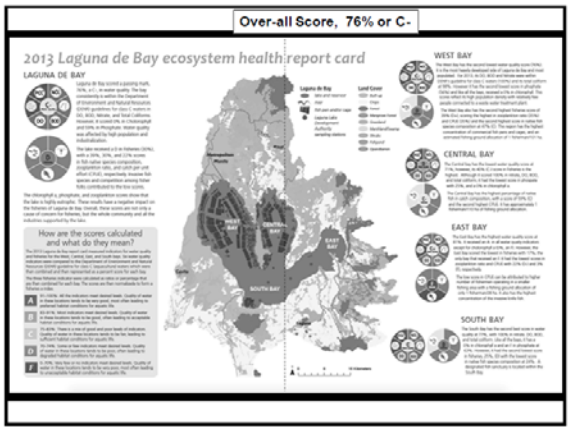
Fisheries



Ten year production trend in Laguna de Bay. Data source: Bureau of Agricultural Statistics.



Comparison of clown knife fish and ayungin catch from actual sampling in Laguna de Bay in 2013. Data source: Bureau of Fisheries and Aquatic Resources



People can make a difference

- ✓ Youths are being educated and getting involved
  - CLEAR (Conservation of Laguna de Bay's Environment and Resources) Youth Network
- ✓ Government agencies and local communities work together
  - "Panganib ng Knife Fish Sugpuin; Laguna de Bay Muling Pasiglahin"
  - "Mapanganib na Dayuhang Isda Pigilang Makawala sa mga Ilog at Lawa"
- ✓ A new technology helps restore water quality
  - UPLB Aquatic Macrophyte Biosorption System (AMBS)

You can help save the Lake!

Youths participate in tree planting activity.

Be conscientious
Properly dispose your household waste and maintain a clean surrounding. Organize and participate in community clean-up and tree planting activities.

Phosphate free detergents are now available.

Be proactive
Support environmentally friendly products. Join the campaign to encourage the use of phosphate-free detergents and household cleaners.

Invasive knife fish forum.

Be informed
Learn about the status of the lake, and existing and future projects of governmental and non-governmental agencies that you can participate in.

Polluting industry is closed.

Be vigilant
Report illegal activities and malpractices of the aquaculture, agricultural, and industrial sectors.

Thank You Very Much

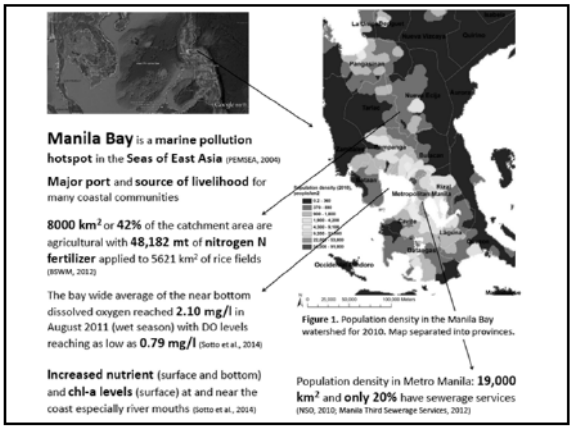
First Laguna de Bay Ecosystem Health Report Card Dissemination Forum
October 28, 2015

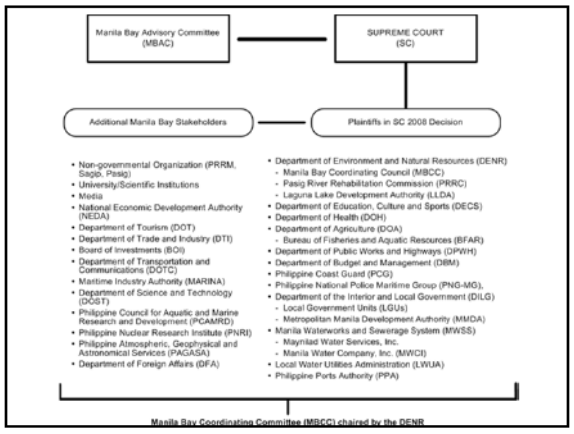
Annex 3e - Gil Jacinto

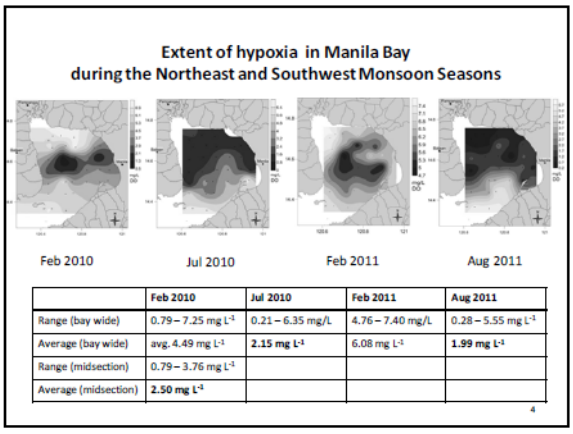
Assessment and Planning for Nutrient Management - Manila Bay Case Study

Gil S. Jacinto[1], Lara Patricia A. Sotto[1], Cesar L. Villanoy[1], Arthur H.W. Beusen[2], & Lex F. Bouwmann[2]

[1]The Marine Science Institute, University of the Philippines Diliman, Philippines
[2]Department of Earth Sciences – Geochemistry , Utrecht University, The Netherlands



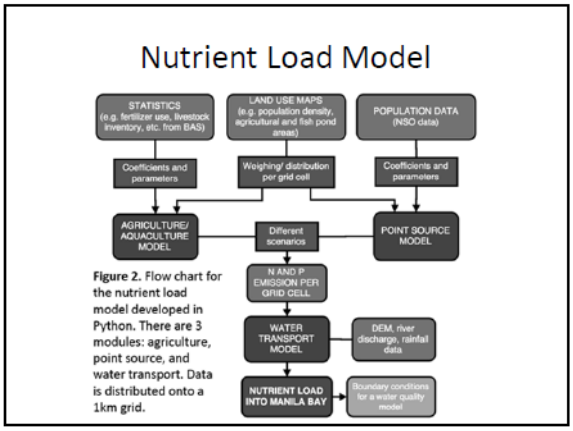




	Feb 2010	Jul 2010	Feb 2011	Aug 2011
Range (bay wide)	0.79 – 7.25 mg L^{-1}	0.21 – 6.35 mg/L	4.76 – 7.40 mg/L	0.28 – 5.55 mg L^{-1}
Average (bay wide)	avg. 4.49 mg L^{-1}	**2.15 mg L^{-1}**	6.08 mg L^{-1}	**1.99 mg L^{-1}**
Range (midsection)	0.79 – 3.76 mg L^{-1}			
Average (midsection)	**2.50 mg L^{-1}**			

Global Foundations for Reducing Nutrient Enrichment and Oxygen Depletion from Land Based Pollution, in Support of Global Nutrient Cycle

- *Component B4. Development of regional models of coastal effects under different physical regimes using regional data.*
  - *Nutrient Load Estimates for Manila Bay*



Treatment of population data

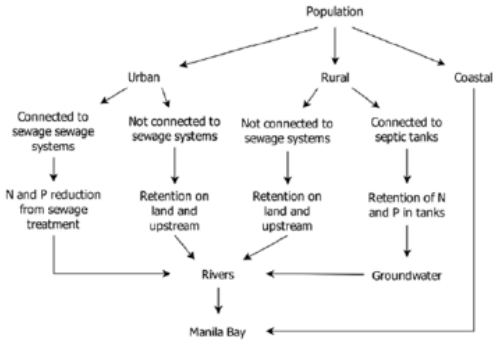
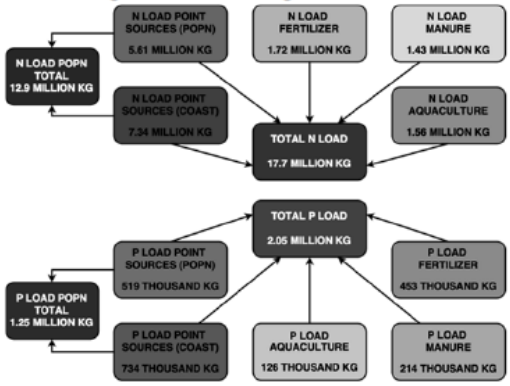


Figure 3. Schematic diagram of the treatment of population data in the point source model

Nutrient load coming from domestic sources appears to be greater than the agriculture sector



Emissions and loads

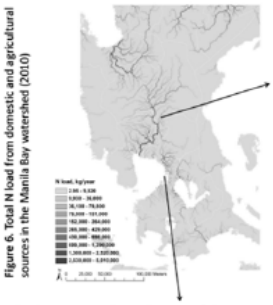


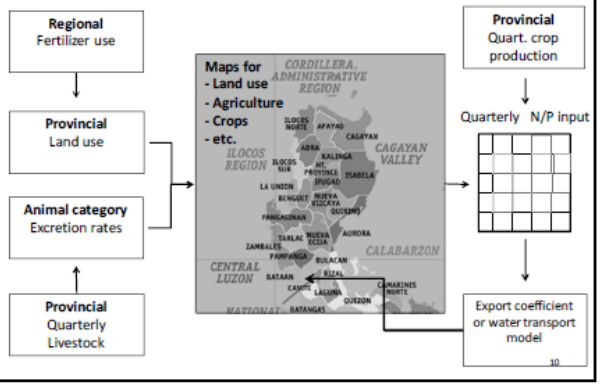
Figure 6. Total N load from domestic and agricultural sources in the Manila Bay watershed (2010)

One of the major rivers in the Manila Bay Watershed, the Pampanga River, drains a majority of the agricultural areas in the watershed bringing in as much as **1.47 million kg of N** and **395 thousand kg of P load to the bay per year**

Pasig river passes through most of the densely populated urban areas in Metro Manila bringing in as much as **3.61 million kg N** and **340 thousand kg P load into the bay per year.**

Figure 7. Total P load from domestic and agricultural sources in the Manila Bay watershed (2010)

Preliminary calculation scheme for **agriculture** in Manila Bay or country-wide



How much N and P could be going into the bay?

Scenarios	Total N load (kg/yr)	Total P load (kg/yr)
Baseline (2010)	4.67E+07	4.54E+06
Scenario 1 (2050)	1.64E+08 (250%)	1.62E+07 (257%)
Scenario 2 (2050) (partial 1° and 2° treatment, no 3° treatment)	2.66E+08 (469%)	2.47E+07 (444%)
Scenario 3 (2050) (10% primary, 10% secondary, 70% tertiary treatment)	1.22E+08 (161%)	9.62E+06 (112%)
Scenario 4 (2050) (70% primary, 10% secondary, 10% tertiary treatment)	1.67E+08 (288%)	1.36E+07 (232%)
Scenario 5 (2050) (Population growth rate halfed, conditions same as scenario 1)	9.83E+07 (110%)	9.66E+06 (113%)
Scenario 6 (2050) (Population growth rate halfed, conditions same as scenario 2)	1.58E+08 (238%)	1.46E+07 (222%)
Scenario 7 (2050) (Population growth rate halfed, conditions same as scenario 3)	7.29E+07 (56%)	5.75E+06 (27%)

11

What if?

"What if?" scenarios were tested using 2010 baseline values projected to year 2050 with different sewage treatment settings

118% N **88% P**
If we don't do anything by 2050 and the population keeps increasing at current rates

273% N **188% P**
If we connect everyone to sewage pipes but do not improve treatment

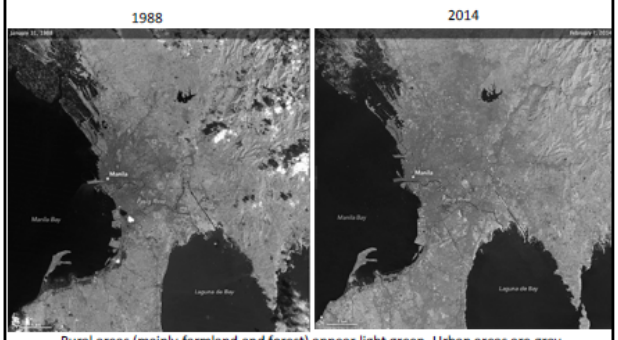
79% N **35% P**
If everyone is connected and 70% tertiary treatment is achieved

55% N **41% P**
If the population growth rate is reduced to half and baseline sewage scenarios are maintained

Summary of Preliminary Results of Nutrient Load Model

- Domestic waste seems to be a more significant source of N & P into Manila Bay compared to agriculture.
- With continued high population growth (driven principally by migration into Metro Manila), nutrient loading from the domestic sector will continue to increase even with improvements in sewage treatment

Metro Manila



Rural areas (mainly farmland and forest) appear light green. Urban areas are gray.
Source: http://earthobservatory.nasa.gov/IOTD/view.php?id=86780&src=fb

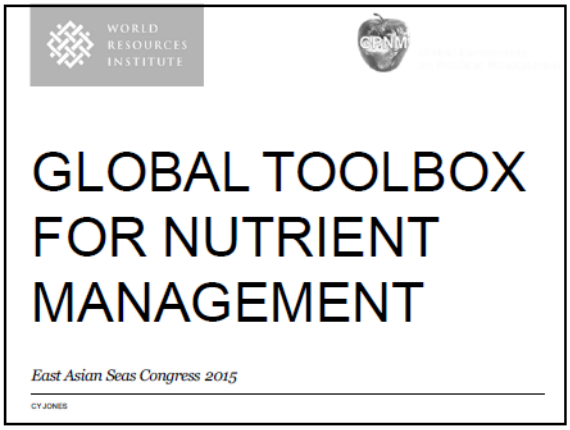
Policy Recommendations

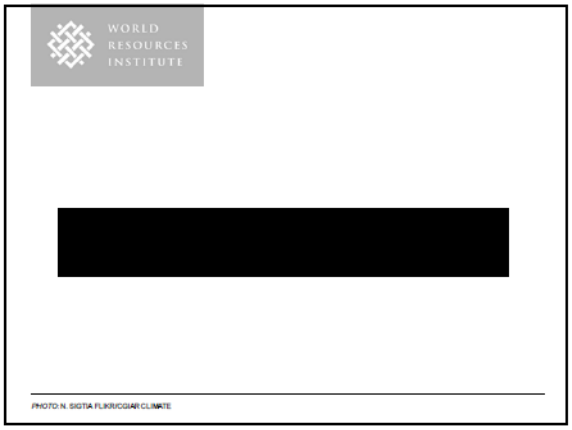
- Improve data gathering and access (e.g., nutrients, discharge rates of rivers and point sources, time series observations, data encoding protocols).
- Encourage or legislate the sale and use of phosphate-free detergents. This could significantly decrease the phosphorus load into the bay, without need for substantial government or private sector investments.
- Review, adopt and enforce nutrient water quality standards for point discharges and water quality criteria for receiving waters.
- Government support towards the development of and investments in growth areas outside Metro Manila will help decongest a densely populated megacity and reduce nutrient inputs into Manila Bay.

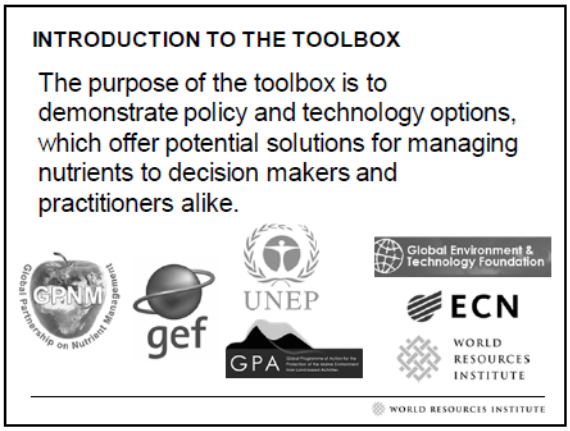
Acknowledgment

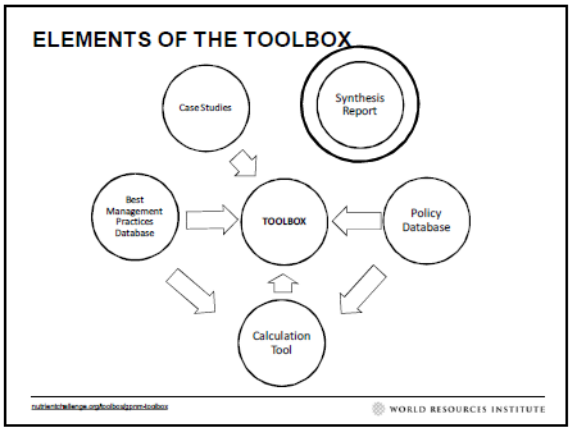
- UNEP-GEF
- UNESCO-IOC
- PEMSEA
- Marine Environment & Resources Foundation
- Metropolitan Waterworks & Sewerage System
- Bureau of Soils and Water Management
- PBL Netherlands Environmental Assessment Agency

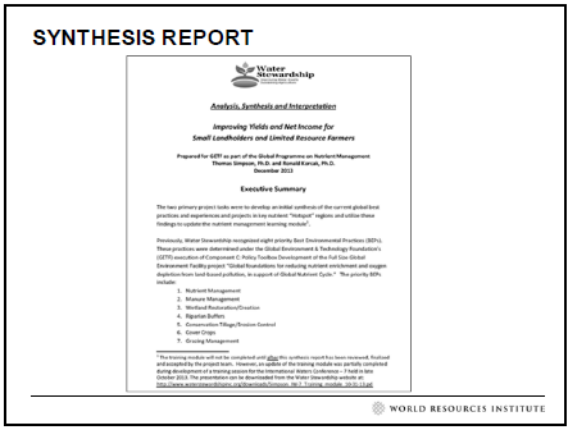
Annex 3f – Cy Jones

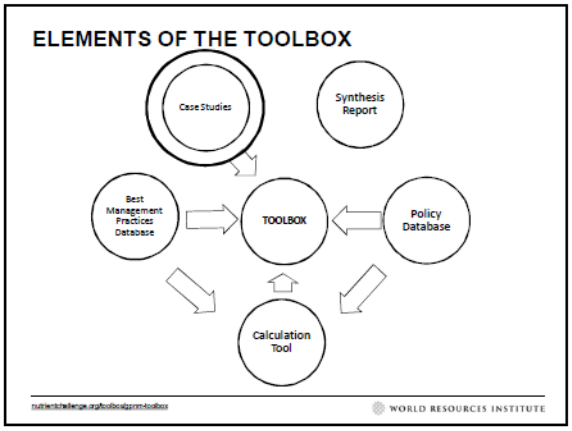












CASE STUDIES


GLOBAL PARTNERSHIP ON NUTRIENT MANAGEMENT
BMP Case Study

Overview

Name: Nutrient Expert (NE) Improves Grain, Profitability and Efficiency for Maize

Location/Terrain: North China

Crop(s): Maize

Nutrient(s): N, P and K

Rationale: A new fertilizer recommendation method based on yield response and agronomic efficiency for hybrid maize, Nutrient Expert (NE), was tested to increase yields and optimize profits.

Issue(s) of Concern/Challenges:

A dynamic and robust nutrient management approach is essential to increase yields and optimize profits for smallholder farmers within intensified cropping systems.

Practice Description:

On-farm experiments were conducted from 2010 to 2012 at 408 sites in seven provinces to evaluate o

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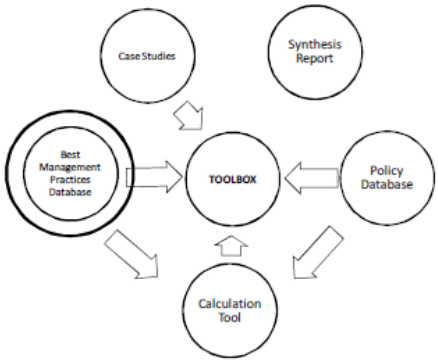
ELEMENTS OF THE TOOLBOX



nutrientchallenge.org/toolbox/gpnm-toolbox

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BEST MANAGEMENT PRACTICES DATABASE

Practices searchable by: sector

Agriculture	Urban

Practices searchable by: category

• Conservation buffers	• Detention
• Erosion control	• Filtration
• Drainage control	• Infiltration
• Irrigation management	• Septic management
• Grazing management	• Urban erosion control
• Wetland creation	• Urban stream restoration
• Etc.	• Etc.

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BEST MANAGEMENT PRACTICES DATABASE

Practices searchable by: climatic zone

Arid	Tropical
Semiarid	Temperate

Practices searchable by: land use/agriculture type

Animal confinement	Rice
Fodder	Row crop
Palm oil	Small grains
Pasture	

Practices searchable by: scalability to small farms

Only show practices scalable to small farms? ☐

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BEST MANAGEMENT PRACTICES DATABASE

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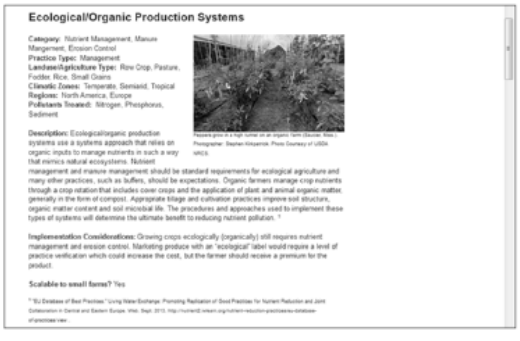
BEST MANAGEMENT PRACTICES DATABASE



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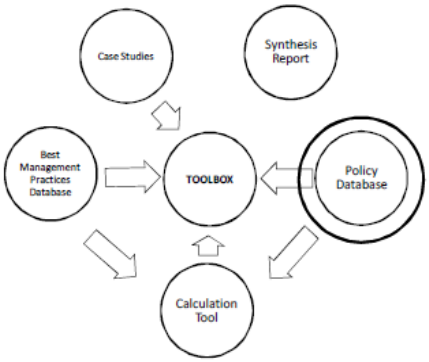

nutrientchallenge.org/toolbox/gpnm-toolbox

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POLICY DATABASE

Policies searchable by: category

- Environmental outreach & education
- Regulatory approaches
- Price-based instruments
- Market-based instruments
- Ecosystem restoration and protection
- Institutions & capacity
- Research, monitoring, & evaluation

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POLICY DATABASE

Policies searchable by: type

- Environmental outreach & education
- **Regulatory approaches**
  - -environmental bans and restrictions
  - -environmental standards
  - -environmental caps & limits
  - -regulatory frameworks
- Price-based instruments
- Market-based instruments
- **Ecosystem restoration and protection**
  - -ecosystem restoration
  - -protected areas
  - -land purchases
  - -covenants & easements
  - -stewardship agreements
- Institutions & capacity
- Research, monitoring, & evaluation

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POLICY DATABASE

Practices searchable by: region

Asia	North America
Europe	Oceana
Middle East	South America

Practices searchable by: sector

Agriculture	Transport
Aquaculture	Urban
Fisheries	Wastewater
Mixed	

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POLICY DATABASE

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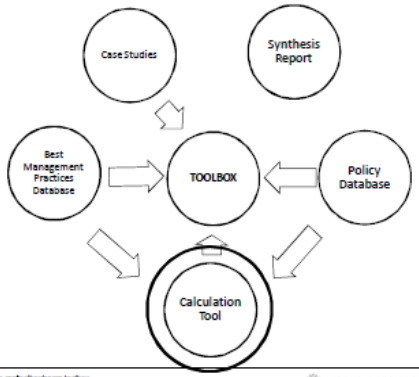
ELEMENTS OF THE TOOLBOX



nutrientchallenge.org/toolbox/gpnm-toolbox

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TOOLBOX CALCULATOR

Step 1

User defines area of interest:

- Continent
  - Ocean
    - Sea
      - Basin

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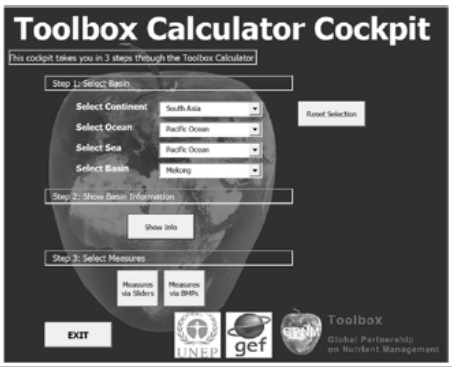
TOOLBOX CALCULATOR



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TOOLBOX CALCULATOR

Step 2

- Based on geographic selection, tool provides data on:
  - Land area
  - Population
  - Gross domestic product
  - Agricultural activities
  - Wastewater

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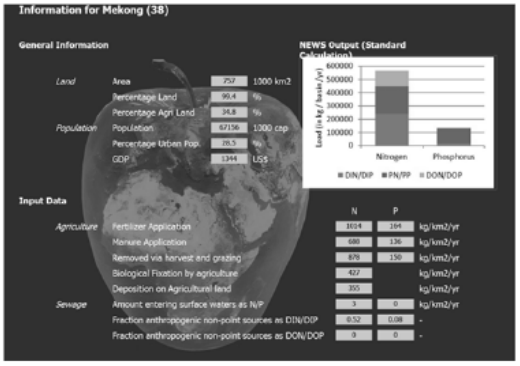
TOOLBOX CALCULATOR



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TOOLBOX CALCULATOR

Step 3

User selects measures to run scenarios:

- Measures via sliders
  - increase/decrease agricultural inputs, sewage treatment, etc.

  OR

- Measures via BMPs
  - increase/decrease BMP implementation

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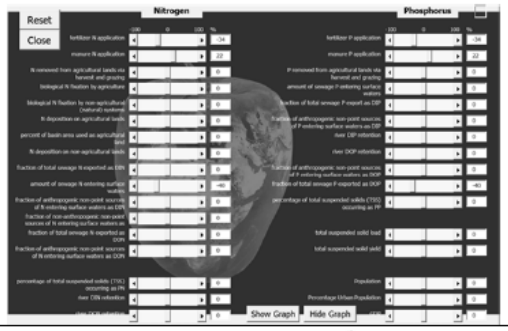
TOOLBOX CALCULATOR

Select measures via sliders



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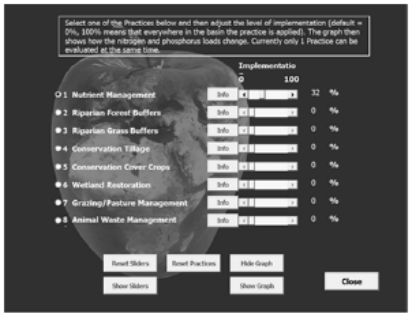
TOOLBOX CALCULATOR

Select measures via BMPs



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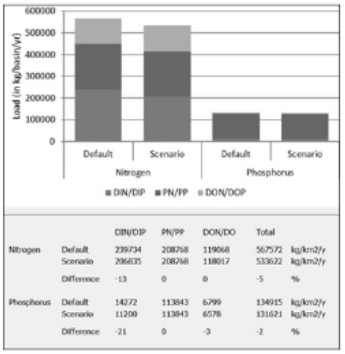
TOOLBOX CALCULATOR



		DIN/DIP	PN/PP	DON/DO	Total	
Nitrogen	Default	239734	208768	119068	567572	kg/km2/y
	Scenario	206835	208768	118017	533622	kg/km2/y
	Difference	-13	0	0	-5	%
Phosphorus	Default	14272	113843	6799	134915	kg/km2/y
	Scenario	11200	113843	6578	131621	kg/km2/y
	Difference	-21	0	-3	-2	%

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SUMMARY

- Toolbox serves as a resource for information about nutrient reduction strategies
- Farmers and extension agents can use the practice database to learn about conservation practice options
- Decision makers can use the policy database and case studies to learn about programs and policies working in other areas

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Image: Chesapeake Bay Program

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Annex 3g – Christopher Cox

Global Partnership on Nutrient Management

The GPNM and its Mandate

Technical and Policy Workshop on Sustainable Nutrient Management

18 November 2015
East Asian Seas Congress
Danang, Vietnam

Christopher Cox PhD
Programme Officer
Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA)

The global concern

- Oceans and Coasts – the very basis of much of the world's economy.
  - 350 million jobs globally linked to the oceans.
- Marine environment supplies planet with key services
  - climate regulation, storm protection, food security, nutrients cycling etc..
  - All these services underpin lives and livelihoods in different sectors from tourism to fisheries.
- Oceans are suffering from advanced degradation mainly as a result of human activities.
  - Over the past decades marine pollution has become an increasingly significant problem.
- Marine pollution occurs when harmful, or potentially harmful, effects result from the entry into the ocean of chemicals, particles, industrial, agricultural and residential waste, noise, plastic debris or the spread invasive organisms.
- With growing population, set to reach nine billion by 2050 - marine pollution and impacts are likely to build up unless global action is taken to sustainably manage and protect oceans and coastal ecosystems

About the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA)

- Over 108 governments declared "their commitment to protect and preserve the marine environment from the impacts of land-based activities, through the Washington Declaration
- The GPA was adopted in 1995
- Only global intergovernmental mechanism explicitly addressing the linkages between freshwater, coastal and marine environments.
  - Voluntary, action-oriented, intergovernmental programme led by UNEP
  - GPA designed to address accelerating degradation of the world's oceans and coastal areas
  - encourage governments and regional organizations to prepare and implement comprehensive, continuing and **adaptive action plans** to protect the marine environment, recognizing the **effects on food security, poverty alleviation, and ecosystem health, as well as the resulting economic and social benefits.**

About the GPA

- UNEP has focused on key pollution sources since the 2006 Inter-Governmental Review-2 in Beijing – marine litter, nutrients & wastewater
- The Manila Declaration in 2012, gave GPA the mandate to establish global multi-stakeholder partnerships for these 3 priority areas
- The GPA secretariat has established and is strengthening three global multi-stakeholder partnerships
  - The **Global Partnership on Nutrient Management (GPNM)**, which was launched at the UN CSD in New York, May 2009
  - The **Global Partnership on Marine Litter (GPML)**, which was launched at Rio+20, June 2012
  - The **Global Wastewater Initiative (GWI)**, which was announced by UNEP's Executive Director, Achim Steiner in May, 2013

Global Partnership on Nutrient Management (GPNM)

- Key roles:
  - Catalyze strategic **advocacy** and co-operation at the global and regional levels
  - As a **knowledge** platform to support science policy interaction and translating science for policy makers
  - To provide information and **enhance capacities** to address the growing problem of nutrient over-enrichment and eutrophication
  - To position nutrient issues as part of the international sustainable development agenda
    - Guided by a Steering Committee; United States is the current Chair; UNEP is the Secretariat under the GPA
  - **Mainstreamed within UNEP' Programme of Work**

GPNM strategic outlook

Key work areas:

- Development of **knowledge** products to inform decision making (policy makers, professionals, farmers, private sector)
- Support for piloting and replication of **appropriate pilot solutions** and BMPs for sustainable nutrient management and pollution reduction
- Generate **awareness** resources to drive change in behaviours and practice
- Strengthening **partnerships** - expanded global and regional partnerships, particularly through Regional-level Platforms mainstreamed in relevant national and regional development programmes

Partnership strengthening:

Support under GEF-Global Nutrient Cycling Project

- **Global partnership of stakeholders actively engaged in addressing nutrient over-enrichment in coastal waters**
  - Engage international and regional fora to promote the GPNM /seek new members
    - Over 40 Partners engaged; research academia, government, private sector
  - Communications and outreach strategy
  - Publish and disseminate an advocacy documents e.g. Our Nutrient World
  - Engage with other GEF LME projects e.g., BOBLME
  - Develop and maintain partnership (and project) web-based knowledge platform

GPNM Steering Committee, December 2014

Knowledge generation:

Support under GEF-Global Nutrient Cycling Project

Analysis of relationship between nutrient sources and impacts

- **Global database development with documentation of data on nutrient loading and occurrence of harmful algal blooms, hypoxia, and effects on fish landings, fish abundance, and composition of fish populations.**
  - Data Base: Global-Nutrient Export from Watersheds (NEWS) data for river nutrient export
  - Data base: Nutrient release from aquaculture - several publications available
  - Global database development - coastal conditions, non-land based nutrient sources, as well as coastal effects
  - Synthesis report and maps on occurrences of hypoxia and harmful algal blooms
  - Synthesis report "impacts on fisheries" based on data and model output from regions - develop relationships between fishery production and potential controlling variables and hypoxia

Best practices and solutions:

Support under GEF-Global Nutrient Cycling Project

Scientific, technological and policy options

- Production of a fully operational 'policy toolbox' and delivery of the training.
  - Case studies of BMP examples that are being implemented around the world by key partners
  - agricultural BMPs and urban BMPs database
  - policy database
- Replication and up-scaling of BMPs, measures etc. through training workshops; up-scaling strategy
- Holding of training sessions within global meetings of nutrient relevance

Knowledge contributions and best management practice

Support under GEF-Global Nutrient Cycling Project

Demonstration - source-impact modeling and best practices in Manila Bay watershed, Philippines

- **Strengthening decision support system for Manila Bay watershed**
  - State of the Coasts reports of the Provinces of Bataan, Cavite and Pampanga
  - Updating Manila Bay Environmental Atlas
- **Building the Foundations and Agreement on nutrient reduction strategies for Manila Bay**
  - Application of source-impact models and best practices
  - Presentation and adoption of nutrient reduction strategies

Knowledge contributions and best management practice

Support under GEF-Global Nutrient Cycling Project

Demonstration – Lake Chilika, India and Laguna de Bay, Philippines

- Application of ecosystem health report card in Lake Chilika, India and Laguna de Bay, Philippines
- Management plan for application/implementation of report card
  - incorporation into nutrient reduction strategies for Manila Bay watershed
- Lessons drawn for replication and up-scaling

GPNM – a growing partnership

Kingdom of the Netherlands
International Fertilizer Industry Association
UNDP
gef
IFDC
UNEP
UN-HABITAT
IPNI International Plant Nutrition Institute
USDA
Utrecht University
INI International Nitrogen Initiative
Nebraska
NOAA
Washington State University
ING
IAEA International Atomic Energy Agency
SACEP
Laguna Lake Development Authority
saln UK-China Sustainable Agriculture Innovation Network
Global Environment & Technology Foundation
World Resources Institute
PEMSEA
Centre for Ecology & Hydrology
ECN Energy research Centre of the Netherlands
LRTAP

Annex 3h - Ario Damar

THE EAST ASIAN SEAS CONGRESS 2015

COASTAL AND MARINE POLLUTION REDUCTION STRATEGY : NUTRIENT MANAGEMENT OF INDONESIA

Ministry of Environment and Forestry
Republic of Indonesia

THE EAST ASIAN SEAS CONGRESS 2015

INTRODUCTION

- High human population living in coastal area (70% of the total country's population)
- Lack of communal domestic waste water treatment
- Lack of community awareness

THE EAST ASIAN SEAS CONGRESS 2015

Main Issues of coastal nutrient pollution in Indonesia

Solid urban domestic waste
Unordered domestic settlements
Lack of communal urban domestic waste treatment
Agriculture-related practices waste

Lack of coordination among sectors
Lack of strong law enforcement

Lack of community awareness
Lack of good infrastructures

THE EAST ASIAN SEAS CONGRESS 2015

Handled by
Directorate General Pollution Control and Environmental Degradation – Ministry of Environment and Forestry Republic of Indonesia

Ultimate Goals

- **Improvement of air quality**
- **Improvement of water quality**

THE EAST ASIAN SEAS CONGRESS 2015

Main Indicators

- **Improvement of air quality : index of air quality 84**
- **Improvement of water quality : Index of water quality 55**

THE EAST ASIAN SEAS CONGRESS 2015

Programs

- **Finalization of the Governmental Decree on Water and Air Pollution**
- **Review and development of National Standard for Waste Water and Air Emission**
- **Evaluation on industrial pollution management**
- **Evaluation on river water quality and coastal water quality**
- **Swamp peat area hydrological mapping**
- **Pilot projects on River Restoration : Ciliwung River Restoration**

THE EAST ASIAN SEAS CONGRESS 2015

Indicators

- Water quality monitoring system is developed and continuously operated in the 15 major river watershed
- Pollution load and its carrying capacity is calculated
- Improvement of river water quality in the 15 major watershed aimed for source of fresh water (key parameters : BOD5, COD, and E-Coli)
- Total pollution load decreased by 16% trough pilot project and management of source of pollution
- Improvement of annual coastal water quality at 3 major coastal areas : (Jakarta Bay National Capital Integrated Coastal Development/ NCICD, Semarang, and Bali)
- Improvement of coastal ecosystem in the 85 major coastal areas : coral reef, seagrass beds and beach
- Number of IPAL (waste water treatment) project in the fishermen villages as much as 50 units

THE EAST ASIAN SEAS CONGRESS 2015

Example of JAKARTA CITY STRATEGIC PLAN 2012-2017

THE EAST ASIAN SEAS CONGRESS 2015

Target

Reduction of environmental pollution

Strategy

Development of instrument
Control of water pollution

Policy

Controlling aquatic pollution trough water quality monioring, community extension and education in managing water pollution and law enforcement

THE EAST ASIAN SEAS CONGRESS 2015

Programs

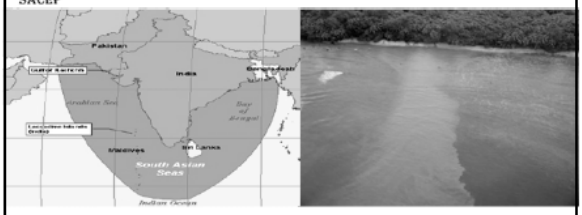
- Water quality monitoring : river, lakes and coastal waters
- Law enforcement on industries
- Establishment of Carrying Capacity and Allowable Total Pollution Load
- Study on Water and Quality Class of the river
- Development of Masterplan of River Pollution Control and River Water Quality Rehabilitation
- Incentive and disincentive system application on waster-producing industries
- Community education
- Development of communal domestic waste water treatment

THE EAST ASIAN SEAS CONGRESS 2015

THANK YOU VERY MUCH
FOR YOUR ATTENTION

Annex 3i - Muhammad Khurshid

South Asian Seas Programme (SASP)



Dr. Muhammad Khurshid
Director General,
South Asia Co-operative Environment Programme (SACEP)
www.sacep.org

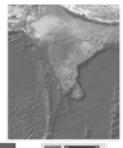
Technical and Policy Workshop on Sustainable Nutrient Management
Venue: Vietnam, Date: 17-19 November, 2015.

South Asia Cooperative Environment Programme (SACEP)

- Established in 1982, SACEP is an inter-governmental organization of eight member states:
- Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka
- Apex decision body is the SACEP Governing Council comprising of Ministers
- SACEP core programme and project activities apart from South Asian Seas Programme and are:
  - Waste Management
  - Adaptation to Climate Change
  - Data base and Information Management
  - Biodiversity

South Asian Seas Programme (SASP)

- Action Plan for SASP (sub-regional agreement) was formally adopted at a Meeting of Plenipotentiaries of the concerned countries held in New Delhi, on March 24th 1995.
- The overall objective of the SASP is to protect and manage the marine environment and related coastal ecosystems of the region in an environmentally sound and sustainable manner.
- The Action Plan in addition to specifying the needs under the main components of Environnemental Sassement, Environnemental Management, Environnemental Legislation & Institutional and Financial Arrangements, identified the following priority areas:
  - ✓ **Integrated Coastal Zone Management (ICZM),**
  - ✓ **oil-spill contingency planning,**
  - ✓ **human resource development and**
  - ✓ **the environmental effects of land-based activities.**



Important Features of South Asian Seas Region

The coastal habitats of South Asia are at a high risk of eutrophication from nutrient enrichment due to leakages from agriculture, aquaculture, sewage, industrial effluents, marine trade and transport. Some of the important features of the South Asian Seas region mostly Indian Ocean are:

- **About 22% of the global population;**
- **With only 4.8% of the world's land mass;**
- **14% of the global arable land;**
- **2.73% of the world forest area and**
- **4% of the world's coastline.**

Partnership

- IMO
- UNEP-GPA,
- UNEP Coral Reef Programme
- FAO
- Bay of Bengal Large Marine Ecosystem
- USDA
- Private Sector/Shipping Associations
- Other regional and sub-regional agencies

Programme Activities

- Regional Strategy and Task Force on Ballast Water Management in South Asia
- South Asia Coral Reef Task Force
- Regional Oil Spill Contingency Plan in south Asian Region
- A Scoping Study of Nutrient Pollution on the Coastal and Marine Systems of South Asia
- Development of a Marine and Coastal Biodiversity Strategy for the South Asian Seas Region

Controlling Nutrient Loading and Eutrophication of Coastal Waters of the South Asian Seas Region (UNEP-GPA)

Project objectives:

- An inventory of point/non- point sources of nutrients that end up in the coastal waters
- Estimating the impact of nutrient enrichment on coastal waters.
- Develop and undertake actions to reduce nutrient inputs to agriculture as well as remedial masseurs to over utrophication/ hypoxia conditions in identified sites.
- Development of a regional action plan and establishment of a regional policy forum to be pursued by member countries

Study Report

- The study report was validated during the two day regional consultative workshop; 20-21 May 2014 in Colombo, Sri Lanka.
- The report set targets and identified opportunities for technical and financial support from potential donors .
- The report will be presented at the 6th-Inter Ministerial-SASP
- SACEP is working closely with Bay of Bengal Large Marine Ecosystem (BoBLME) Phase 2 to incorporate some of the actions identified in this report (BoBLME Steering Committee meeting). The report is available at SACEP website.

Main Findings

- With over 94% of arable land already under cultivation;
- Food production in both rain-fed agriculture and irrigated areas depends on the use of fertilizers and nutrients, at a varying scale;
- Sediment transport through river systems and sediment upwelling from the ocean surface also results in the release of nutrients into the ocean waters.
- Nutrients are also lost through sewage in densely populated areas along the major watercourses;
- Sewage treatment is mostly unavailable and/or inadequate, except in a few large cities and towns.

Main Finding Cont..

- Increasing contribution of reactive nitrogen compounds from the burning of fossil fuels in power generation and transport
- South Asia is also oceanographically significant, with two seas of opposite circulation physically separated by the Indian peninsula.
- The Bay of Bengal maintains a clockwise circulation of major currents during both the northeast and southwest monsoons while in the Arabian Sea it reverses with surface water masses circulating counter clockwise in the northeast monsoon and clockwise during the southwest monsoon, which encourages phytoplankton blooms and biogeochemical process due to increased mixing of nitrogen and phosphorus.

Impact of Nutrient Pollution

- Signs of degradation of aquatic, estuarine, coastal and marine ecosystems;
- Enhanced **growth** of aquatic vegetation or phytoplankton and **algal** blooms-Eutrophication;
- Sediment transport and sediment release can also trigger algal blooms and eutrophication;
- Estuarine and coastal systems in South Asia are nitrogen-limited/depleted and nitrogen loading through upwelling;
- Some of the estuaries, especially along the Indian east coast, are phosphorus limited and are adversely affected by phosphorus loading.

Policy recommendations

•Strict adherence to laws and policies related to coastal ecology.
•Effective river conservation program ensuring direct linkage to coastal habitat conservation.
•Develop quality standards for coastal waters including introduction of uniform standard for primary water quality criteria for the coastal waters.
•Managing pollution sources on land including capture and recycling of the nutrients emanating from agriculture, aquaculture, poultry and livestock farming etc.
•To minimize nutrient leakages throughout the food chain. They should be enforced and monitored periodically through a joint task force comprising relevant scientific, administrative and civil society stakeholders.
•Develop national and sub-regional policies for conservation, protection and sustainable policies for conservation, protection and sustainable development of oceanic and marine resources through a South Asian level intergovernmental working group/task force with governmental and civil society representatives.

Annex 3j – Reynaldo Molina

Coordinating Body for the Seas of East Asia (COBSEA)

Regional Initiative on Nutrient Management

Technical and Policy Workshop on Sustainable Nutrient Management
PEMSEA East Asian Seas Congress, 18 November 2015
Danang, Vietnam

COBSEA
Coordinating Body for the Seas of East Asia www.cobsea.org

Coordinating Body for the Seas of East Asia (COBSEA)

- UNEP Regional Seas Programme (RSP) for the East Asian Seas Region
- 18 RSPs covering 143 countries

COBSEA
Coordinating Body for the Seas of East Asia www.cobsea.org

UNEP/GEF SCS Project

- Known as UNEP/GEF project "Reversing environmental degradation trends in the South China Sea and Gulf of Thailand" was implemented in partnership with seven riparian states bordering the South China Sea over the period 2002 – 2008.
- Addressed three priority areas of concern identified in the Transboundary Diagnostic Analysis (TDA): the loss and degradation of coastal habitats; over-exploitation of fisheries; and land-based pollution.
- Data and information generated were used in the development of the National Action Plans (NAPs) and the Strategic Action Programme (SAP) approved in 2008.
- UNEP supported the development of Project Identification Form (PIF) for Implementing the Strategic Action Programme for the South China Sea.

COBSEA
Coordinating Body for the Seas of East Asia www.cobsea.org

UNEP/GEF SCS SAP Implementation Project

- Known as UNEP/GEF project "Implementation the Strategic Action Programme for the South China Sea" was be implemented for 5 years in partnership with six countries – Cambodia, China, Indonesia, Philippines, Thailand and Vietnam
- Aim to assist countries in meeting the targets of the coastal and marine environment components (mangroves, coral reefs, seagrass and wetlands) of the SAP through implementation of NAPs in support of the SAP, and strengthening regional coordination for the SCS SAP implementation
- **Component 1**: Reducing habitat degradation and loss via national and local reforms to achieve Strategic Action Programme targets for coastal habitat management in the South China Sea
- **Component 2**: Strengthening knowledge-based action planning for the management of coastal habitats and land-based pollution to reduce environmental degradation of the South China Sea
- **Component 3**: Facilitating regional and national level integration and cooperation for implementation of the South China Sea Strategic Action Programme.
- Proposed budget is USD 15 Million from the GEF co-financed by USD 56 Million from participating countries. COBSEA and UNEP as Executing and Implementing Agency.

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Coordinating Body for the Seas of East Asia www.cobsea.org

UNEP/GEF SCS SAP Implementation Project

Component 2: Strengthening knowledge-based action planning for the management of coastal habitats and land-based pollution to reduce environmental degradation of the South China Sea

- Intends to help countries fulfill their GPA commitments to develop policies to reduce and control wastewater, marine litter and pollution from fertilizers through the development and implementation of national goals and plans.
- Development and application of simple models of pollution impacts under different development scenarios for land-based activities
- Reviews of legislative and institutional frameworks for land-based pollution management
- Revision of national/provincial policies
- Development, enactment and implementation of supporting regulations for land-based pollution
- Updating and adoption of National Investment Plans for land-based pollution management in the SCS

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UNEP/GEF SCS SAP Implementation Project

Development and application of simple models of pollution impacts under different development scenarios for land-based activities

- Nutrient carrying capacity model for the SCS marine basin used to communicate with decision-makers about the localized v. transboundary impacts of land-based pollution in the SCS
- Total contaminant loading and carrying capacity of the SCS estimated via application of quantitative modeling and GIS-based techniques for seven heavy metals (Hg, Cd, Pb, Cu, Cr, As, Zn).
- Impacts of estimated heavy metal contaminant loadings defined, quantified and communicated to decision-makers
- Characterization of heavy metal pollution hotspots
- Quantification of effluent volumes and contaminant loadings from coastal aquaculture to the SCS marine basin

Note: UNEP/GEF SCS Project initiated in collaboration with SEA-START, modelling of the assimilative capacity of the South China Sea marine basin with respect to nutrient contaminant inputs from land-based sources.

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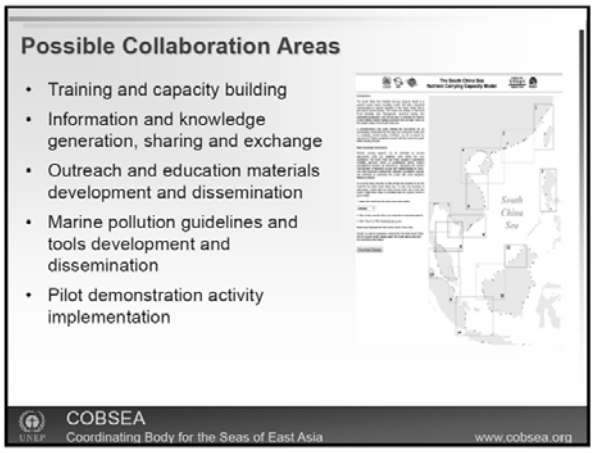
Possible Collaboration Areas
• Training and capacity building
• Information and knowledge generation, sharing and exchange
• Outreach and education materials development and dissemination
• Marine pollution guidelines and tools development and dissemination
• Pilot demonstration activity implementation
South China Sea
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Annex 3k - Nancy Bermas-Atrigenio

PEMSEA

Integration of Nutrient Management Agenda into the SDS-SEA Implementation Plans at the Regional, National and Local Levels

Nancy Bermas-Atrigenio
PEMSEA Resource Facility

Sustainable Development Strategy for the Seas of East Asia (SDS-SEA)

- Adopted by 14 countries in East Asia (12 in 2003 and 2 in 2006)
- Principles, objectives and actions enshrined in global and regional agreements including UNCLOS, Agenda 21, WSSD, MDG, Rio + 20, GPA, etc.
- SDS-SEA 2015 (Aichi Biodiversity Targets, Sendai Framework on DRR, UN SDG)
- 7 strategies (sustain, preserve, protect, adapt, develop, implement and communicate), 23 objectives and 268 action programs
- Implementation through the integrated coastal management framework and process that have been tested for over 20 years in the EAS region

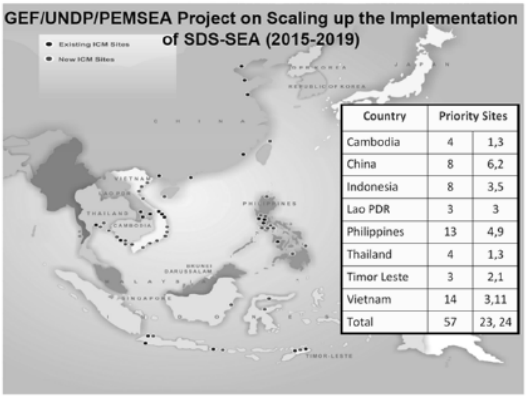
Healthy Oceans, People and Economies

PEMSEA

SDS-SEA strategies and objectives relevant to GPA and nutrient management

Strategy	Objective
Sustain	Maintenance and enhancement of the quality of coastal waters
Protect	Coastal and marine degradation from land-based human activities arrested • Strengthening capacities • Implementing management programs at local level • Adopting a holistic approach to managing the impacts of land-based activities
Develop	ICM as an effective management framework to achieve the sustainable development of coastal and marine areas
	Partnerships in sustainable financing & environmental investments
Implement	Regional cooperation in integrated implementation of international instruments
	Execution of obligations under international conventions and agreements at the local government level

GEF/UNDP/PEMSEA Project on Scaling up the Implementation of SDS-SEA (2015-2019)



Country	Priority Sites	
Cambodia	4	1,3
China	8	6,2
Indonesia	8	3,5
Lao PDR	3	3
Philippines	13	4,9
Thailand	4	1,3
Timor Leste	3	2,1
Vietnam	14	3,11
Total	57	23, 24

Priority sites for IRBCAM/water use and conservation and pollution reduction and waste management

Country	Priority sites	Indicators
Cambodia	• Preah Sihanouk • Khemrak Phumin (Koh Kong Province)	• 50% reduction in annual BOD loading to coastal waters from household/tourism facilities
China	• Jiulong River (Fujian Province)	• 20% reduction in annual N and P loadings from domestic/agricultural sources
Indonesia	• Pelabuhanratu Bay (Sukabumi) • Bali Province	• Water quality monitoring program • 50% reduction in solid waste discharged in to river systems and coastal areas
Lao PDR	• Houay Pali (Saravanne Province); Houay Champi (Champasak Province); Sedon River (Sekong Province); Vangvieng (Vientienne Province)	• Increase in population with access to improved water supply
Philippines	• Calumpang River (Batangas Province)	• 20% reduction in BOD loading and 5% reduction in N & P loadings
Thailand	• Rayong Province	• Pollution reduction implementation and investment plan
Vietnam	• Vu Gia-Thu Bon River (Quang Nam & Danang)/Huong River Thua Thien Hue Province	• Pollution reduction implementation and investment plan

Mainstreaming GPA & GPNM Objectives into SDS-SEA Regional, National and Local Plans

Regional Strategy and Implementation Plan

- Policies
- Legislations
- Priorities
- Targets

National SDS-SEA Implementation Plan/ National ICM Program

Coastal Strategy and Implementation Plan/ Local ICM Plans

- Priority locations and priority issues
- Coordinating arrangements
- Pollution reduction and investment plan
- State of the Coasts reporting
- Good practices
- Networking

Building Synergies and Promoting Collaboration

- **Replication of the Manila Bay experience in other priority watersheds in the region**
  - Mobilization of expertise/networks established through GPNM and GNC Project
  - Application of modelling tools, policy tool box and guidelines
  - Documentation and dissemination of good practices
  - Conduct of policy/leadership forums/cross-learning
- **Linking the GEF/WB Knowledge Management Platform on enhancing capacity and performance of investments through knowledge sharing, portfolio learning and networking with the GPNM/Asian platform for GPNM**
  - Interaction among policymakers, implementers, networks and investors; address gaps in skills and services for implementation of management programs and investment projects
  - E-portal, e-library, e-directory, linkages to other systems

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Thank you!

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Annex 4

Position paper

Discussion paper

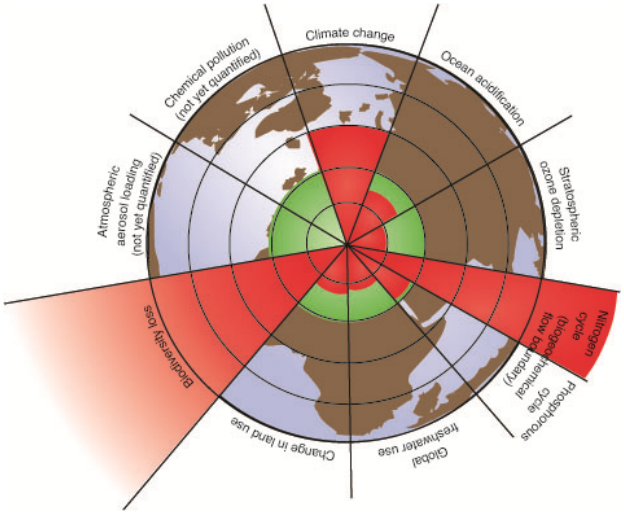
DRAFT FOR DISCUSSION ONLY

Technical and Policy Workshop
on Sustainable Nutrient Management
within the East Asian Seas Congress
Da Nang, Vietnam
November 2015

The Nutrient Challenge

An overview on the drivers for addressing sustainable nutrient management

The world needs to keep pace with population growth and food production to ensure global food security for its 7 billion inhabitants. Nitrogen and phosphorus are the key nutrients for growing crops and the food security of two-thirds of the world's population depend on the availability of these nutrients as fertilizers. We produce 120 m tons of reactive nitrogen and mine 20 m tons of phosphorus every year. Of these, around half of the mined phosphorus enters the world's oceans which is eight times the natural rate, while around 20% of nitrogen is lost through surface run-off and leaching into groundwater. Moreover, nitrogen fertilizers are also the source of gaseous reactive nitrogen[7] emissions. Globally, synthetic fertilizer and agricultural crops account for 12% of total ammonia emission and FAO prediction indicates that global nitrous oxide (N_2O) emission from fertilizers will increase to between 35 and 60% by 2030.



The publication *"Our Nutrient World: the challenge to produce more food and energy with less pollution"* was produced in 2013 jointly by the Global Partnership on Nutrient management (GPNM) and the International Nitrogen Initiative (INI) through the efforts of a group of 50 scientists from 15 countries. The report clearly outlined that sustainable nutrient management constitutes a nexus that unites many global resource management concerns. The report also underscored how improved management of nutrients would simultaneously make quantified contributions toward meeting existing global commitments for improving/protecting water, air, soil, climate and

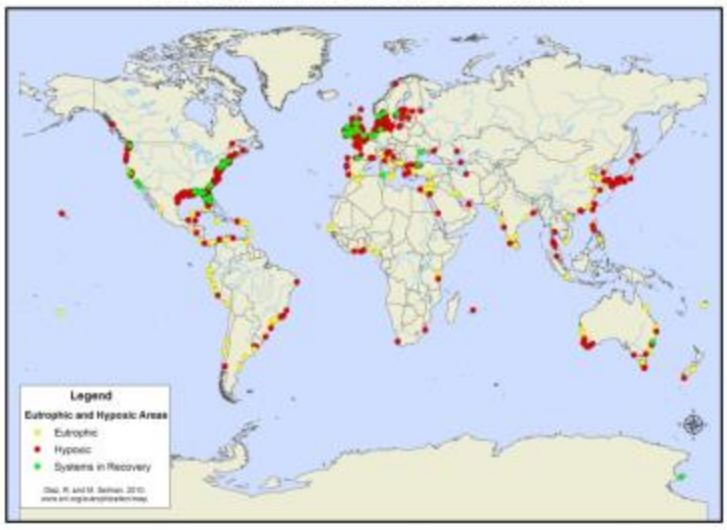
[7] Reactive Nitrogen (N_r) refers to all forms of N except for di-nitrogen gas (N_2). The Earth's atmosphere is made up of 78% N_2: this gas is so stable that it is not usable by most organisms, which instead depend on small amounts of N_r entering the environment (source: Our Nutrient World, 2013).

biodiversity resources. At the same time it would deliver consequent contributions to food and energy security with major net social and economic benefits. The report articulated the basis for global actions to improve nutrient use efficiency. It concluded that a 20% improvement in global nutrient use efficiency by 2020 would allow the world community to save nearly US$170 billion a year through contributions to improved human health, climate and biodiversity.

Poor nutrient management and associated challenges are a consequence of how nutrient inflows from fertilizers and manures are managed by crop and livestock producers, and how wastewater discharges from domestic, commercial, industrial wastewater generators are managed. In the context of crop production, in parts of Europe, China and India for example, the challenge is typically associated with excess fertilizer application to maximize yields, while in parts of the developing world, notably in parts of Africa, the challenge is mainly in respect to nutrient mining or depletion. In intensive livestock production there are issues with excess nutrient loading from direct manure discharges to the environment.

The increased release of nitrogen and phosphorous into the environment can be contextualized in relation to 'Planetary Boundaries', which define safe operating space for humanity with respect to the Earth system which are associated with the planet's biophysical subsystems or processes (Johan Rockström et al., 2009). It is concluded that reactive nitrogen releases have now greatly exceeded the accepted planetary boundary.

Poor nutrient is manifested in five key threats in terms of (1) **W**ater quality, (2) **A**ir quality, (3) **G**reenhouse balance, (4) **E**cosystems and (5) **S**oil quality, in short WAGES. It should be noted that air and greenhouse balance are inter-connected and that the ecosystems dimension is cross-cutting over all these threats.



Water quality: The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) through the Washington Declaration of 1995 and the Manila Declaration of 2012 is mandated to address excessive nutrient loading into fresh and marine waters from the local level, up to the regional trans-boundary, and global levels. Nutrient loads lead to eutrophication in fresh and coastal receiving waters, and under extreme conditions, lead to the onset of hypoxic conditions and impairment of aquatic ecosystem health that alters biodiversity status. This either creates conditions where sensitive species are negatively impacted and become threatened, or opportunistic species capable of surviving in such conditions displace the original species, transforming the ecosystem. This invariably leads to altered and in many cases reduced marine resource productivity in terms of commercial and artisanally exploited resources, in turn impacting livelihoods at both the local community and national levels. It has been estimated that about 80% of large marine ecosystems are subject to significant eutrophication in coastal waters (Selman et al., 2008; Diaz et al., 2010). The full

damage cost has not yet been assessed, but annual global loss of ecosystem services including damage to fisheries from coastal nitrogen and phosphorous pollution-related hypoxia alone costs an estimated US$170 billion (Our Nutrient World, 2013). A related problem associated with eutrophication and degraded quality of recreational fresh (rivers and lakes) and coastal waters is diminished aesthetic and recreational use value, which has serious socio-economic implications on local and national economies that are heavily dependent on tourism.

Secondary problems but no less important, are associated with contamination of drinking water resources at the local scale where nutrient-laden runoff from crop and livestock operation and wastewater disposals may permeate aquifers, rivers and lakes that are used for sourcing potable water. This contamination risk invariably leads to adverse health impacts at the local level particularly with respect to nitrates and nitrites in drinking water (WHO, 2011) translating to rising economic costs for treating illness with increased burden on the health care sector.

Air quality and **Greenhouse gas balance:** Another problem is that of air quality, through the volatilization of forms of reactive nitrogen from fertilizer application as well as contributions from industrial and combustion processes that generate air pollutants such as nitrogen oxides (NO_x) and ammonia (NH_3) which in turn contributes to increased human morbidity and mortality. These same processes have implications for greenhouse gas balances in terms of interactions with tropospheric ozone (O_3) and methane (CH_4), particulate matter, and alteration of carbon dioxide (CO_2) exchange due to atmospheric reactive nitrogen deposition. Nitrous oxide (N_2O) is now also the main cause of stratospheric ozone depletion, increasing the risk of skin cancer from UV-B radiation (GPNM 2013). The net effects are manifested on wide spatial scales of trans-boundary and global dimensions that have implications for changing climate and potential for increasing economic losses and adverse social impacts.

Ecosystems and biodiversity impacts are considered as cross-cutting given the interaction with water, atmospheric and soil nutrient cycling, where too much reactive nitrogen and phosphorous within the system can lead to the loss of species of high conservation value which are adapted to a specific natural nutrient balance. Further, too little nutrients in productive landscapes increases the risk of land-use change associated with agricultural incursions into virgin ecosystems.

Soil quality: In terms of impacts to soils, too much atmospheric reactive nitrogen deposition acidifies natural and agricultural soils altering productive capacity. On the other hand, an inability to match crop harvests with sufficient nutrient return to the soil leads to nutrient and organic matter depletion, leading to land degradation and increasing the risk of erosion. The net effect is reduced crop productivity and yield output, with consequent livelihood impacts from local community to the national level.

The culmination of the 'WAGES' of poor nutrient management is worsening socio-economic conditions particularly in parts of the globe where countries are resource-constrained to address the nutrient challenge.

The Global Partnership on Nutrient Management (GPNM)

A coordinated global multi-stakeholder approach to addressing the nutrient challenge within the framework of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)

Formation and GPNM Mandate: During the 17th session of the United Nations Commission on Sustainable Development in May 2009, the Global Partnership on Nutrient Management (GPNM) was launched as a global mechanism to bring together and harmonize what was perceived to be fragmented efforts to address the nutrient challenge amongst a great many number of stakeholders. These included government, research and academia, agricultural and fertilizer producer organizations in the private sector, regional and international intergovernmental organizations and non-governmental organizations.

The GPNM responds to the 'nutrient challenge' – how to reduce the amount of excess nutrients in the global environment consistent with global development. The GPNM provides a platform for governments, UN agencies, scientists and the private sector to forge a common agenda, mainstreaming best practices and integrated assessments, so that policy and investment options are effectively 'nutrient proofed'. The GPNM also provides a space where countries and other stakeholders can forge more co-operative work across the variety of international and regional fora and agencies dealing with nutrients, including the importance of impact assessment work.

The work of the GPNM is advanced by a Steering Committee, a sub-set of the Partnership members. The GPA Coordination Office within the United Nations Environment Programme (Division of Environmental Policy Implementation) serves as the Secretariat of the GPNM.

The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) and relationship to the GPNM: In 1995 the Washington Declaration established the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA). The GPA provides a comprehensive, yet flexible framework for guiding a country's response to major pollution problems and facilitating implementation action. A key component of the GPA framework is the development and implementation of National Programmes of Action (NPAs) for mainstreaming strategies for control of land-based sources (LBS) of pollution into national policies, and assist governments, industry, agriculture, other relevant sectors and local communities to prioritize their marine/coastal protection and development goals. One of the key focus thematic areas of the GPA is that of nutrient management in the context of minimizing the pollution of the marine environment from excess nutrient loading.

The GPNM and the Manila Declaration on Furthering the Implementation of the GPA: During the Third Inter-Governmental Review (IGR-3) meeting of the GPA held in January 2012 in Manila, the Philippines, UNEP reported on the GPNM and requested governments to endorse this partnership and provide guidance on programmatic implementation. Within the scope of the Manila Declaration that resulted from the IRG-3, the sixty-four attending governments and the European Union committed:

- *to step up efforts to develop guidance, strategies or policies on the sustainable use of nutrients so as to improve nutrient use efficiency with attendant economic benefits for all stakeholders, including farmers, and to mitigate negative environmental impacts through the development and implementation of national goals and plans;*

- *to support the further development of the Global Partnership on Nutrient Management (GPNM) and associated regional and national stakeholder partnerships, as well as their activities, including assessments as agreed by the partnership, and sharing of best practices*.

In effect, the Manila Declaration gave a clear mandate to GPNM, and also outlined the key areas of focus.

Read more on the Manila Declaration at: http://unep.org/gpa/documents/meetings/IGRIII/IGRIIIDraftManilaDeclaration.pdf; the proceedings of the IGR3 and other support documents at: http://unep.org/gpa/resources/IGR3.asp

Nutrient management and global frameworks

How does nutrient management fit in wider global commitments

There are many regional and international cooperative frameworks, which call for sustainable nutrient management – the core mandate of the GPNM. Those of key significance and relevance are discussed below.

Nutrients management in the Rio+20 Outcome Document: *The Future We Want*: The Heads of State and Government and high-level representatives, attending the June 2012 UN Conference on Sustainable Development in Rio de Janeiro, Brazil, noted *"with concern that the health of oceans and marine biodiversity are negatively affected by marine pollution, including marine debris, especially plastic, persistent organic pollutants, heavy metals and nitrogen-based compounds, from a number of marine and land-based sources, including shipping and land run-off. We commit to take action to reduce the incidence and impacts of such pollution on marine ecosystems, including through the effective implementation of relevant conventions adopted in the framework of the International Maritime Organization (IMO), and the follow-up of the relevant initiatives such as the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, as well as the adoption of coordinated strategies to this end"* (Para 163, emphasis added). The global leaders reiterated their commitment to promote, enhance and support more sustainable agriculture, that improves food security, eradicates hunger and is economically viable, while conserving land, water, plant and animal genetic resources, biodiversity and ecosystems and recognized *"the need to maintain natural ecological processes that support food production systems"* (Para 111).

Read more at:
http://www.uncsd2012.org/content/documents/727The%20Future%20We%20Want%2019%20June%201230pm.pdf

The Oceans Compact: The Oceans Compact is an initiative of the United Nations Secretary-General. In the Oceans Compact, the Secretary General articulated his vision and set one goal "Healthy Oceans for Prosperity". In this document the Secretary General called for *"reducing pollutants from sea and land-based activities, including gas and oil extraction, marine debris, harmful substances and nutrients from wastewater, industrial and agricultural runoff entering the world's oceans"* The Secretary General further urged that *"by 2025, based on collected scientific data, all countries set relevant national targets for nutrients, marine debris and wastewater".*

Read more at http://www.un.org/depts/los/ocean_compact/SGs%20OCEAN%20COMPACT%202012-EN-low%20res.pdf.

SIDS Accelerated Modalities of Action [S.A.M.O.A.] Pathway: The outcome of the Third International Conference on Small Island Developing States (SIDS Conference) which took place in September 2014 in Samoa, saw the endorsement by the Heads of States and Government of several key areas for priority action. Of direct relevance to the issue of nutrient management was within the 'Oceans and seas' priority area where governments agreed *"To address marine pollution by developing effective partnerships, including through the development and implementation of relevant arrangements, such as the United Nations Environment Programme Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, and, as appropriate, instruments on marine debris and on nutrient, wastewater and other marine pollution, and through the sharing and implementation of best practices."*

Read more at: http://www.sids2014.org/index.php?menu=1537

UN Convention on the Protection of Biological Diversity: The Aichi Target 8 states *"By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity."* This is highly relevant to the work of the GPNM and linkages to controlling excessive loading into fresh and coastal waterbodies that lead to ecosystem impairment.

Sustainable Development Goals (SDGs): Given the fact that nutrient management is integrally linked with food security and environmental sustainability, management of nutrients must be considered by countries while formulating plans to achieve the Sustainable Development Goals by 2030 countries have committed to. The following are the key goals and most relevant targets to nutrient management, however, recognizing the interlinkages between other goals and targets.

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Target 2.4: *By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.* Achieving this target will need to incorporate the concept of nutrient use efficiency (NUE) where application of nitrogen and phosphorous fertilizers are based on plant requirements, and that there is adequate nutrient replenishment to mitigate soil degradation.

Goal 6: Ensure availability and sustainable management of water and sanitation for all

Target 6.3: *By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.* This target is linked to minimizing excessive nutrient (reactive nitrogen and phosphorous) leakage to the environment that can result in adverse environmental conditions and pollution.

Target 6.a: *By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.* Nutrient recycling will feature prominently particularly in the area of wastewater reuse and capture of nutrients for recycling into agricultural production in particular. This is closely linked to building circular economies and enhancing cleaner production efforts.

Goal 12: Ensure sustainable consumption and production patterns

Target 12.2: *By 2030, achieve the sustainable management and efficient use of natural resources.* Achieving this target will include the aspect of nutrient management particularly related to use efficiency. Management of phosphorous reserves and micro-nutrients is of particular interest.

Target 12.4: *By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.* Achieving this target is related to abatement of excess nutrient leakage to the environment and pollution of fresh and coastal waters, and the atmosphere, particularly in the form of volatilized nitrogen compounds.

Target 12.5: *By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.* Improved nutrient use efficiency and recycling of waste streams, particularly wastewater to harvest nutrients for re-use will be relevant in achieving this target.

Goal 13: Take urgent action to combat climate change and its impacts

Target 13.2: *Integrate climate change measures into national policies, strategies and planning.* Nutrient management has direct relevance to this target particularly in the context of airborne emissions from volatilized nitrogen compounds (with greenhouse gas potential) released from agricultural cropping and livestock production systems in particular. An emerging issue is the potential increasing persistence and occurrence of prolific harmful algal blooms, caused by altered ocean and surface water body dynamics (temperature, chemistry and circulation) driven by climate change influences.

Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Target 14.1 *By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.* This target is directly related to addressing nutrient loading into the marine environment from land-based sources that include agricultural runoff (crop and livestock production), discharge of untreated domestic and industrial wastewater.

Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Target 15.3 *By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.* Addressing nutrient use efficiency will contribute to reducing land degradation particularly in circumstances where nutrient removal through crop/biomass harvest exceeds replenishment. Under these conditions the soils become fatigued and less productive, eventually leading to erosion as the capacity to sustain vegetative cover is diminished.

Supportive regional action frameworks to the GPNM

Nutrient management within regional seas programmes in the Asian region

There are inter-governmental frameworks that seek to conserve the marine environment in the Asia region within which sustainable nutrient management is embedded. The Regional Seas Programmes

best encapsulate strategic management objectives for protection of the marine environment, of which nutrient management is a key aspect. The relevant conventions associated with the establishment of the Regional Seas governance mechanisms take cognizance of the wider developmental priorities particularly related to utilization of shared marine resources. These priorities are elaborated further in global instruments such as the United Nations Convention on the Law of the Sea, the United Nations Convention on Biological Diversity and the Ramsar Convention which at national level, are implemented through respective development strategies and plans.

There are some key over-arching regional governance frameworks in the Asia region of relevance nutrients management. A brief overview of these is provided below.

The **South Asia Cooperative Environment Programme (SACEP)** is an inter-governmental organization, established in 1982 by the governments of South Asia to promote and support protection, management and enhancement of the environment in the region. SACEP also serves as the secretariat of **South Asian Seas Programme (SASP)**. SACEP is mandated to promote cooperative activities for the management and conservation of the environment in countries bordering the northern Indian Ocean, Bay of Bengal and the Arabian Sea. SACEP member states are Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

The **Coordinating Body on the Seas of East Asia (COBSEA)** is a UNEP-administered Regional Seas Programme with responsibility for implementation of the **East Asian Seas Action Plan** as mandated by its member states namely; Cambodia, China, Indonesia, Malaysia, Philippines, Republic of Korea, Singapore, Thailand and the Republic of Vietnam. The Action Plan for the Protection and Development of the Marine Environment and Coastal Areas of the East Asian Seas Region (the East Asian Seas Action Plan) was approved in 1981 and includes assessment of the effects of human activities on the marine environment, control of coastal pollution, protection of mangroves, seagrasses and coral reefs, and waste management. There is no regional convention; instead the programme promotes compliance with existing environmental treaties and is based on member country goodwill.

The **Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)** is a partnership arrangement involving various stakeholders of the Seas of East Asia, including national and local governments, civil society, the private sector, research and education institutions, communities, international agencies, regional programmes, financial institutions and donors. It is also the regional coordinating mechanism for the implementation of the **Sustainable Development Strategy for the Seas of East Asia (SDS-SEA)**. The partnership covers six large marine ecosystems namely, the East China Sea, the Yellow Sea, the South China Sea, the Sulu-Celebes Sea, the Gulf of Thailand and the Indonesian Seas, and includes the countries of Cambodia, China, Indonesia, Japan, the Democratic People's Republic of Korea, the Republic of Korea, Lao PDR, the Philippines, Singapore, Thailand, Timor Leste and Vietnam.

The **Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP)** was adopted in September 1994 as a part of the Regional Seas Programme of the United Nations Environment Programme (UNEP). Implementation of NOWPAP contributes to the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) in the Northwest Pacific region. This regional sea includes the countries of China, Japan, Republic of Korea and Russia.

Towards a GPNM agenda for action; where are we?

Sustainable nutrient management in the Asia region

The GPNM has been active in the Asia region, having launched the GPNM Asia Nutrient Platform in 2010, facilitated subsequent meetings of the Platform and its stakeholders and contributed to foundational research and capacity building for improved policy and best field management practices. The following is a summary of the key achievements of the GPNM in the region.

The GPNM Asia Platform: The GPNM Secretariat facilitated the launch of the Platform in a meeting in June 2010 in Delhi, India followed by another in November 2011 in Beijing, China. The Delhi meeting was co-hosted by the International Nitrogen Initiative (INI) South Asia chapter and attended by country representatives from Bangladesh, China, India, Indonesia, Japan, Malaysia, Sri Lanka and Vietnam, along with academia and the science community and the private sector. The Beijing meeting was hosted by the China Agricultural University Beijing and was attended by representatives from governments, industry and the science community from Bangladesh, China, India, Indonesia, Malaysia, Sri Lanka, Thailand and Vietnam, including representatives from the international research community and the fertilizer industry.

Both meetings considered concerns about use and abuse of nitrogen and phosphorus in the form of fertilizer, more efficient utilization of nutrients, potential for recycling organic residues, use of commercial organic fertilizers and plugging leakage of excess nutrients emanating from anthropogenic usage including agriculture. Coastal deposition of nutrients was recognized as leading to hypoxic and anaerobic hot-spots affecting valuable ecosystem services. The meeting agreed that more work needs to be done to determine climatic influences on nutrient fluxes into the environment.

Key areas for action for the Platform (clustered by theme) that emerged from the two meetings to be implemented both at the national and regional levels included:

<u>Development of knowledge (policy & technical) products</u>

- Compile baseline data for each country on the status of nutrient management;
- Inventory best management practices being implemented; compare application of nutrient efficiency management technologies among countries;
- Enhance knowledge exchange on the transport and fate of nutrients in the environment;
- Delineate and identify nitrogen and phosphorus sources: agriculture and aquaculture, land erosion, atmospheric deposition, domestic and industrial wastes, forests;
- Facilitate nutrient management data sharing;
- Develop common/standardized methodologies for data collection;
- Develop common criteria and identify hotspots for further investigation (inclusive of criteria that enable identification of pathways that contribute most (or least) to N loss);
- Formulate policy measures to encourage balanced fertilization and integrated nutrient management to ensure higher nutrient use efficiency, greater soil health, crop yields and profitability with minimum environmental footprint;
- Facilitate the interlinking of “on-line fertilizer management recommendations” to field practice based on soil tests and support from tools such as GIS and GPS-based soil maps;
- Prepare GIS and GPS-based soil fertility maps.

Demonstration and innovation

- Promote use of nanotechnology and newer forms of fertilizers for greater nutrient uptake and utilization;
- Advocate for investment in organic manures and utilization of bio-fertilizers;
- Develop and promote non fossil-fuel based technologies for nutrient supply;
- Develop national action plans with associated policy support for site-specific nutrient management (SSNM);
- Improve/upgrade soil test laboratories for soil, plant, water and manure analysis;
- Fine-tune urea briquette application technologies;
- Promote investment in science-based customized fertilizer solutions and enhance relevant policy support from government to industry;
- Compare application of nutrient efficiency management and technology among countries/research institutions (universities).

Advocacy and awareness-raising

- Strengthen capacity in all areas of sustainable nutrient management building and build Communities of Practice;
- Advocate for governments and industry to promote best fertilizer management practices (focus on the 4Rs; right quality, right quantity, right time and right place);
- Develop effective outreach and dissemination methods with articulation of key messages to global, regional (Asia platform) and national level stakeholders.

Partnership strengthening

- Facilitate effective collaboration between participating countries and sister institutions for detailed analysis of the impact of agriculture and land-use change and other enterprises on nutrient flow to the oceans;
- Identify critical stakeholders with emphasis on bringing industry and governments on board, including transparent and participatory approaches to identify partners (especially researchers);
- Create regional soil testing laboratories for quality assessment;
- Develop a regional network for an integrated coastal monitoring and prediction system for nutrient loading to the oceans;
- Form consortia of stakeholders within country and within the region.

Additional significant GPNM-supported activities in the region:

(a) **GEF-funded Global Nutrient Cycling Project:** The project supported convening of Asia Platform meetings and engagement of stakeholders in various international fora, and has contributed to development of a coastal ecosystems health monitoring protocol in the form of an "Ecosystem Health Report Card" and demonstration of best practices at Chilika Lake in Odisha State in India and within the Manila Bay (and Laugua de Bay) watershed in the Philippines. The project has also contributed to the development of a dedicated web portal of the GPNM (www.Nutrientchallenge.org). A significant body of knowledge related to quantitative modelling approaches on coastal nutrient enrichment has now been generated with several published scientific journal articles available. A comprehensive suite of best field and policy management practices has now been integrated within a Nutrient Management Toolbox, also developed under the project and accessible through the Nutrientchallenge.org website. Validation of the

toolbox functionality with stakeholders was undertaken in a July 2015 training activity with agricultural advisory professionals and farmers at the Chilika Lake demonstration site. Watershed-based nutrient flux modelling has been on-going for the Manila Bay watershed to support the design of watershed BMPs and strategies for addressing nutrient loading into the receiving environment. Work on the various products such as the Environmental Atlas of Manila Bay and the Laguna de Bay Health Report Card and the Management plan is on-going.

(b) **Assessment on nutrient loading and eutrophication:** The GPNM in cooperation with the Bay of Bengal Large Marine Ecosystem (BOBLME) Project and the South Asia Cooperative Environment Programme (SACEP) completed a review study on *Controlling Nutrient Loading and Eutrophication of Coastal Waters of the South Asian Seas*. The paper was presented at a sub-regional validation workshop in May 2014 in Colombo, Sri Lanka. The paper identified major gaps in data availability needed for assessment work such as production and use of fertilizers, estimates of detergent phosphate uses and quantities and sewage reaching the coast. The study concluded that South Asian estuaries appear to be largely heterotrophic and denitrifying systems and hence may be influenced by nitrogen pollution. Sewage treatment before discharge to receiving waters is limited and hence an important source of nutrient pollution. Additionally, the large livestock population in the South Asian countries is a major contributing factor. Inorganic fertilizer usage has been steadily increasing in India and Pakistan though it is coming down marginally in the other countries in the region, but studies to estimate the impacts in receiving waters are scarce. Participants at the workshop proposed a set of goals to realize "South Asian Seas free of nutrient pollution by 2020" as follows:

   a. *Establish use-dependent ambient marine water quality standards for the SA seas and implementation of such regulations with greater transparency between countries;*
   b. *Enhance the nutrient efficiency and recovery in the agriculture, livestock, poultry and aquaculture sectors;*
   c. *Improve the management of nutrient recovery in sewage;*
   d. *Improve waste disposal mechanisms in major and minor harbors and fish landing sites;*
   e. *Efficient solid waste management through enhanced awareness and opportunities.*

(c) **Major conference on nutrients management:** In June 2013 the GPNM in partnership with the International Fertilizer Development Center (IFDC) organized a joint conference on sustainable nutrient management in Beijing. The conference, also held in conjunction with the first International Conference on the Global Transdisciplinary Processes for Sustainable Phosphorous Management (Global TraPs), and was hosted by the China Agricultural University with support from the Ministry of Agriculture and the Ministry of Education. The conference, attended by some 150 participants discussed challenges and showcased case studies aimed at addressing the challenges.

Towards an institutional mechanism for the GPNM Asia Platform

Principal mandate and operating modalities

The following is for consideration by the delegates attending the Nutrients Management Workshop hosted by the GPNM within the 2015 East Asia Seas Congress, as well as for consideration by other

collaborators from the region engaged in prior platform advisory activities. It summarizes the mandate of the GPNM Asia Platform, the relationship of the work of the Platform within the scope of the GPNM at the global level, and a proposal for country hosting/chairing of the Platform within the context of wider relevant regional governance frameworks. It is anticipated that the outcomes of deliberations from the workshop will contribute to the positions advanced in this paper, and be fed into the EAS Congress 2015 Ministerial Forum with key recommendations for action by the Platform.

Core mandate of the Regional Platform: Stakeholders in the region (based on discussions in the Delhi and Beijing meetings) recommended the establishment of a Secretariat for the Asia platform with active support from the GPNM global Secretariat. The regional platform would principally be engaged in (a) analysis and synthesis of knowledge, (b) dissemination of knowledge through on-line information sharing, (c) fostering of collaborative activity amongst stakeholders, (d) facilitating forecasting through modeling applications, (e) piloting demonstration of specific knowledge and technological interventions in soil conservation, agriculture, aquaculture and animal husbandry, and (f) producing policy briefs. Importantly, the Platform will need to facilitate actions in light of outcomes of prior meetings, taking into account conclusions of various studies and projects that are of relevance to the region within the scope of work of the GPNM.

Alignment of the work of the Regional Platform to the global GPNM partnership: The work of the regional platform should be aligned to the workplan of the GPNM at the global level which is clustered into four (4) key areas;

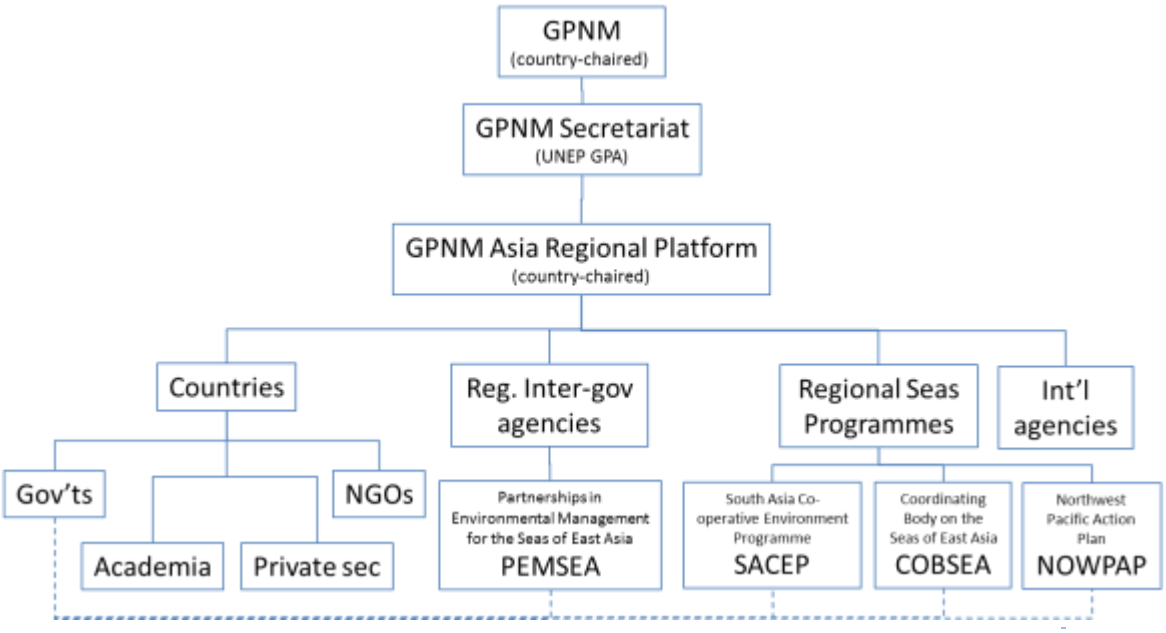
(1) Contribution to development of knowledge (policy & technical) products to inform decision making amongst policy makers, professionals, farmers, private sector;
(2) Provision of support for piloting and replication of appropriate pilot solutions and BMPs for sustainable nutrient management and pollution reduction with focus on developing countries, sharing lessons from developed countries;
(3) Generation of awareness resources and social marketing tools and facilitating easy dissemination (via the GPNM platform and other ICT tools) to influence farmers, extensionists, policy makers and other stakeholders to drive change in behaviors and practice; and
(4) Contribution to continued strengthening of the GPNM to facilitate expanded global and regional partnerships, particularly through Regional-level Nutrient Management Platforms.

It is recommended that the work of the Regional Platform be planned and implemented over a five-year horizon.

Country support for the Secretariat: The Beijing meeting recommended that (perhaps initially) the Asia Platform Secretariat be hosted jointly between China and India, on a rotational basis between the two countries. The country(ies) will have lead responsibility to drive a programme of work for the platform, consistent with the work programme of the global GPNM. A recommendation was made to assign Thailand to lead the programme on capacity building and Indonesia to lead assessment and monitoring of coastal/marine nutrient pollution.

Inter-relationships between GPNM global and the Regional Platform: The Regional Platform will fall under the global GPNM, supported by the GPNM Secretariat within the UNEP's GPA Coordination Office. The regional platform should be led by a country-chair that will provide overall leadership in both technical and policy arenas. The Platform itself should be constituted by national governmental representatives, ideally from ministerial portfolios that are of closest relevance to nutrients management, and other stakeholders such as industry, the science community and civil society organisations. It is recognized that ministerial portfolios may either encompass all or part of the

nutrient management spectrum (agriculture, wastewater management, coastal zone /marine resource management, water resources management) in any given country, hence it will be left to countries to determine institutional representation on the Platform. It should be noted however that given the orientation of the GPA and the wider governing framework within the Manila Declaration, and the close nexus to the Regional Seas Programmes, countries are strongly urged to maintain close alliances to the Regional Seas focal point agencies in cases where the Platform focal point agency may be different. The graphic below illustrates the structural relationship between the Platform, regional and global entities.



Annex 5

Summary statement for the congress proceedings

Special Event: Workshop Technical and Policy Workshop on Sustainable Nutrient Management in support of the Asian Platform of Global Partnership on Nutrient Management (GPNM)

Issues:

- ***Nutrient loading from agricultural runoff and untreated wastewater:*** *Countries attending the workshop, namely Cambodia, China, Indonesia, Korea, the Philippines, Thailand and Vietnam noted that crop and livestock production are significant non-point and point-source contributors of nutrient loads to fresh and coastal waters. Untreated and inadequately treated domestic wastewater discharges from coastal cities and communities are also significant nutrient contributors, with noted concern over the rapid rate of expansion of urban footprints and impacts to the marine environment in the region.*

- ***Eutrophication and harmful algal blooms (HABs):*** *Algal blooms are natural ecosystem processes but their frequency of occurrence and extent is increasingly exacerbated by land-based contributions of nutrients and climate change drivers in the context of changing ocean dynamics. Shoreline physical development is known to create conditions that may be more conducive to HABs within inshore areas due to current circulation modification. HABs negatively affect fisheries resources through degraded ecosystems and can impact human health through seafood poisoning from toxins released by algae. The proliferation of eutrophic and dead-zones worldwide is estimated to result in annual economic losses of approximately 200 billion/year.*

- ***Fragmented response across countries:*** *There is need for sharing of common approaches between countries in the Asia region in addressing nutrient management both from the standpoint of efficient use of nutrients at points of application within production systems, and designing and implementing solutions to mitigate nutrient excess and leakage to the environment. There is need to strengthen the profile and reach of the Global Partnership on Nutrient Management (GPNM) within the Asia region to assist countries in this regard.*

Conclusions:

- ***National responses to address nutrient management:*** *The nutrient challenge is a multi-layered complex issue that needs to be addressed in an integrated manner across many sectors, recognizing the agricultural and wastewater management sectors as key areas for intervention. Countries need to continue efforts in addressing the nutrient challenge and support governance mechanisms at the national level; this includes implementation of appropriate incentive frameworks and regulatory tools directed at nutrient use and discharge controls to facilitate adoption of best practice.*

- ***Recognition of work in progress:*** *There is much work already in progress in many countries in the region but can they can benefit further from shared experiences and lessons learnt. The GEF-funded Global Nutrient Cycling Project has contributed to best practices in sustainable nutrient management through expansion of the foundational knowledge base through demonstration in Chilika Lake, Odisha State in India, and in the Manila Bay watershed and Laguna de Bay in the Philippines.*

- ***Coordinated global approach to nutrient management:*** *The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), established in 1995 is the only global inter-governmental mechanism explicitly addressing the linkages between freshwater, coastal and marine environments. Its mandate, which was strengthened at GPA's third Inter-Governmental Review (IGR-3) in 2012 through the adoption of the Manila Declaration, directed focused attention to the issue of nutrient pollution through a Global Partnership on Nutrient Management (GPNM).*

Recommendations*:*

- ***Country representation within a GPNM Asia Regional Platform:*** *The GPNM needs to continue efforts to realize a Regional Platform for Asia that helps countries share lessons and coordinate efforts in addressing the various aspects of the nutrient challenge. The Regional Seas Programmes (RSPs), specifically the South Asia Cooperative Environment Programme (SACEP)[8], the Coordinating Body on the Seas of East Asia (COBSEA)[9]*

[8] SACEP members: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka

and the Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP)[10] should be entry points for the GPNM Asia Nutrient Platform. This will facilitate more formal engagement and commitment by countries within the Asia Platform through the formal governing council and implementation mechanisms of the regional seas programmes. The Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) is a key partner to the GPNM contributing technical and scientific inputs to advance best management practices. This cooperation should be expanded under the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA) framework.

- ***Asia Regional Platform within GPNM global advocacy:*** *There should be country representatives from each of the regional seas regions, namely South Asia, East Asia and the Northwest Pacific on the GPNM global Steering Committee to enhance global leadership and advocacy that will reflect the positions of the Asia region. The designates from each of these sub-regions will provide representation on behalf of their respective sub-regional country groupings.*

- ***Defining the work of the Asia GPNM Platform:*** *The Regional Platform should work closely with the GPNM and its Secretariat within the UNEP-GPA Coordination Office to develop a Work Plan based on priority themes, endorsed by the Platform member countries. This work plan will need to integrate the work on nutrient management across overall and sectoral developmental plans within relevant national and regional strategy frameworks.*

[9] COBSEA members: Cambodia, China, Indonesia, Malaysia, Philippines, Republic of Korea, Singapore, Thailand, Republic of Vietnam

[10] NOWPAP members: China, Japan, Republic of Korea, Russia

Annex 6

Statement contributed to the Ministerial Forum

Countries recognized the value of the support provided by UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) in addressing the global issue of nutrient pollution into the ocean environment, through the support of the Global Partnership on Nutrient Management (GPNM). Countries supported the strengthening of an Asian GPNM Regional Platform to promote the exchange of best practices and advocacy in sustainable nutrient management, to effect national policy to reduce degradation of the marine resources of the Asian region.