UNITED NATIONS ENVIRONMENT PROGRAMME

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Программа Организации Объединенных Наций по окружающей среде برنامج الأمم المتحدة للبيئة

联合国环境规划署

UNEP

PROJECT DOCUMENT

SECTION 1: PROJECT IDENTIFICATION

1.1 **Project title:** Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of Global Nutrient Cycle

1.2 Project No. **ADDIS #00593 (GEF ID#4212)**

1.3 Project type: **FSP**

1.4 Trust Fund: **GEF**

1.5 Strategic objectives: **IW-SP2**

1.6 UNEP priority: Ecosystem Management, Resource Efficiency, Harmful Substances and Hazardous Wastes

1.7 Geographical scope: **Global**

1.8 Mode of execution: **Internal**

1.9 Project Executing Agency: **UNEP**

1.10 Duration of Project: **4 years** **Commencing May 2011**
Completion May 2015

1.11 Cost of project:

Cost to the GEF Trust Fund: $1,718,182
Co-financing: $2,398,165
Total Cost of Project: **$4,116,347**

Sources of Co-financing	Type of Co-financing	Amount $	%
Governments: 1. US 2. Netherlands 3. India (Lake Chilika Development Authority)	In-kind	 320,000 57,600 20,000	16.57
UNEP	Cash 250,000 In-kind 511,765	761,765	31.76
IOC/UNESCO	Cash 192,000 In-kind 188,000	380,000	15.84
PEMSEA	In-kind	305,000	12.71
Global Environment Technology Foundation	In-kind	141,800	5.91

International Nitrogen Initiative	In-kind	180,000	7.54
University of Utrecht Washington State University Institute of Ocean Management, Chennai	In-kind	123,000 79,000 30,000	9.67
Total Co-Financing		**2,398,165**	**100.00**

1.12 Project summary

Project Rationale

The rationale for project intervention operates on two linked scales:-

- the more specific, relating to nutrient over-enrichment and oxygen depletion in coastal areas and the logic and timing for intervening now in the way proposed by the project,

- and the broader scale, which sets the context for intervention, and which relates to the overall level of excess nutrient use and the resulting global nutrient cycle,

The broader arguments can be summarized as follows:-

- the very large increases in the levels of nutrients such as nitrogen and phosphorous having entered the world's environmental media because of human activity - agriculture, wastewater, burning of fossil fuels

- the global extent, nature and developing severity of the environmental problems caused by this nutrient excess, including air and ground water pollution, and in the case of coastal waters eutrophication and oxygen depletion and the associated damage to ecosystems, biodiversity and coastal water quality

- the increasingly global and cross-boundary drivers leading to these problems, problems which are set to increase, notably in coastal waters, in severity and scope in the light of increased food and energy production, and coastal urbanization to the growing economic cost of countries and their stakeholders

- the complexity of the issues - given that nutrients are multi-source, have multi-effects, and impact at various scales - and the relative lack of awareness of the problems excess nutrients bring

- the need for countries and their stakeholders to shift towards a focus on sustainable production and use of nutrients if key development goals such as food and energy security (Green Economy) are to be achieved sustainably

- this means lower nitrogen and phosphorous inputs to human activities through agreed efforts to limit and treat discharges, promote efficiencies and incentives in production, and make full use of re-cycling opportunities

- *but* the lack of a sufficient governance and management framework (at global and national levels) to trigger effective, strategic and practical action by countries and their stakeholders to control and reduce nutrient use in the way described.

The logic for project intervention should be seen in this broader context of the underlying causes for nutrient over-enrichment and the need to change patterns of use.

The more specific arguments for project intervention in the way proposed in this document can be summarized as follows:-

- the project directly addresses the underlying problem described above of the lack of a sufficient governance and management framework for governments and stakeholders to take effective action on reducing nutrient inputs and improving efficiency of use,

- it does this in a practical, systematic and catalytic way, which, has the clear potential to promote and instigate transformative change on the management of nutrient over-enrichment contributing to broader environmental sustainability benefits,

- the project can be successful in fulfilling this aim because it is constructed so as to provide countries in a coherent and accessible way with the information, tools, and policy options, necessary to stimulate and incentivize *cost effective action in developing nutrient reduction strategies* to the benefit of coastal areas and stakeholders generally,

- a key part of which is that the project, through the application of tested nutrient source-impact models in conjunction with best practice policy options, will for the first time provide a replicable 'road map' approach as to which investments and actions across a range of nutrient related sectors can be most cost effective and environmentally beneficial,

- and because the project structure, recognizes that success in countries in initiating the necessary transformative action will also require a supportive political trigger and catalyst linked to the right integrated institutional and stakeholder framework, which brings out the wider sustainable development benefits of more effective nutrient management,

- to this end, the project design and outcomes, including modeling and best practice work, are set within, and seek to further promote cross sectoral integrated management in the form of integrated watershed and coastal management, making full use of related initiatives such as the Global Programme of Action (Washington GPA), the regional seas programme, and the GEF IW trans-boundary programme,

- at the same time, a Global Partnership on Nutrient Management, provides an over-arching catalyst to political and institutional engagement in international and regional fora, working across the GEF nutrient related portfolio to set in motion associated regional and national stakeholder partnerships, and providing an ongoing platform for the uptake and application of the project outcomes

Underpinning and connected to these arguments are a number of clear timing rationales for project intervention in the way proposed at this juncture.

First, unless technological advances and policy changes are implemented nutrient inputs to watersheds associated with agriculture, sewage and fossil fuel combustion are projected to more than double by 2050 (Millennium Ecosystem Assessment 2006) with consequential intensification of eutrophication and hypoxia in many regions, notably in Asia and Africa. There will be a growing economic cost to countries in terms of the degradation of valuable marine and coastal natural resources and the services and jobs they provide, which could undermine targets set by the World Summit and make it harder to achieve elements of the MDGs. Further degradation of coastal ecosystems could also undermine their contributing to meeting climate change. Effective project intervention is timely.

Secondly, the GEF portfolio (and other initiatives) of nutrient related work in various regions has advanced to a point where an overview and inventory of best practice measures and tools should be effectively brought together for global benefit in a systematic Tool Box – one of the project outcomes. GEF can build on its initial leadership through heightened attention to nutrients in a more integrated, cross programmatic and cross GEF agency manner.

Thirdly, modeling and analytical techniques have likewise advanced to the point where the causes and effects of nutrient over-enrichment in watersheds around the world can be effectively quantified. They can combine and integrate the impacts of drivers and sources of nutrients, and be used to evaluate and map present day contributions of different watershed based nutrient sources to coastal nutrient loading and their effects, indicating when nutrient over-enrichment problem areas are likely to occur, and estimate the magnitude of expected effects of further nutrient loading on coastal systems under a range of scenarios. This provides a frame of reference by which to assess the likely impact and thus cost-effectiveness of the various policy options related to managing nutrient impacts from key source sectors, which are brought together under the Tool Box.

This combination of Tool Box and modeling techniques will enhance the capacity of resources managers and policy makers to anticipate impacts of nutrient over-enrichment, providing in effect a road map as to which investments and decisions policy makers can better make in addressing root causes of coastal over-enrichment through nutrient reduction strategies.

In this context, the value of the Manila Bay watershed in order to apply and insert the combination of modeling and tool box provides a further compelling rationale in support of the project. The nature of the watershed and its institutional and stakeholder structure will enable highly policy relevant interventions – a nutrient reduction plan based on full cross agency and stakeholder engagement – to be facilitated, making full use of the modeling and best practice approach described above. Underpinning this is a specific legal requirement from the Philippines Supreme Court that the Philippine government agencies and other bodies should work together in restoring the water quality of the Bay and its coastal area, addressing in so doing the root causes of the current degradation, including the problems of nutrient over-enrichment.

These circumstances provide the opportunity to not only insert effective nutrient reduction planning into the heart of decision making in a major watershed and conurbation in a developing country consistent with national and local priorities, contributing to a real improvement in coastal water quality for millions of people, but in so doing facilitate the development of tools and approaches of wider global application.

To conclude, the broader nutrient excess context, the specific modeling, best practice and partnership approaches entailed in the project, wedded to the benefits of timing and working productively in the proposed demonstration area provide a clear and timely added value for project intervention. By addressing causes of eutrophication and hypoxia, the project is designed to initiate transformative action by countries and other stakeholders on nutrient reduction leading to the benefits:-

- of improved water quality and more resilient coastal ecosystems
- from the stimulus to the take up of adaptive integrated watershed and coastal zone management,
- and from the resulting shift towards more sustainable nutrient management generally and its contribution to moves towards a Green Economy.

Project Objective, Outcomes and Outputs

The project meets this rationale and associated benefits by setting and seeking to achieve the following objective: -

- *to provide the foundations (including partnerships, information, tools and policy mechanisms) for governments and other stakeholders to initiate comprehensive, effective and sustained programmes addressing nutrient over-enrichment and oxygen depletion from land based pollution of coastal waters in Large Marine Ecosystems.*

This is to be achieved through a number of core project outcomes and outputs, which were referred to in the project rationale and which can be summarized as :-

- the development and application of quantitative modeling approaches: to estimate and map present day contributions of different watershed based nutrient sources to coastal nutrient loading and their effects; to indicate when nutrient over-enrichment problem areas are likely to occur; and to estimate the magnitude of expected effects of further nutrient loading on coastal systems under a range of scenarios

- the systematic analysis of available scientific, technological and policy options for managing nutrient over-enrichment impacts in the coastal zone from key nutrient source sectors such as agriculture, wastewater and aquaculture, and their bringing together an overall Policy Tool Box

- the application of the modeling analysis to assess the likely impact and overall cost effectiveness of the various policy options etc brought together in the Tool Box, so that resource managers have a means to determine which investments and decisions they can better make in addressing root causes of coastal over-enrichment through nutrient reduction strategies

- the application of this approach in the Manila Bay watershed with a view to helping deliver the key tangible outcome of the project – the development of stakeholder owned, cost-effective and policy relevant nutrient reduction strategies (containing relevant stress reduction and environmental quality indicators), which can be mainstreamed into broader planning

- a fully established global partnership on nutrient management to provide a necessary stimulus and framework for the effective development, replication, up-scaling and sharing of these key outcomes.

Project components:

The key outcomes outlined above are reflected in 4 main operational components – Component A, the global partnership, Component B, the development of the modeling techniques, Component C, the development of the Policy Tool Box and the integration of the tools with the modeling techniques, and Component D, the application of tools and modeling techniques in the Manila Bay watershed to produce actual nutrient reduction strategies both for mainstream adoption in that area, and as a model for the development and application of nutrient reduction strategies in other regions. Each component will contribute to overall lessons drawn and potential for replication and up-scaling, which will be disseminated in an inter-active way through the Component A partnership, which continues after project completion to provide sustainability.

In addition to the 4 operational components, two over-arching components are represented by *Component E - monitoring and evaluation effective project co-ordination, and Component F –management and over-sight.*

The following gives a brief overview of the main outcomes and outputs intended from components A to D.

Component A: *Global Partnership on Nutrient Management addressing causes and impacts of coastal nutrient over-enrichment and hypoxia*

Total resources: $766,500 : GEF grant 316,000 co-finance 450,500

Main outcomes

- Global partnership of stakeholders actively involved in addressing nutrient over - enrichment in coastal water

- GEF projects, countries and stakeholders: -

  - better informed about the importance of eutrophication & hypoxia, including environmental and economic costs, and

  - have access to ongoing guidance & support for development & implementation of nutrient reduction strategies

Main outputs:

- partnership establishment and stakeholder involvement
- partnership and project communication strategy, including web platform
- global overview of nutrient over-enrichment/*eutrophication/*oxygen depletion
- synthesis report identifying emerging issues and knowledge gaps
- establishment of Community of Practice, including web-based platform targeting GEF related projects as part of IW Learn, as well as eXtension agricultural services
- participation at and input to GPA review and GEF IW conferences
- replication and up-scaling of good practices and lessons learnt

Component B: *quantitative analysis of relationship between nutrient sources and impacts to guide decision making on policy and technological options*

Total resources $1,192,847 :GEF grant 488,682, co-finance 704,165

Main outcomes

- Relevant stakeholders in developed and developing countries have basis and tools available to:-

  -attribute sources of nitrogen (N), phosphorus (P)and silica (Si) within watersheds
  -quantify past, current and potential future export of N, P and Si to the coastal zone
  -develop estimates of the relative efficacy of increases/decreases in nutrient export on coastal water quality at regional to international scales

Main outputs:

- overview of existing tools for source-impact analysis
- global data bases on nutrient loading, occurrence of harmful algal blooms and hypoxic areas, and on coastal conditions, nutrient sources and effects
- nutrient impact modeling to provide source-impact analysis at global/regional scales and in relation to Manila Bay watershed, enabling predictive capability/ assessment of effects/and development of regional models and maps
- summary models and analysis tailored to assist policy making
- training of regional and national scientists/policy experts in source impact modeling
- source impact guidelines/user manuals for integrated assessment and nutrient criteria to assist policy makers

Component C :*establishment of scientific, technological and policy options to improve coastal water quality policies in LMEs and national strategy development*

Total resources $771,000: GEF grant 329,500, co-finance 441,500

Main outcomes:

- Decision-makers have informed and interactive access, to cost effective, replicable tools and approaches to develop and implement nutrient reduction strategies in LMEs

Main outputs:

- global overview and inventory of technological/policy options to reduce nutrient over-enrichment
- in depth case studies of technology/policy options, including analysis of cost effectiveness and success
- synthesis report providing review of regulations, measures etc to reduce nutrients
- replication and up-scaling strategy for above
- consolidated policy toolbox (bringing together above outputs) containing detailed summaries of policy options, technology measures and their achievements, costs, socio-economic impacts, infrastructure required

- application of source-impact analysis from component B to the Policy Toolbox to illustrate and communicate method for integrated approach to investments and decision making on nutrient reduction
- regional and national scientists and policy experts, particularly from developing countries, trained in using the above outputs in order to develop nutrient reduction strategies

Component D: *Development of nutrient reduction strategies through application of quantitative source-impact modeling and best practices in Manila Bay watershed*

Total resources $892,000: GEF grant 330,000, co-finance 562,000

Main outcomes:

- Strengthened information and decision support system on nutrient issues for the Manila Bay watershed as part of integrated approach to overall water quality
- Agreement with government agencies and relevant stakeholders in the Manila Bay watershed on nutrient reduction strategies to be implemented (incorporating stress reduction and environmental quality status indicators), including their effective insertion into integrated national water quality planning for the Bay area
- Application and implementation of ecosystem nutrient health report card in Lake Chilika, India and Laguna de Bay, Manila, including as part of overall nutrient reduction strategies for Manila Bay watershed
- Accessible up scaling and replication strategy shared interactively with countries, GEF projects & stakeholders for development and implementation of nutrient reduction strategies, both for other watersheds in the [Manila region] as well as for other regions and globally

Main outputs:

- Development and integration of indicators, information and reporting on nutrient issues and indicators in Manila Bay watershed into Manila Bay State of Coast's reporting system
- compilation and analysis of best nutrient reduction practices for Manila bay area engagement with key sectors and
- application of source-impact modeling and best practices to produce draft nutrient reduction strategies for Manila Bay watershed
- adoption of nutrient reduction strategies as part of overall approach to water quality improvements in Manila Bay watershed
- application of ecosystem health card for nutrient over-enrichment and impacts for estuarine and delta areas (developed in Lake Chilika, India, as well as Manila Bay watershed)
- evaluation of lessons learned during the development of nutrient reduction strategies, including work on ecosystem nutrient health card in Lake Chilika/Lake Laguna

Sequencing of Component outcomes and outputs:

Initial outputs are focused on developing the overall partnership architecture for the project under component A as well as the best practices and associated Tool Box under Component C, where advantage will be taken of (and input given to) up-coming meetings in 2011 such as the Global Programme of Action (GPA) review and the GEF IW Conference. There will also be a focus on early outputs in the Manila Bay watershed area in terms of strengthening the decision support system, and engagement with sectors and other stakeholders on nutrient reduction best practice approaches. This will build support for project aims in the region, notably with a view to developing a road map approach to eventual nutrient reduction strategies. The nutrient health reporting card will be developed first in Lake Chilika and then in the Manila Bay area with a view to its being ready in years one and two of the project for implementation.

Regarding the source-impact modeling work, the initial focus will necessarily be on data collection and assembly, including in relation to the Manila Bay watershed. Global and regional data bases will become available in years one and two of the project, and will form the basis for the development and application of first versions of the source-impact modeling. First versions of the models and associated analysis at both the global level and in relation to the Manila Bay watershed will be available at mid- term review, and subsequently for initial application and refinement in discussion with stakeholders, including in Manila Bay along with best nutrient reduction practices.

Activities then focus on practical application of the modeling and analysis and best practices to produce final versions of policy relevant models at both the global and Manila Bay levels, culminating in the latter case in the development of nutrient reduction strategies for the Manila Bay watershed in conjunction with government agencies and other stakeholders. Workshops and associated training reflect this sequencing with activities combined across components where suitable to maximize interaction between science and policy makers. A final stage would be see the nutrient reduction strategies fully integrated within broader improved water quality planning in the Manila Bay watershed and lessons drawn in conjunction with stakeholders and experts cross the work of the project for final replication and up-scaling.

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Acronyms and Abbreviations

AMR	Annual Monitoring Review
DENR	Department of Environment and Natural Resources, Government of the Philippines
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
Global NEWS	Global Nutrient Export from Watersheds
GPA	Global Programme of Action for Prevention of Marine Pollution from Land Based Activities
HABs	Harmful Algal Blooms
HELCOM	Helsinki Convention on the Protection of the Baltic Sea Area
ICEP	International Coastal Eutrophication Potential
IGBP	International Geosphere-Biosphere Programme
IHDP	International Human Dimensions Programme
INI	International Nitrogen Initiative
IOC	International Oceanographic Commission
ICM	Integrated Coastal Management
IMC	Inter - Ministerial Committee
IW	International Waters
IWRM	Integrated Water Resources Management
LME	Large Marine Ecosystem
LOICZ	Land-Ocean Interactions in the Coastal Zone, an IGBP programme
MBCS	Manila Bay Coastal Strategy
MDGs	Millennium Development Goals
OSPAR	Oslo and Paris Conventions for the Protection of the North East Atlantic
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
PIMS	Project Implementation Management System
PIR	Project Implementation Review
TDA	Transboundary Diagnostic Analysis
SAP	Strategic Action Programme
SCOR	Scientific Committee on Oceanic Research
SMART	Sustainable, Manageable, Attributable, Reachable, Targeted and Time bound indicators
STAP-GEF	Scientific and Technical Advisory Committee of the GEF
TT	Tracking Tool
UNDP	United Nations Development Programme
UNECE	UN Economic Commission for Europe
UNESCO	UN Educational, Scientific and Cultural Organization
UNEP	UN Environment Programme
UN Habitat	UN Human Settlements Programme
UNIDO	UN Industrial Development Organization
WSSD	World Summit on Sustainable Development

SECTION 2: BACKGROUND AND SITUATION ANALYSIS (BASELINE COURSE OF ACTION)

2.1 Background and context

Nature and scope of the problem: Human activity, associated with the industrial and agricultural revolutions of the last 150 years has greatly accelerated the amount of key nutrients such as nitrogen and phosphorous present and active in the world's environmental media. Nitrogen and Phosphorous are the two key nutrients entailed in this project, though Silica is also included in some of the modeling work. There are growing concerns among the scientific community that the levels of nitrogen and phosphorous use are excessive in terms of the capacity of the earth's ecosystems, notably the marine environment, to absorb them without severe, detrimental effect to ecosystem functioning and resilience, including to important marine biodiversity and fisheries, and the capacity of these ecosystems to absorb carbon dioxide and assist with adaptation efforts.

Nutrient over-enrichment and oxygen depletion of coastal waters in Large Marine Ecosystems (LMEs) is a direct consequence of these elevated nutrient levels and is an increasing problem worldwide. Reactive nitrogen production (the conversion of inert nitrogen into a reactive, usable form) has increased more than 20 times from 1860 to 2005 and currently amounts to some 187 tonnes annually, around 1.5-2 times the natural rate for the planet as a whole. Estimates suggest that some 90 tonnes of this reactive nitrogen derived from land based human activities ends up in the world's oceans. Of the around 20m tonnes of phosphorous mined each year, nearly half is estimated to enter the world's oceans – 8 times the natural rate of input.

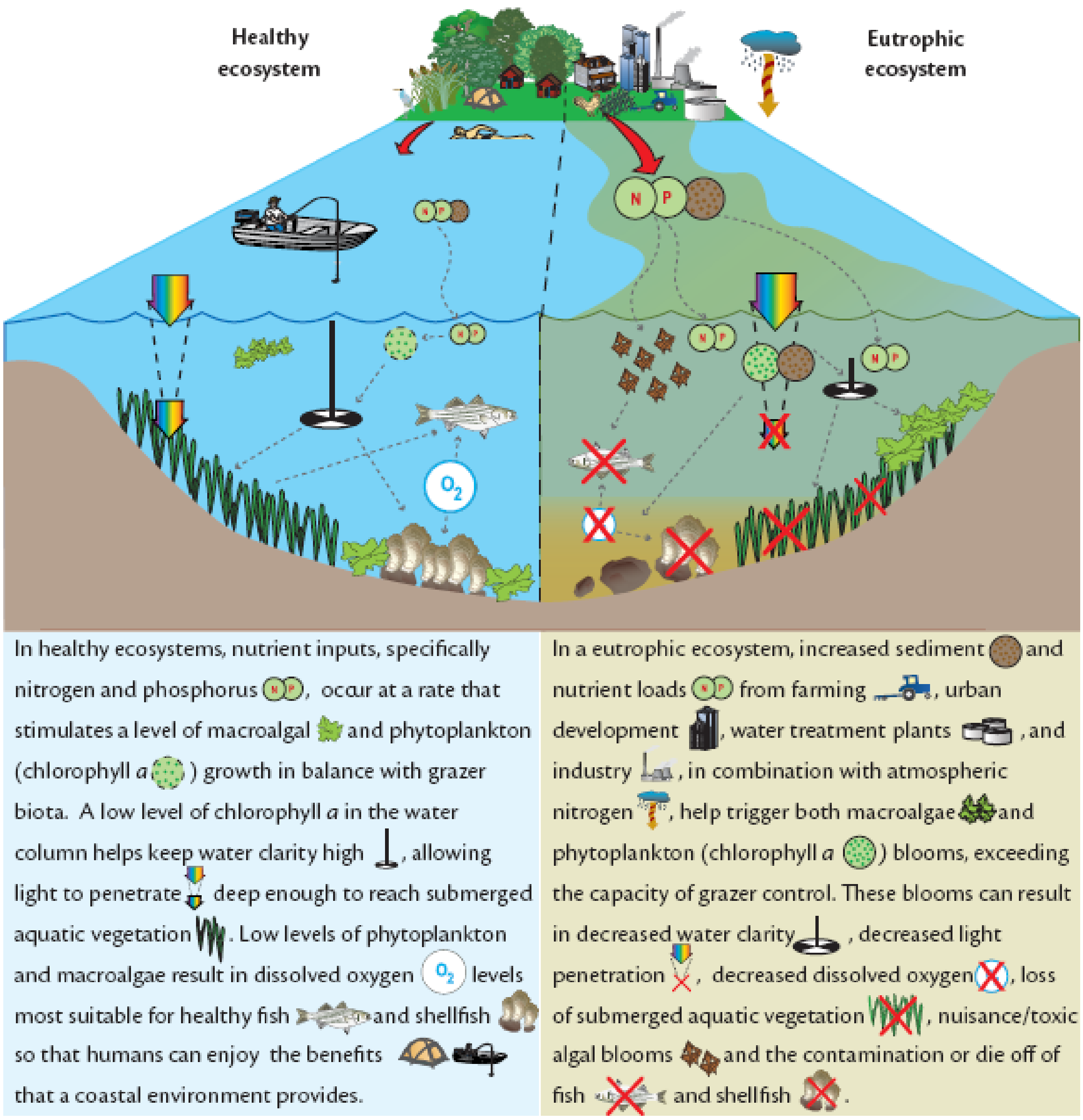
In coastal waters, this over-enrichment of nutrients cause phytoplankton and macro algae blooms, a process known as *eutrophication* – in short an increase in the rate of supply of organic matter to an ecosystem .*Eutrophication* can lead to the occurrence of harmful algal blooms, and oxygen depletion (hypoxia). Globally, harmful algae blooms are considerably more widespread and frequent than they were a decade ago, a situation that is expected to further deteriorate by 2020. Harmful algal blooms are often toxic with effects ranging from neurotoxic, diarhheic, paralytic shellfish poisoning and cyanotoxic algal blooms. The many additional effects include the loss of sub-aquatic vegetation, fish kills, shellfish poisoning in humans, coral reef degradation, and loss of species diversity. Diagram 1 illustrates how eutrophic systems develop.

Hypoxia (oxygen depletion) is caused when algae die, sink to the bottom and are digested by bacteria, in the process using up the available dissolved oxygen. In short the aerobic organic respiration rate exceeds the oxygen supply rates. The Scientific Committee on Ocean Research (SCOR), which informs the work of the Scientific and Technical Advisory Panel of the GEF, takes the definition of hypoxia for coastal waters as 30% of oxygen saturation. Spatial scales of hypoxic systems range from estuaries to coastal and open ocean waters and span depths of 1-2m to 600-700m.

Since 1960, the number of documented hypoxic areas has doubled every decade: in 2007, 415 eutrophic and hypoxic coastal systems were identified – 169 identified hypoxic areas, 233 areas of concern and 13 systems in recovery. Such areas are now present not only in enclosed seas, such as the Baltic Sea and the Black Sea, but also in large coastal areas which have internationally important fisheries. They are now spreading to developing countries, including off large estuary areas such as the Changjiang, Mekong Delta, and in the Arabian Sea. Diagram 2 below shows the distribution of world hypoxic and eutrophic coastal areas. The current extent of hypoxic zones in the world's seas has been estimated as equivalent to the total global area of coral reefs.

It is widely accepted that the expansion of occurrence, intensity and duration of hypoxia in coastal zones is primarily driven by increased eutrophication. This underlines the need for the project to deal with eutrophication and oxygen depletion together. Problems of over-enrichment which were once largely confined to the industrialized areas of Europe and North America are now also prevalent in Asia and South America.

Diagram 1 – how eutrophic systems result



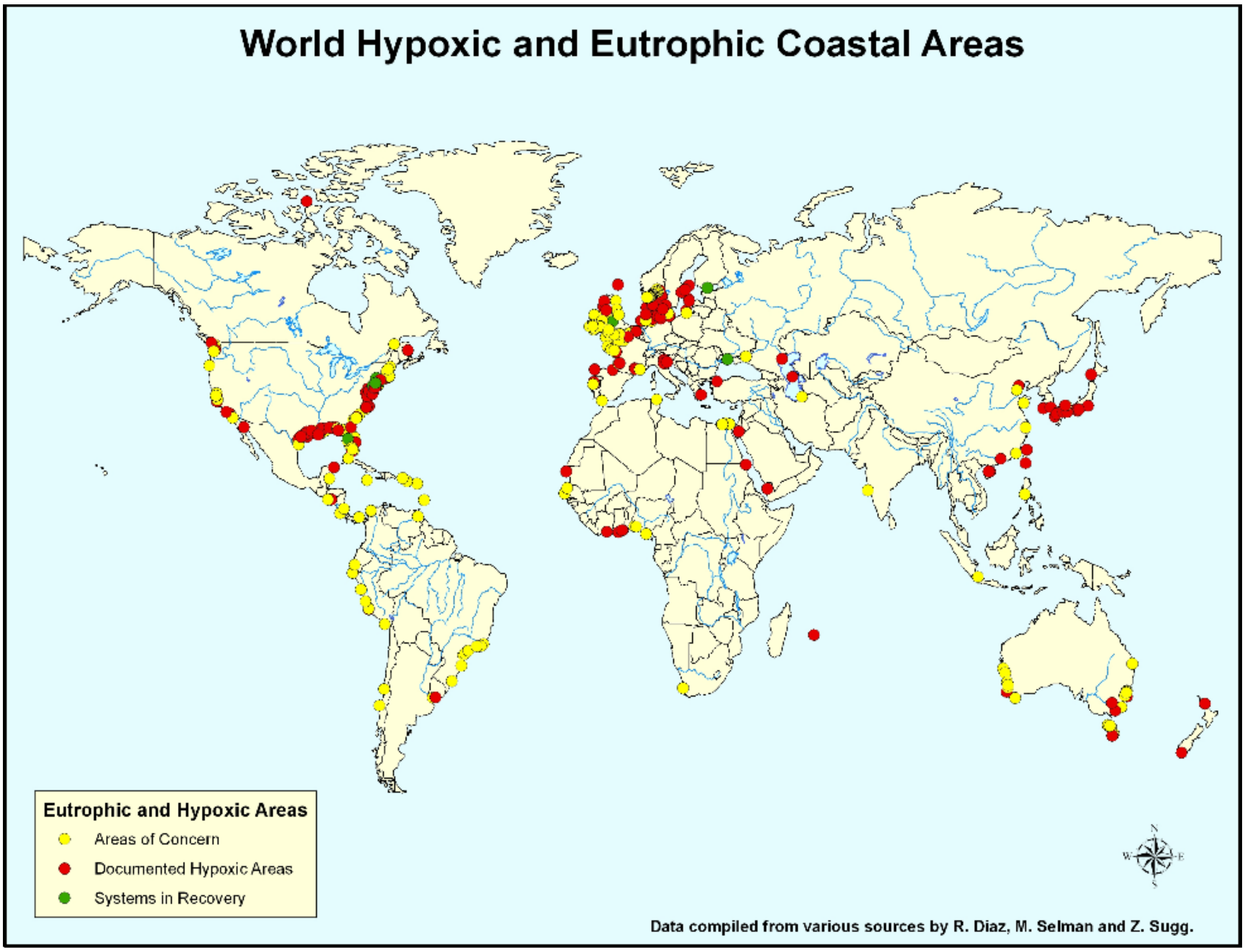


Diagram 2 – eutrophic and hypoxic zones around the world

Effects: the key effects in coastal waters of *eutrophication* and oxygen depletion are on coastal water quality and human health, fisheries, seagrass and coral reefs. The overall effect is to undermine the resilience of these marine and coastal ecosystems, affecting in turn their ability to support coastal livelihoods such as fishing and tourism and their potential role in climate change adaptation and mitigation. UNEP's Global Environment Outlook Report 4 warned that a number of environmental thresholds have been reached due to sustained human activities including collapse of fisheries and *eutrophication* and deprivation of oxygen in aquatic systems.

While the effects of eutrophication have been documented in many areas around the world, there are many areas for which data have not been compiled or do not exist. In particular there is a need for additional information in Asia, Africa, Latin America and the Caribbean regions. The implication is that the problems – and thus need for concerted solutions - may be more widespread and substantial than the above analysis and information sources suggest.

A particular problem relates to nitrogen. A single molecule of reactive nitrogen may move successively through the environment in a variety of ways, known as the nitrogen cascade, causing in turn a succession of harmful impacts. In the air, this means more ozone causing respiratory ailments and vegetation damage. From the air, nitrogen falls to the surface acidifying buildings, soils and water bodies, and fertilizing trees and grasslands, creating nutrient imbalances and changing biodiversity. On reaching coastal zones it can harm fish stocks and biodiversity. Finally, part of the molecule converts to nitrous oxide, contributing to greenhouse gases and ozone depletion. This underlines the need for integrated approaches.

2.2 Global Significance

There are four main themes relating to global significance:-

(i) the scope and impact of eutrophication and hypoxia illustrated in the preceding section. The impacts go to global issues of biodiversity and fisheries decline, coastal water quality and the resilience of marine and coastal ecosystems to climate change.

(ii) that excess nutrients in the world's environmental media have a range of harmful effects of global significance that go beyond coastal waters – on air quality and human health, freshwater quality (and thus water availability) and on levels of greenhouse gas emissions (nitrous oxide is a powerful greenhouse gas).

(iii) though focused on coastal waters, effective nutrient management approaches developed under the project, including through integrated watershed and coastal management, can provide a strong lever to help engage and strengthen for a and processes addressing the broader range of environmental problems, so improving air and water quality. This cross sectoral engagement needs to be stimulated because of the range of drivers causing coastal over-enrichment, including emissions of nutrients from fossil fuel burning

(iv) the drivers of change in levels of nitrogen and phosphorous use - population growth, food and energy security, and coastal urbanization – are global and regional in scope. Addressing coastal nutrient over-enrichment effectively on a global basis has important implications for sustainable use of nutrients and thus how key global development issues such as food security are taken forward.

The Global Partnership for Nutrient management established in relation to the project reflects linkage with these issues of broader global significance, as does the project design. To be successful there needs to be effective engagement with key stakeholders such as the agri-business, aquaculture and wastewater sectors, demonstrating win to win benefits for countries of nutrient reduction.

2.3 Root causes, threats and barrier analysis

Root causes and threats:

Land-based activities are the dominant source of nutrients and these can enter coastal ecosystems through different pathways including air, surface water and groundwater. Key sources of anthropogenic nutrients include: agriculture - in particular through fertilizer leaching from agricultural fields, manure from concentrated livestock operations and aquaculture -, wastewater discharge from sewage and industry, fossil fuel emissions and atmospheric deposition from land based sources. Biological N_2-fixation (both natural and from agriculture) is also an important nitrogen source.

In brief the root causes of nutrient over-enrichment in coastal areas and the associated problems are consequential on mainstream human activities. Agriculture is the dominant sectoral driver of nutrient over-enrichment generally, and the project recognizes the reality that currently the food security of around one half of the world's population is estimated to depends on fertilizers, particularly nitrogen fertilizer. Between 1960 and 1990, global use of synthetic nitrogen fertilizer increased more than sevenfold, while phosphorus use more than tripled. In practice, however, chemical fertilizers are often over-applied, or applied at a time when they cannot be effectively utilized by crops. As a result, as much as 20% of nitrogen fertilizer is lost through surface runoff or leaching into the groundwater. Phosphorus binds to the soil and can be lost through soil erosion on agricultural lands. Intensive livestock breeding in concentrated areas has also contributed to increases in nutrient releases to the environment through manure production and application resulting in nitrate losses to groundwater and ammonia emissions to the atmosphere.

Considered point sources of pollution, urban and industrial sources of nutrient releases to coastal waters are often the most controllable. The contribution to nutrient loading of coastal waters from human wastewater varies considerably and is generally more important as a source of phosphorus than of nitrogen. Some of the underlying root causes of eutrophication from urban sewage are due to limited funding for treatment infrastructure and a lack of incentives to operate existing infrastructure. The burning of fossil fuels, in particular from coal-fired power plants and exhaust from cars, buses and trucks, releases nitrogen oxides into the atmosphere. It is estimated that fossil fuel combustion contributes 22 Tg of nitrogen to the global environment every year, which is approximately 20% of the contribution of synthetic nitrogen fertilizers.

The shift towards renewable energy sources is also causal of over-enrichment. It has led to the additional use of fertilizer for the production of crops and biomass for bio-energy and bio-fuel production. Currently, bio-energy is estimated to contribute some 10% to the global energy use, while bio-fuels contribute 1.5% .The influence of this shift on overall global levels of fertilizer use is still relatively marginal, but as present climate and energy policies tend to stimulate bio-fuel production, the influence on fertilizer use and production of nitrogen will tend to grow, depending on which soils and crops are used and in how far nitrogen efficiencies in food production can be increased. Recent changes in subsidy patterns for types of land use which encourage bio-fuels (at the possible expense of land used previously for human food consumption) have been seen by some experts as exacerbating the very large hypoxic problems of the Gulf Coast of the US and Mexico.

Threats: the 'threats' reflect the main causal drivers, including the simple reality of population growth. We can anticipate that eutrophication and hypoxia will intensify in many regions in response to the increased application of fertilizers, especially in Asia and Africa. It will also increase in prevalence due to increase in food and animal production, growth in the aquaculture industry, increasing quantities of human sewage, generation of nitrogen from fossil fuel combustion and potentially as a result of global warming.

In particular, the 2009 the World Food Summit on Food Security stated that the world must produce 70% more food by 2050 than currently produced in order to sustain a world population of 9bn. This will require an annual increase in crop production of 44m metric tons. Without encroachment on natural forests, grasslands and wetlands, this implies an intensification of food production and fertilizer use. The position is further complicated by the reality of global trade in agriculture, which in effect transports nutrients around the world by virtue of products containing nitrogen.

A particular problem, related to the likely growth of synthetic fertilizer application is that while there are excess nutrients in many parts of the world caused by human activities, a number of areas, notably in sub-Saharan Africa suffer from nutrient shortages. Agriculture is the region's primary industry but it has the lowest fertilizer application in the world, accounting on some estimates for around 1% of global use of synthetic fertilizer use. Most sub-Saharan countries appear to have negative annual nutrient balances meaning that essential plant nutrients are being removed through harvests or being inadvertently lost from agricultural fields than are being introduced into the system.

The underlying threat, therefore, is that countries will focus straightforwardly on development goals, linked with population growth and urbanization, such as food and energy security (as they have in the past) and not take account in so doing of the problems caused by excess nutrients entering the world's environment associated with those drivers. Linked with this are problems of awareness of the problems and capacity to take action.

A step change in mainstreaming nutrient management efficiency, avoidance of discharge, and re-use will be necessary if nutrient over-enrichment problems are to be addressed. In particular, it will be important in many areas to show that efficiency in fertilizer use can be an important part of meeting food security, both in terms of cost benefits to farmers and assisting fisheries.

Accordingly, the project has a strong sense of global and regional advocacy among inter-governmental and other fora to trigger productive discussion, and the opportunities of win-win investment and stakeholder benefits of nutrient management efficiencies.

Barrier analysis:

The 2006 inter-governmental review of the GPA concluded that the lack of an overview of available information and tools is a key barrier to effective nutrient management.

Information barrier: Over the last decade a number of global, regional and national initiatives have identified and addressed the issue of nutrient enrichment to the coastal zone. These include global assessments such as the Global International Waters Assessment (GIWA), TDA/SAP processes of GEF projects and work done by the IGBP core project on Land-Ocean Interactions in the Coastal Zone (LOICZ).

The availability of marine environmental data is increasing through the development and coordination efforts under initiatives such as the Global Ocean Observing System (GOOS). This suite of sustained observations covers physical, chemical, biological and socio-economic variables. The sustained observations are starting to be applied for analysis of marine environment conditions that may promote or mitigate specific eutrophication effects, such as changes in occurrence of specific toxic micro algal species.

This said, information is generally much dispersed and has not yet been compiled into a consistent database so that nutrient sources in specific LMEs can be linked to impacts in their associated coastal system. This is a critical next step in order to formulate and take effective policy measures, and evaluate outcomes

The landscape of nutrient initiatives, management approaches and information is also dispersed and fragmented. A large number of protocols to Conventions have been drafted, strategic action plans agreed, and regional and national policy and legislative reforms pursued. But there is little in terms of a systematic approach to information and which management approaches work and why. Moreover, while an increasing number of GEF projects focus on nutrient related issues and GEF projects and partners would benefit from consolidated nutrient information, bringing together the outcomes of assessments, modeling approaches and practical experiences, and increasing the availability of information and tools to a greater number of stakeholders. There is no single place for GEF projects or countries where an overview of available information, tools and mechanisms can be found with a view to offering sets of policies and measures that can be readily implemented to reduce inputs and effects.

Analytically, while qualitative relationships between nutrient sources (e.g. upstream over-use of fertilizer use and appearance of algae in coastal areas) are well documented and form the evidence basis for current interventions, there has been a lack of a systematic and accessible to approach to *quantifying* the relationships between:-

- nutrient sources and controlling factors in watersheds, such as urbanization, wastewater treatment and agricultural production
- and their effects in coastal ecosystems in terms of the occurrence, frequency and aerial extent of (i) harmful algal blooms and (ii) hypoxia, (iii) effects on fish abundance and composition, and (iv) effects on coral reefs.

This is of signal importance because it relates closely to a further underlying barrier to effective nutrient management – the pressing need *to improve knowledge on the economic costs of nutrient over-enrichment and oxygen depletion and thus the benefits of action*. Such knowledge is required to assess the most cost-effective policy and technological options for the reduction of nutrients and their effects, including the development of public/private partnerships. This is particularly important in the case of nutrients where the sectoral sources and drivers, effects and scale of impacts are highly various, making it very difficult for policy makers to weigh the effects of various measures in a co-ordinated way. The development and application of coherent and rigorous ‘quantitative approaches’ based on consistent data bases (a key feature of this project) will enable policy makers to make more informed, cost effective and joined up decisions.

Institutional capacity: the barriers to effective nutrient management are not just ones of better and broader information and assessment. In the end, the main drivers of nutrient use need to be addressed directly and concrete actions taken. The primary responsibility for action lies with governments who need to integrate policies and resources across a range of sectors and agencies dealing with air, water, soil, agriculture and commerce.

However, even in developed countries with substantial resources this is difficult given the multi-source and multi-impact nature of nutrient issues. Relevant agencies may lack access not just to assessment information, but crucially to information about and access to the available best practices and tools to effective nutrient management. They may be unclear where and how effective action can be taken and the costs, benefits of and possibilities for so doing. There is an underlying need to trigger political and institutional engagement in countries and support it with systematic provision of information and tools. The following section gives further relevant information on institutional and policy issues, which are also relevant to the barrier analysis.

The complexity of the institutional and stakeholder context as described below is an additional and important factor in relation to problems of institutional capacity, though there are frameworks, programmes and approaches which are beneficial and which the project makes use of.

Public awareness: public awareness is generally low, in terms of consumers as end users or producers of nutrient related products and processes, such as food, energy, transport, water quality, and wastewater being aware of the role and importance of nutrients. It is improving as knowledge of the implications of issues such as changing diets (more meat e.g.) and food and energy sources increase. Key user groups such as farmers are probably more attuned to the nutrient over-enrichment implications of fertilizer use in proportion to the intensity of past and current use, as for example countries in the EU seek to reduce fertilizer use. This can also be the case among farmers in some regions in emerging economies such as India where fertilizer reduction is taking place. Knowledge among some user groups such as fishermen as to adverse consequences can be limited.

2.4 Institutional, sectoral and policy context

As has been described, excess nutrients in the world's environment - the operative cause of coastal nutrient over-enrichment - derives from :-

- a variety of drivers, sources and sectors, which operate at a variety of levels from global to local
- resulting in a complex web of various development benefits and various harmful environmental impacts, which in turn can undermine ecosystems and livelihoods.

Accordingly, the institutional, sectoral and policy context is highly variegated. Within countries, for example, nutrient management issues relate to Ministries and agencies with responsibilities for environment, agriculture, air, health and commerce, while some 9 major EU Directives – e.g. urban waste water, soil management, water quality, air pollution, and marine protection… are strongly connected to nutrient management.

The reality of this high variegation is that the institutional, sectoral and policy context for the project ranges considerably from the global to regional and national levels, and to analysis of the on the ground situation in the Manila Bay watershed, the main application area for the development of nutrient reduction strategies. The analysis of the institutional, sectoral and policy context is broken down into two main parts – first, general and then the Manila Bay watershed and the supplementary application site of Lake Chilika.

2.4.1 - General

***(i)Overall sectoral context*:** the range of sectors involved in causing nutrient over-enrichment and its management entail farming, aquaculture, tourism, fisheries, industry (both in terms of waste and fossil fuel burning), transport (likewise for nitrous oxide emissions) renewable energy, urbanization and coastal development (solid waste and sewage management). This range has necessarily influenced project construction and stakeholder analysis.

The sectors operate at different levels, from the large agro-corporations of global reach, to small scale farmers, to large scale aquaculture to artisanal fishermen. The reality of engagement by sectors in actual, effective nutrient management varies. The tourism industry can be aware, for example, of the costs of sewage and algal blooms, but can also be part of the problem of overall coastal development contributing to additional nutrients. While farming is a major source of nutrient excess, some farms operate nutrient recycling because they see cost benefits.

Given this complexity, the project focuses on the main, direct and more readily accessible sectors in terms of engagement at watershed and coastal level- agriculture, aquaculture, and wastewater management.

Leaving aside the Manila Bay watershed, direct engagement will take place in particular with sectoral representatives through the construction of the policy tool box, drawing on the GEF portfolio and the contacts therein. At the same time, the project uses the full range of relevant UN agencies, drawing on their work, contacts and information sources to assist with policy development, building inter-agency co-operation through the global partnership. More regionally and nationally based partnerships and communities of practice are aimed at providing platforms for bringing users together around shared goals of promoting nutrient management efficiencies and re-use and the win to win investments countries can achieve.

(ii) Global institutional and policy context*:* there are no discrete international conventions focused on nitrogen or phosphorous. However, the impact of nutrient over-enrichment is significant within the work of the ***Convention on Biological Diversity,*** given impacts on a variety of biodiversity, terrestrial as well as marine and coastal, including coral reefs and sea-grass. The levels of nutrients under the CBD are a negative conservation indicator. CBD supports the use of integrated coastal management as a key tool to help biodiversity conservation and implement its marine and coastal programme.

Within the ***UN Convention on Climate Change*** **and the work of** ***the Intergovernmental Panel on Climate Change***, there is growing recognition and evidence that the amount of reactive nitrogen in the environment is playing an important role in climate change. Nitrogen Oxide is a powerful greenhouse gas formed not only by the burning of fossil fuels, but also through emissions from all forms of nitrogen sources such as fertilizer and animal manure. Carbon dioxide resulting from the production of fertilizer is an important component of some countries overall greenhouse gas emissions, notably China. And much of the emissions of nitrogen oxide from fossil fuel burning ends up in the marine environment, contributing to over-enrichment.

The IPCC has called for further work on linkage between climate change and nitrogen, a call facilitated by the Global Partnership on Nutrient Management . Of specific relevance to this project is that eutrophication and hypoxia can undermine the resilience of marine and coastal ecosystems and thus their potential contribution to climate change adaptation and mitigation.

The World Summit on Sustainable Development in 2002 recognized the importance of addressing effective nutrient management and that it should be a priority focus under the Washington Global Programme of Action. More generally, effective nutrient management as foreseen in the project can contribute to more resilient coastal ecosystems and the services and livelihoods they underpin. In this way, the project can contribute to environmental sustainability and the achievement of the ***Millennium Development Goals***, including cleaner water.

Washington Global Programme of Action for the Protection of the Marine Environment from Land based sources of Pollution (GPA): this is the only inter-governmental programme that addresses directly the effects of nutrient enrichment on the marine and coastal environment. Nutrients are a priority area of focus under the GPA. It is also the only global programme that addresses inter-linkages between freshwater and coastal environments. The focus of the GPA is, therefore, consistent with the GEF IW programme, and the reality that watersheds are a prime source of nutrient flows into coastal waters.

During the last Intergovernmental Review meeting of the GPA participating governments identified nutrient over-enrichment as a priority issue and committed themselves to devote additional effort, finance and support to address point and non-point source nutrients at national level. These include municipal, industrial and agricultural wastewater, as major and increasing source categories directly affecting human health, well-being and the environment, including marine ecosystems and their associated watersheds. The GPA's main implementation mechanism is through National Programmes of Action (NPAs) – see national below – a mechanism, which provides clear opportunities for linkage with integrated programmes such as IWRM, and ICAM.

Small Island Developing States: the effects of nutrient over-enrichment in the SIDS can be particularly apparent with local hot spots emerging from sewage and agricultural runoff concentrations. The Barbados Programme of Action (the main international instrument specifically directed at the sustainable development of SIDS) incorporates the importance of nutrient management. The project will engage with SIDS primarily through UNEP's regional seas programme.

UN system and agencies :there has been substantial *Global Environment Facility* involvement in relation to nutrient over-enrichment, which is covered at section 2.7. *UNEP* and *IOC/UNESCO* programmes are also detailed in that section.

FAO, UN Habitat, UNIDO, and UNDP have a variety of projects and initiatives (often with the GEF) which relate to nutrient over-enrichment in one form or another. The focus reflects the mandate of the agency and the sectors it covers. FAO, for example, are carrying out relevant work on fertilizer best practice and reducing impacts of aquaculture, whilst UN Habitat focuses on wastewater (an important source of nutrient over-enrichment) from urban planning and sanitation aspects. UNDP has initiated a number of initiatives which are of direct relevance to the work of this project, including the seminal work with GEF and the World Bank in the Black Sea/Danube basin.

The UN Commission on Sustainable Development(CSD): the CSD provides an over-arching forum for reviewing global sustainable development issues. Accordingly, the Global Partnership on Nutrient Management (GPNM) was launched at CSD to promote sustainable consumption and use of nutrients, notably nitrogen and phosphorous to ensure food security and environmental sustainability. This approach of holding events at key international meetings is consistent with the project aim of using the Partnership to insert the importance of nutrient management issues into inter-governmental fora and trigger strategic action by countries.

(iii) regional institutional and policy context: in line with their mandates, many of the regional seas programmes and conventions have activities and focusing on nutrient over-enrichment and impacts on coastal waters. The focus tends to reflect the particular prime causes in the region. Wastewater is for example a prime sectoral focus regarding nutrient impacts under the Caribbean Cartagena Convention. In the case of the Mediterranean, the Barcelona Convention focuses on agricultural inputs and impacts, notably on bathing water quality, fisheries and marine ecology, while OSPAR (NE Atlantic) and HELCOM (Baltic) focus on agricultural and sewage hot spots. However, programmes and associated capacity varies among regional seas programmes and conventions. The project under Component A will pursue synergies and catalytic links with regional seas programmes and the clear intention is that they should benefit from the application of project outcomes through up-scaling and replication.

Trans-boundary water: trans-boundary issues in relation to GEF are covered under section 2.7. *The UNECE Convention on the Protection and Use of Trans-boundary Watercourses and International Lakes* focuses on eutrophication of watercourses, lakes and ground waters and its effects on ecological condition and human health. A number of integrated programmes covered under the national section, such as IWRM are also relevant.

Air: there are protocols to the UNECE's Long Range Trans-Boundary Air Pollution Convention, which seek to control emissions of nitrogen oxide a major source not just of land and air pollution but also nutrient over-enrichment in coastal waters. It is indicative that the European Nitrogen Assessment, which takes an integrated, cross-sectoral approach to nutrient management is being launched under this convention. The Global Partnership on Nutrient management established under component A of this project is engaging with this and other regional nitrogen and nutrient assessments to promote cross-disciplinary and integrated approaches. The US also takes a regional approach in large part through tackling Nitrous oxide emissions through its Clean Air Act.

These examples of regional approaches are not easily replicable in other parts of the world. Moreover, the emissions from personal and business transport is a major source of emissions, and is a major growth activity in developing country cities all around the world. The project does not seek to engage that problem source directly.

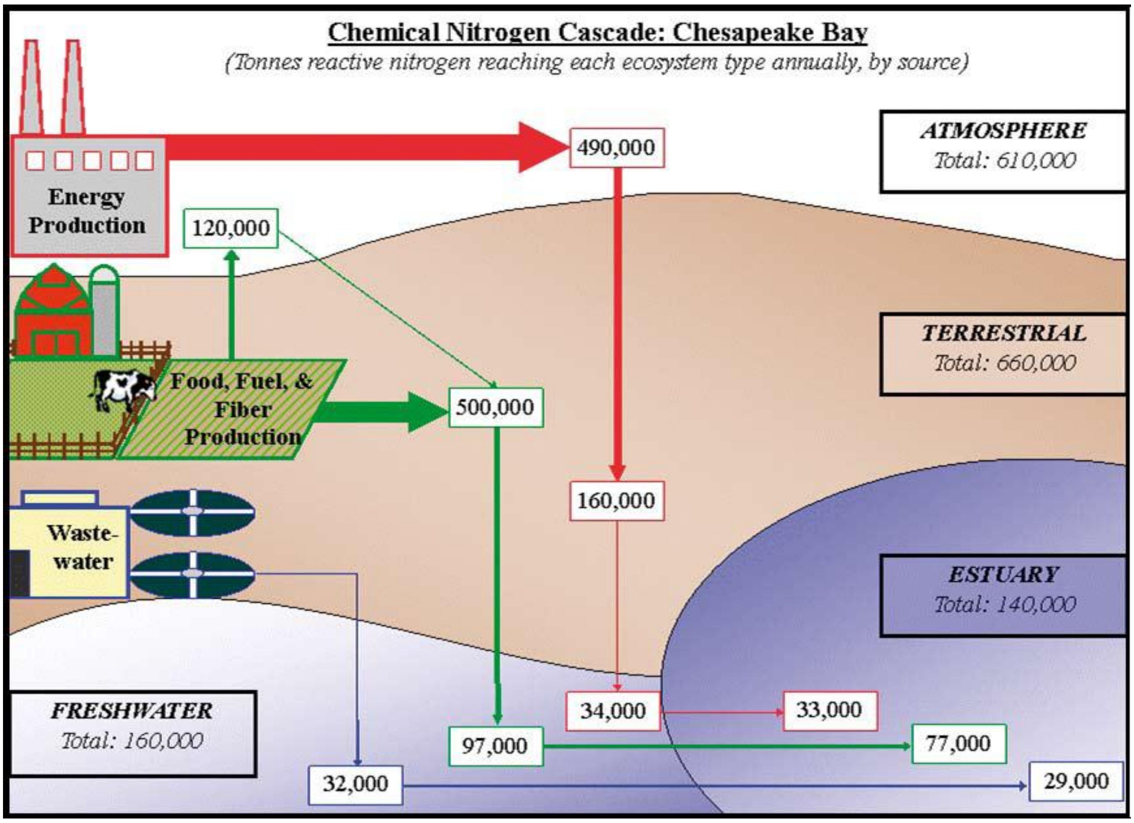
(iv) National institutional and policy context: at the national level, countries both developed and developing have brought forward a range of relevant legislation. In relation to coastal nutrient over-enrichment the main measures relate to water quality and wastewater. However, in developing countries and countries in transition implementation is a major problem, even where legislative frameworks exist.

National Programmes of Action (NPAs) under the GPA provide a comprehensive, yet flexible framework for guiding a country's response to major pollution problems and facilitating implementation action. Importantly, in this regard NPAs set out a set of actions for mainstreaming the GPA into national policies, and planning. They can assist governments, industry, agriculture and other relevant sectors and local communities to prioritize their marine and coastal protection and development goals. Over 60 governments are addressing nutrient issues through NPAs, which will form one of the key mechanisms for implementing project outcomes, linked in with regional seas activity.

Consistent with the use of NPAs, and the need to address cross sectoral inputs and various stakeholders, addressing nutrient over-enrichment can benefit from (and contribute to) ***integrated watershed and coastal zone management.*** The major sources of nutrient over-enrichment often originate from upland watersheds, including from agriculture and wastewater. Integrated watershed and coastal zone management have the potential to address multiple impacts and the trade offs and synergies that arise between ecosystem services and human well being.

In particular, the role of ICM (integrated coastal management) as an enabling framework for supporting the implementation of NPAs is well recognized. ICM is in itself an effective tool to achieve sustainable coastal management, based as it is on adaptive ecosystem based management, integration and inter-relationships.

The way in which such integrated approaches and associated models can be used for addressing nutrient over-enrichment in a cost effective, cross-sectoral way is illustrated by diagram 3below, which sets out costs in relation to nitrogen inputs into Chesapeake Bay, United States. These sorts of tools, which facilitate integrated management will be incorporated into and developed in the Policy Tool Box produced under the project.



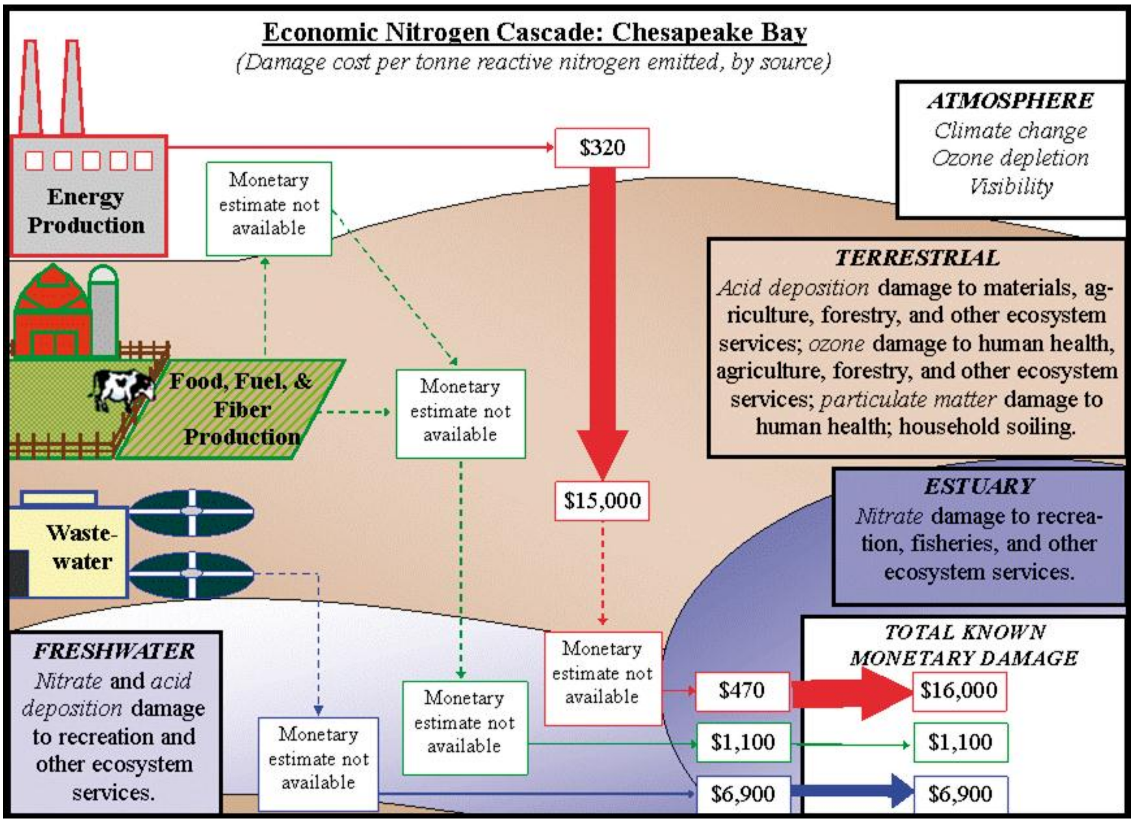


Diagram 3: Chesapeake Bay – costs of excess nutrients (Moomah& Birch 2005)

Showing that actions, or lack thereof, have specific costs and benefits, the nitrogen cascade provides a framework to help guide policies.

2.4.2 Institutional, sectoral and policy context

(a) the Manila Bay Watershed – application of quantitative nutrient source-impact modeling and analysis and best practices

The following material is not only descriptive of the institutional, sectoral and policy context in the Manila Bay watershed, but also helps illustrate how the institutional and stakeholder structure and associated policy context in the area lends itself (and can benefit from) the needs of the project in developing nutrient reduction strategies.

Context: Manila Bay is a semi-enclosed estuary facing the South China Sea, and covers 17,000km 2 of watershed and about 1,800km 2 of bay surface. It is bordered by 5 coastal cities. Also within the watershed are 11 non coastal cities. Currently, the Bay area contributes 55% to the country's domestic product. It is a major fishing ground, the biggest shipping port, and the country's financial centre. Some 30% of the country's population live in the watershed. The Pasig and Pampanga rivers are the Bay's major tributaries

Mangroves, sea-grasses, coral reefs, mudflats, beaches, seaweeds have all declined substantially under the pressure of coastal development. Over-exploitation of fisheries and the contamination of fish and shellfish is a major concern. There are significant human health risks associated with fecal coliform, heavy metals, and pesticides.

Increasing river nutrient export and massive increases in aqua-cultural production have led to very large increases in loading of nitrogen and phosphorus, while transport of dissolved silica has probably decreased or been stabilized by increasing dam construction in river systems. Levels of nutrients which favour algal blooms are high in Manila Bay. Nutrient enrichment and changes in nutrient stoichiometry are probably the major causes of the increased occurrence, frequency and extent of algal blooms in the coastal seas of the Philippines.

The algal blooms create ecological as well as human health risk. Morbidity and mortality cases due to paralytic shellfish poisoning related to toxic algal blooms are frequent and well documented. Nitrogen loading from the aquaculture farms also stimulates eutrophication, contributing to the increasing evidence of fish kills. Solid wastes entering the Bay via river and drainage systems result in loss of amenity value and are carriers of pathogens.

The GEF/UNDP Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) had identified Manila Bay as one of the three sub-regional seas areas/pollution hot spots in the region. The guiding management philosophy of PEMSEA and thus the approach to Manila Bay is one of integrated coastal and watershed management, and this approach runs through the structures put in place. The recent (October 20100) Third Ministerial Forum in Manila reaffirmed the commitment of countries in the PEMSEA region to meet the targets of the Sustainable Development Strategy for the Seas of East Asia through Integrated Coast Management scaling up efforts.

Since 2000, PEMSEA has spearheaded *the Manila Bay Environmental Management Project* (MBEMP), which is being implemented with various local and national governmental agencies, academic institutions, the private sector, and civil society groups, with the Department of Environment and Natural Resources (DENR) as the lead agency

The MBEMP aims to achieve an acceptable balance between economic development and environmental management of land and sea based practices and activities that threaten the health of the Manila Bay area. It employs a risk assessment management framework, aimed at developing an effective and sustainable inter-sectoral management mechanism for Manila Bay. Fundamental to the framework is the prioritization of environmental concerns through risk assessment, systematic development of measures, mobilization of stakeholders, and putting in place necessary institutional arrangements to effectively implement and sustain plans and programmes. The overall status of the resources and habitats of Manila Bay based on retrospective risk assessment point to an urgent need for improved management of these resources, long term planning and an integrated land and sea-use zoning scheme

The Manila Bay Coastal Strategy was formed to serve as a common framework for all stakeholders to address environmental problems, achieve balanced and sustainable development, and improve the quality of life. The MBCS was subsequently translated into an operational plan - Operational Plan for the Manila Bay Coastal Strategy (OPMBCS), which was published in December 2005. The plan is a major component of the overall MBEMP, and reflects the need to shift the strategy towards implementation action plans which could be taken forward by government agencies, communities, private sector and other stakeholders. The plan is a public document setting out a vision, goals, objectives, targets, and mean of implementation. Public private partnerships are a key delivery mechanism in the development and implementation of investments in environmental facilities and services, notably those identified in the coastal strategy and the operational plan.

Supreme Court verdict: There is an important legal context underpinning current efforts to clean up the Manila Bay area, which culminated in a landmark decision of the Supreme Court of the Republic of Philippines in December 2008. The essence of the decision was twofold: first, that the agencies and other bodies, consequent to their statutory obligations, could be compelled to perform functions relating to the clean up, rehabilitation, and preservation of Manila Bay– in brief, these functions were mandatory not discretionary: secondly, those functions entailed the cleanup of water and related pollution generally as opposed to dealing with specific pollution incidents. The Court saw clean up and restoration as only the first stage in a broader process of preserving water quality by addressing root causes, that is stopping contaminants reaching the Bay. The Department of Environment and Natural Resources (DENR) was assigned as the primary government agency responsible and directed to fully implement the Operational Plan for the Manila Bay Coastal Strategy.

A practical effect and implication of the ruling for this project is the degree of co-operation required among the relevant agencies in addressing the range of contaminants including from nutrient over-enrichment, and that in so doing they will need to address root causes by looking at the Manila Bay watershed as a whole and implement integrated plans. This dovetails with the integrated coastal management and stakeholder approach supported by PEMSEA. It also lends itself to the application of the integrated modeling and tool box approach to be developed under this project, the essence of which is to provide a mechanism and approach to help policy makers weigh the environmental and cost effectiveness of various measures in a co-ordinated and integrated manner and make investments accordingly.

(b) Chilika Lake, Orissa, India

Chilika Lake will provide a complementary application area given the importance of developing a comprehensive 'nutrient health reporting card's approach to estuaries and deltas (where effects of nutrient over-enrichment can be highly apparent and affect a range of livelihoods directly). The choice of Lake Chilika reflects (a) the role of the LOICZ programme in establishing a basis for work in the area and the associated LOICZ score card modeling;(b) the institutional and stakeholder suitability of the area, as set out here and at section 2.5.2;and (c) the importance attached by the project to reaching across the GEF portfolio to support complementary and synergistic efforts, in this case with the marine pollution component of the GEF/FAO Bay of Bengal LME project.

The overall focus of the proposed work is on understanding the biogeochemical process and fluxes of nutrients in the Chilika Lake using the LOICZ Biogeochemical Model, and estimating the overall water quality status of the Chilika Lake and the coastal water quality in the adjacent Bay of Bengal. The baseline for action (as in the report card work in Manila Bay watershed) is provided by the previous LOICZ work supported by UNEP and GEF. The practical outcome of this piece of work – of wider relevance for the replication aspects of the project – is the development of a 'nutrient health report card' which enables coastal communities to anticipate problems and take avoiding actions. The Report Card approach will be replicated, suitably adapted, in the Laguna de Bay, which is part of the Manila Bay watershed, and will contribute to the development there of overall nutrient reduction strategies. The LOICZ model and its proposed application in Lake Chilika are detailed in appendices 16 and 17. The work activities are incorporated into the Component D work plans.

Context: the Chilika drainage basin, including the Lake itself, covers an area of almost 4300 $km^{2.}$ In addition to 1100 km^2 area of the Lake, the drainage basin of the Lake includes 2325 km^2 of agricultural land, 525 km^2 of forests, 190 km^2 of permanent vegetation predominantly used for plantations, 70 km^2 of swamps and wetlands and 90 km^2 of grassy mud flats. About 52 small rivers and streams are draining to the Chilika Lake and the large Mahanadi River enters the lake in its north-eastern end. On account of its rich biodiversity, Chilika Lake was designated as a "Ramsar Site" i.e. a wetland of international importance.

These characteristics – an important centre of both intensive agricultural production and where fishing is also an important livelihood (both commercial aquaculture and artisanal) as well as the amount of mangroves and wetlands – mean that the Lake area experiences a large amount of nutrient inputs and their direct adverse consequences. The characteristics also lend themselves to the development and testing of the LOICZ model for estuarine and delta areas, aimed at providing coastal communities with the knowledge, understanding and prediction needed to allow estuarine/coastal communities to manage inputs of nutrient over-enrichment and respond accordingly. A key part of this approach will be to foster linkages between agricultural and fishing communities. The development of the model will also have the key objective of helping to estimate and so improve not only the water quality status in the lake itself but also the coastal water quality in the adjacent Bay of Bengal, so also contributing to the aims of the GEF/FAO Bay of Bengal LME.

Chilika Development Authority (CDA): a supportive institutional structure is provided by the Chilika Development Authority established by the Government of Orissa in 1992 for the restoration and overall development of the Lake under the jurisdiction of the Forest and Environment Department. The governing body of the Authority is headed by the Chief Minister of the State of Orissa and has Members of Parliament, representatives of fishing communities and secretaries of the key departments, experts and eminent scientists as its members.

An Integrated Management Plan for the Lake has been taken forward with financial support of US$12.7 million. Hydro-biological monitoring was supported under the Orissa Water Resources Consolidation Project of the World Bank to the extent of US$220,000.A strong support network was created with 7 state government organizations, 33 NGOs, 3 national government ministries, 6 other organizations, 11 international organizations, 13 research institutions and 55 different categories of community groups. The overall approach is one of 'catchment management in a participatory micro- watershed management in a whole ecosystem approach'.

2.5 Stakeholder mapping and analysis

2.5.1 Overall project:

The stakeholder and mapping reflects the multi-source and multi-impact nature of nutrient over-enrichment on coastal waters described earlier. The stakeholder map is potentially very broad. As well as governments, scientists, and a full range of relevant UN agencies, it involves farming, aquaculture, tourism, fisheries, industry, renewable energy, urbanization and coastal development (solid waste and sewage management). This range has necessarily influenced project construction and planned implementation.

An overall assessment of the need to and how to engage relevant stakeholders and their potential roles in the project was part of the process of the initial establishment of the Global Partnership on Nutrient Management, which comprises representatives of the various stakeholders referred to above.

The scope of the GPNM goes wider than a focus on nutrient reduction in coastal areas, but project configuration and the partners now involved have benefitted from this broader partnership work and stakeholder engagement. In particular, the project development has benefitted from government, scientific representatives, the fertilizer industry representatives, and UN agencies working through the partnership to address potential obstacles to co-operation. As a result, stakeholders whose focus was less inclined towards the coastal areas have joined the project as partners, and demonstrated a willingness to co-operate around a shared agenda of more effective nutrient management in relation to the coastal areas. Key has been recognition that there are win to win benefits from such co-operation for countries and stakeholders.

This said, the project recognizes that there is an ongoing need to build stakeholder engagement through partnerships at different levels. The use of integrated watershed and coastal management and the development of an integrated tool box involving all the key sectors is part and parcel of this.

Furthermore it is important to note that according to the millennium ecosystem assessment report[1] economic value of the goods and services delivered by healthy coasts and oceans are worth trillions of dollars: 61 per cent of the world's total economic output of approximately $44 trillion comes from areas within 100 kilometres of the coastline. For many national economies a large percentage of the GDP accounts for exploitation of coastal and marine resources, and they acknowledge the importance of conservation and sustainable management of the marine and coastal resources as pivotal for poverty alleviation and the achievement of the millennium development goals (MDGs).

Economic sectors such as fishing, tourism, coastal transport and coastal zone development would benefit from these activities, which in turn would contribute to the reduction of poverty of the local coastal population. Due to important role of women in many of the activities, this would translate into increased gender equality and the empowerment of women in the relevant areas. Further improvement in the resource base and enhanced economic activities thereof will create opportunities for women to diversity their livelihoods and access to higher income. Special attention to gender concerns will also be given while designing and implementing the demo projects.

Consequently it not surprising that the governments have repeatedly affirmed their commitment to the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities. The 2008 General Assembly recognized "that most of the pollution load of the oceans emanates from land-based activities and affects the most productive areas of the marine environment, and calls upon States as a matter of priority to implement the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities" and welcomed "the continued work of States, the United Nations Environment Programme and regional organizations in the implementation of the

[1]The Millennium Ecosystem Assessment. Synthesis report Ecosystems and Human Wellbeing. page 52-53

Global Programme of Action, and encourages increased emphasis on the link between freshwater, the coastal zone and marine resources in the implementation of international development goals, including those contained in the United Nations Millennium Declaration, and of the time-bound targets in the Plan of Implementation of the World Summit on Sustainable Development".

At the World Oceans Conference in Manado, Indonesia, May 2009, governments expressed concern that marine ecosystems continue "to be threatened by land-based and sea-based pollution … poor land-use planning, and socioeconomic pressures." Governments recognized that "healthy and productive coastal ecosystems … have a growing role in mitigating the effects of climate change on coastal communities and economies in the near term" and that "an integrated coastal and ocean management approach is a key in promoting resilience, and thus fundamental to preparing for and adapting to the effects of climate change." Importantly, governments in Manado committed to "strive to reduce pollution of ocean, coastal and land areas".

In line with the stated project objectives, specific attention to address gender considerations and poverty alleviation will be given due attention while constructing the best practice policy tool box.

2.5.2 Manila Bay

Stakeholder mapping and analysis for Manila Bay has proceeded on a number of levels. First, a desk assessment using a wide range of source and practical material. This included experience and study of GEF/PEMSEA project work; analysis of the Manila Bay Environmental Management project, the Manila Bay Coastal Strategy and the associated Operational Plan, and the Supreme Court Judgment (referred to under institutional analysis earlier). Task managers for component B complemented this by focusing on the watershed structure and key sectors involved in nutrient over-enrichment in the watershed area.

Secondly, and in the light of the above analysis an options paper was prepared for the demonstration area to ensure consistency with criteria set out in the project PIF, which was discussed at a project planning meeting attended by a senior representative of PEMSEA. He gave further background and explanation, including on the essential stakeholder approach of PEMSEA and the Manila Bay strategy, including linkage between upstream and downstream users.

Thirdly, a Senior Programme Officer from UNEP visited Manila in late October 2010 at the time of a high level PEMSEA meeting. He discussed the project with leading Ministerial and agency representatives as well as PEMSEA representatives and established senior level buy into the aims of the project work. This included liaison with the official appointed formally to liaise between the Supreme Court and Department of Environment and Natural Resources as part of the Court's oversight to ensure the clean-up of Manila Bay.

Finally, a full stakeholder meeting was held in Quezon City (PEMSEA offices) in late November 2010 attended by the project designer and those leading the modeling and analytical work underpinning the development of a possible nutrient reduction plan for the Manila Bay watershed. The meeting was attended by representatives of government agencies, development authorities, local communities and academic bodies. The meeting is more fully documented, along with attendees, at appendix 3.Detailed discussion on institutional capacity, data availability and what could be best achieved in line with national and local priorities led to the finalization of agreed activities, along with co-financing, which are reflected in the work plan for component D in this document, as well as the substantive planning document for the Manila Bay watershed at appendix 3. A key outcome, adding clear value, was seen as incorporating nutrient reduction strategies into broader efforts to clean up and rehabilitate the water quality of Manila Bay.

A further important point which emerged from the above assessment and discussions is that stakeholder analysis – seen for project purposes as requiring the right institutional and project expertise to identify the key stakeholders, draw out their interests, identify conflicts of interest and relationships and assess their influence and appropriate types of participation- is a central part of the approach being taken to the management of Manila Bay.

For example, in the Manila Bay project, PEMSEA has adopted what it sees as a total ecosystem based management approach by including in the project the whole of the watershed that drains into Laguna de Bay and Manila Bay. This is important in terms of stakeholder mapping and analysis because it establishes a framework of reference which links stakeholders around common themes and possibilities of reconciliation and co-operation.

The commitment to pursue the shared vision for Manila Bay was affirmed by over a hundred representatives from the government, private sector, financing institutions and other stakeholder groups through the Manila Bay Declaration signed in 2001. The Declaration spells out the roles and responsibilities of the stakeholders in the implementation of the action programmes in the coastal strategy. Accordingly, the Manila Bay Coastal Strategy is formulated to serve as a common framework for all concerned stakeholders to address environmental problems, achieve a balanced and sustainable economic development and improve the quality of life. The strategy takes into consideration socio-economic and ecosystem connectivity and was developed in close consultation with both coastal and inland provinces, central line agencies and other stakeholders. The development of the strategy took more than one year and entailed very large stakeholder consultation at municipal, provincial regional, and national levels.

2.5.3 Lake Chilika

Stakeholder and needs analysis has proceeded on a number of levels. First, extensive experience has been gained within UNEP/GPA and IOC/UNESCO and related programmes from nutrient related work in the region. This culminated in the development of a LOICZ model at a workshop conducted by the University of Chennai with UNEP and other donor support. This has been complemented by desk study analysis of the region and good contacts with scientific institutions in the region. Finally, nutrient reduction activities are planned to be an important part of the marine pollution component of the GEF/FAO led Bay of Bengal LME. A senior official of UNEP/GPA attended the first meeting of the marine pollution component of the BOBLME earlier this year, where the Lake Chilika situation and LOICZ model was presented and discussed.

As referred to in the section on institutional context, there is a well established stakeholder network to work with 7 state government organizations, 33 NGOs, 3 national government ministries, 6 other organizations, 11 international organizations, 13 research institutions and 55 different categories of community groups involved in the Lake’s planning. LOICZ itself is a programme aimed at assisting coastal communities in their coastal planning.

2.6 Baseline analysis and gaps

The previous sections have illustrated and demonstrated a number of key baseline findings and gaps, which underline the rationale for project intervention. They are:-

- the landscape of nutrient information is dispersed, lacking an overall approach to information generation and its use. Information needs to be consolidated and synthesized, including as to which management approaches work and why, and knowledge gaps identified for all regions

- the institutional, sectoral and policy complexity involved, given the variety of nutrient over-enrichment sources, the complexity and importance of certain drivers such as food and energy security, and the variety of effects of over-enrichment

- the lack of awareness and complexity of nutrient issues, their cross sectoral dimension and their global drivers requires a new focus on sustainable use of nitrogen and phosphorous, underlined by the reality that the emphasis in coming years on food and energy security and coastal urbanization will exacerbate the problems of nutrient over-enrichment

- there is a need for more integrated and multi-disciplinary assessments of nutrient sources and effects which can help distil the complexity and range of nutrient issues into a clearer policy and governance focus

- there needs to be a stronger focus in policy making and implementation on linking and quantifying patterns of nutrient over-enrichment sources and effects and the economic implications of various approaches. This is a key to integrated, cost effective decision making

- building on various initiatives, such as those of OSPAR, HELCOM, NOAA, and the Danube/Black Sea, and LOICZ and the availability of reliable datasets we have moved to a position, e.g. using the Global News2 USE approach, where the need can be met, described above, in linking patterns of nutrient over-enrichment with coastal effects from around the world in a more rigorous and quantitative way

- there is a growing portfolio of GEF related initiatives and other information sources which are providing lessons and tools which can and should be brought together under the right project and channeled and applied effectively (in the case of work on the nutrient health report card baseline is established clearly by the previous LOICZ work supported by UNEP and GEF)

- notwithstanding the institutional complexity, there are integrated programmes and mechanisms such as ICZM, NPAs under the GPA, and the regional seas, which are available to address nutrient over-enrichment, and assist in mainstreaming nutrient management

- strategic attention in the international political domain is necessary to help stimulate attention to the importance of nutrient management in countries and help them address initial awareness, capacity and access barriers, and make full use of the available programmes, such as NPAs, which can in turn benefit from the project's focus

- global level partnership and engagement can provide the necessary catalyst to mobilize changes with a view to communicating the nutrient challenge, and helping to build constituencies of interest and action among and in countries, agencies and donors around the goal of optimizing nutrient use, including problems of shortage

- finally, the Manila Bay watershed area reflects a real interest and willingness among its stakeholders to address nutrient reduction management, including as part of more integrated, ecosystem based approaches, making full use of the new modeling techniques and best practice measures emerging from the GEF portfolio and related initiatives

2.7 Linkage with GEF and non GEF interventions

Global Environment Facility

The project addresses the IW strategic objective "*to catalyze trans-boundary action addressing water concerns*" where the expected impacts are "*Participating States demonstrate the necessary ability to … reduce land-based coastal pollution".* The project is entirely consistent with IW-SP2 of GEF-4 to "*reduce nutrient over-enrichment and oxygen depletion from land-based pollution of coastal waters in LMEs consistent with the GPA*." It will build on the experience from previous GEF interventions that have proven to be an effective agent for policy, legal and institutional reforms related to international waters and for the creation of enabling environments.

An important part of the project configuration is collaboration and the development of synergies with related GEF initiatives that address nutrient over-enrichment and oxygen depletion from land-based pollution, notably in the development of and testing of various nutrient management tools and the use of expertise, training capacity and stakeholder engagement. These include those GEF Large Marine Ecosystem initiatives underway -East Asia, Yellow Sea LME, Mediterranean Sea, Baltic Sea, Guinea Current, Benguela Current, West Indian Ocean, Agulhas and Somali Current, Danube/Black Sea Basin, and Caribbean Sea - and more generally initiatives with Small Island Developing States (SIDS).

Of particular importance are the *Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) Strategic Partnership Investment Fund for Pollution Reduction in the LMEs of East Asia* project, which leverages pollution reduction investment funds from the public and private sector.

The database and practices inventoried by the GEF/UNDP project to promote nutrient reduction best practices in Central and Eastern Europe will form a key part of the inventory process for developing the Policy Tool box under component C, helping to ensure that this project builds on the outcomes from the very large GEF investment in that region.

The GEF East Java and West Indian Oceans projects demonstrate modular approaches (i.e. small-scale sanitation with local treatment) to construct wastewater collection systems using cost-effective technology and community participation. The Strategic Partnership for the

Mediterranean LME, in particular the Strategic Action Programme to address pollution from land-based activities is also of direct relevance, in particular their work to develop a replication scoring system. These initiatives will be consulted and used in the development of the Policy Tool Box.

The newly established Bay of Bengal LME will benefit from this project's development of a nutrient over-enrichment health report card in the BOBLME region (Lake Chilika) in relation to deltas and estuaries. The report card approach will be made available to BOBLME partners for their use and further testing.

There will be full collaboration with IW: LEARN, notably in relation to component A with the development of a web site and Community of Action, as well as collaboration with projects related to the transfer of environmentally sound technologies related to nutrient reduction. The GEF Trans-boundary Waters Assessment Program (TWAP) will be involved in the development and implementation of the project. And the project will build upon the work and lessons learned from the GEF *Promoting an Ecosystem Based Approach to Fisheries* project, which included nutrient forecast models that were developed and adopted in at least 10 countries involved in the implementation of the GEF/LME projects for management actions to reduce coastal eutrophication.

The GEF project on enhancing the use of science will inform this project regarding the science-policy interface and advise on the appropriate time of involving different types of scientists. There will be full collaboration with the Scientific and Technical Advisory Panel (STAP) of the GEF. This has already begun under the PPG phase of this project and the project will co-operate and co-ordinate with the STAP on related products such as guidelines and tools.

UNEP and related programmes

The project is aimed at implementing UNEP priorities in relation to ecosystem management, harmful substances and hazardous waste and resource efficiency. It is fully consistent with UNEP/GPA priorities on reducing land based sources of marine pollution under the Global Programme of Action and the use of NPAs. The project will draw on and make full use of UNEP's regional seas programme in terms of expertise on nutrient programmes and training capacity, such as the Caribbean Cartagena Convention. Catalytic action with the regional seas is a stated output under component A of the project, and the aim will be for them to benefit from project outcomes through replication and up-scaling. The project will draw on relevant past and ongoing work by DTIE on nutrients and public-private partnerships generally, including with UNIDO. Improved nutrient management, because of linkage to a range of development and environmental issues, including food security, water quality and climate change is of strategic, cross-cutting importance to UNEP, including in moves towards a Green Economy. This significance is reflected in the project rationale, global benefits and incremental cost analysis sections.

IOC related programmes

The project will use the expertise provided by the co-implementing agency of IOC/UNESCO focus on the scientific aspects of the biology, chemistry or management of the coastal zone. For example, the goal of the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) programme is the improved prediction of HABs by determining the ecological and oceanographic mechanisms underlying their population dynamics, integrating biological, chemical and physical studies supported by improved observation and modeling approaches, and specifically its core research project on HABs in eutrophic systems. The Integrated Coastal Area Management (ICAM) programme brings natural and social scientists, coastal managers and policy makers together to understand how to manage the diverse problems of coastal areas.

The IGBP Land-Ocean Interactions in the Coastal Zone Program (LOICZ) aims to provide the knowledge, understanding and prediction needed to allow coastal communities to assess, anticipate and respond to the interaction of global change and local pressures which determine coastal change. The UNEP and GEF supported LOICZ work on nutrient health report cards will provide a baseline for applied report card work in Lake Chilika and Manila Bay.

These programmes all share interests in understanding and better managing the coastal zone. Nutrient loading and its effects, including the expression of coastal eutrophication, is a common element across these programmes.

UN agencies: the project will co-operate and pursue synergies with nutrient related work being taken forward by other UN agencies, including UN-Habitat, FAO, UNDP and UNIDO. This co-operation has already begun through the Global Partnership on Nutrient Management, where FAO, UNDP and UN Habitat have all become active partners, and UNIDO invited. Particular synergies will be looked for in developing best practices and associated win to win investment opportunities such as re-use of wastewater for agriculture, and the engagement of the agri-business, e.g. with UNIDO, along the supply chain.

The project will work with the International Nitrogen Initiative (INI) network of scientists and practitioners dedicated to optimizing the use of nitrogen in food production, while of food and energy production. INI undertakes scientific assessments, develops solutions to solve a wide variety of nitrogen-related problems, and interacts with policymakers to implement these.

SECTION 3: INTERVENTION STRATEGY (ALTERNATIVE)

3.1 Project rationale, policy conformity and expected global benefits

The project rationale was set out in section 1.12 in the overall project summary. For ease of reference, the arguments are repeated here with some more detailed material reflecting points made in the baseline analysis and gaps, which necessarily underpins the rationale.

The context for project intervention revolves around the large increases in the amount of nutrients, specifically nitrogen and phosphorous, which are entering the world's environmental media because of key human activities and the environmental problems this excess of nutrients is producing. In the case of coastal waters around the world this is leading to nutrient over-enrichment, which in turn produces eutrophication and hypoxia leading to the undermining of marine ecosystems and the services they provide, including declining coastal water quality, fish kills, and damage to sea-grasses and coral reefs. The problems have become global in scope in recent decades.

The more specific rationale follows from this context and the baseline analysis and gaps set out at section 2.6. The range, extent, complexity and importance of drivers of nutrient over-enrichment (notably the use of fertilizer for food security purposes) have hindered attempts to address the problems of excess nutrient use effectively. There remains a lack of political attention, practical information and institutional and policy capacity among governments generally to deal with them, though problems are more challenging in developing countries and countries in transition.

The present problems of nutrient over-enrichment in coastal waters around the world resulting from activities such as agriculture, wastewater, and fossil fuel burning provide, therefore, the first contextual point of departure in support of project intervention to improve coastal water quality. The second is that without a step change in improved policy responses and better information, the problems caused by nutrient over-enrichment are set to multiply and intensify in many regions, especially in Asia and Africa, in the light of population growth and associated international and national efforts to promote food and energy production through additional fertilizer use, and through the growth of aquaculture, coastal urbanization and consequential increases in wastewater.

While there will be benefits to people from these additional efforts on food and energy production, there will also be a growing cost to countries (and their stakeholders), from the additional nutrient over-enrichment, through the further degradation of their marine and coastal natural resource base, and the services and livelihoods it provides. The achievement of international environmental and development goals would be made more difficult. Further degradation of coastal ecosystems could also undermine their contributing to meeting climate change. There is a need, therefore, for a new focus on sustainable use of nutrients, promoting efficiencies of use, and re-use, and avoiding unnecessary emissions, establishing that nutrient reduction and use can be compatible with achieving other development goals.

The project directly addresses an underlying problem described in the baseline analysis of the lack of a sufficient governance and management framework for governments and stakeholders to take effective action on reducing nutrient inputs and improving efficiency of use. Accordingly, the project is constructed so as to provide countries, for the first time, in a systematic and accessible way, with the information, tools, and policy options, necessary to analyze and take *cost effective action in developing nutrient reduction strategies* to the benefit of their coastal areas and stakeholders. A key part of this is that the project will provide (through the application of nutrient source-impact models in conjunction with best practices) a replicable 'road map' approach as to which investments and actions across a range of sectors can be most cost effective and environmentally beneficial.

At the same time, the project design recognizes that success in countries in actually initiating the necessary transformative action will require a supportive institutional environment, including an appreciation among countries and stakeholders of the wider sustainable development benefits of more effective nutrient management. To this end, the project design and outcomes, including modeling and best practice work, are set within, and seek to further promote cross sectoral integrated watershed and coastal management, making full use of related initiatives such as the Global Programme of Action (Washington GPA), the regional seas programme, and the GEF IW trans-boundary programme. In parallel, a Global

Partnership on Nutrient Management provides an over-arching catalyst to political and institutional engagement in international and regional fora, working across the GEF nutrient related portfolio to set in motion associated regional and national stakeholder partnerships, and providing an ongoing platform for the uptake and application of the project outcomes. Inter-governmental processes and international GEF conferences will be used to help in this, and the best practice measures drawn across the GEF portfolio and other country and sectoral initiatives.

The partnership approach also reflects a strong stakeholder engagement theme in the project, necessary given the range of sectors involved and need to change patterns of behavior in addressing root causes of nutrient over-enrichment.

Two more specific timing points support project intervention in the way proposed. First, the GEF portfolio (and other initiatives) of nutrient related work in various regions has advanced to a point where an overview and inventory of best practice measures and tools should be effectively brought together for global benefit in a systematic Policy Tool Box – one of the project outcomes. The GEF can build on its initial leadership through heightened attention to nutrients in a more integrated, cross programmatic and cross GEF agency manner.

Secondly, modeling and analytical techniques have likewise advanced to the point where the causes and effects of nutrient over-enrichment in watersheds around the world can be effectively quantified. Specifically, the project applies the Global News2 Use quantitative modeling approach for watersheds around the world. This takes an integrated approach, combining, for example, the impacts of population growth, urbanization, development of sewage systems, wastewater treatment and sewage effluent, atmospheric nitrogen deposition, climate change, agricultural production and food security, land cover change, bio-fuel production, aquaculture, agricultural nutrient management and land degradation. Data (from existing sources) is assembled in a systematic way under the project as an initial outcome, including from the Manila Bay watershed.

The modeling approach can then be used to evaluate (on different scales ranging from the more local and regional such as the Manila Bay watershed, to the global level) the potential effect on coastal ecosystems of *future* human impacts. In this regard, the approach indicates where and when nutrient over-enrichment problem areas are likely to occur and will provide estimates of the relative importance of different nutrient sources within watersheds. This provides a frame of reference by which to assess the likely impact and thus cost-effectiveness of the various policy options related to managing nutrient impacts from key source sectors, which are brought together under the project's Policy Tool Box.

This combination of Tool Box and modeling techniques will enhance the capacity of resources managers and policy makers to anticipate impacts of nutrient over-enrichment, providing in effect a road map as to which investments and decisions policy makers can better make in addressing root causes of coastal over-enrichment through nutrient reduction strategies.

The application of source-impact modeling and best practices in the Manila Bay watershed provides a further compelling rationale in support of the project. The nature of the watershed and its institutional and stakeholder structure will enable highly policy relevant interventions – a nutrient reduction plan based on full cross agency and stakeholder engagement – to be facilitated, making full use of the modeling and best practice approach described above. Underpinning this is a specific legal requirement from the Philippines Supreme Court that the Philippine government agencies and other bodies should work together in restoring the water quality of the Bay and its coastal area, addressing in so doing the root causes of the current degradation, including the problems of nutrient over-enrichment.

These circumstances provide the opportunity to not only insert effective nutrient reduction planning into the heart of decision making in a major watershed and conurbation in a developing country consistent with national and local priorities, contributing to a real improvement in coastal water quality for millions of people, but in so doing facilitate the development of tools and approaches of wider global application.

To conclude, the broader nutrient excess context, the specific modeling, best practice and partnership approaches entailed in the project, wedded to the benefits of timing and working productively in the proposed demonstration area provide a clear and timely added value for project intervention. By addressing causes of eutrophication and hypoxia, the project is designed to initiate transformative action by countries and other stakeholders on nutrient reduction leading to the benefits:-

- of improved water quality and more resilient coastal ecosystems
- the stimulus to the take up of adaptive integrated watershed and coastal zone management and associated programmes such as the GPA and regional seas,
- and also the benefits of promoting a substantive shift towards more sustainable nutrient management generally and its contribution to moves towards a Green Economy.

Policy Conformity

The release of nutrients into groundwater and atmosphere often cross borders and creates environmental, social and economic impacts along the way - until reaching the coastal zone. Accordingly, the project addresses the IW strategic objective "*to catalyze trans--boundary action addressing water concerns*" where the expected impacts are "*Participating states demonstrate the necessary ability to … reduce land-based coastal pollution".* The project is entirely consistent with IW-SP2 of GEF-4 to "*reduce nutrient over-enrichment and oxygen depletion from land-based pollution of coastal waters in LMEs consistent with the GPA.*"

The project will assist GEF projects, countries and relevant stakeholders in facilitating the development and implementation of regional and national policy, legislative and institutional reforms in the most cost-effective manner for the sustainable reduction of nutrient over-enrichment and oxygen depletion in LMEs. In particular, through the provision of tools, guidelines, lessons learned and best practices, linked with modeling and analysis of nutrient causes and effects, the project will provide countries with an approach to assess risks and identify most cost-effective policy and technological options. This will assist in developing and up-scaling of financial mechanisms for the implementation of nutrient reduction strategies and agreements, including agreements for public/private sector partnerships.

The project will build on the experience from previous GEF interventions that have proven to be an effective agent for policy, legal and institutional reforms related to international waters and for the creation of enabling environments. Section 2.7 details the relevant linkage with GEF nutrient related projects. The approach, therefore, of the project is based on effective policy conformity in terms of making use of what works in countries, and what can work, as well as past and current GEF and other projects.

The project design, including in relation to the Manila Bay watershed, reflects a strong sense of working consistently with national priorities and agreed international environment and development goals, and contributes towards achieving these including environmental sustainability more generally. The section below on global benefits gives further illustration of these connections.

As set out in section 2.7 (linkage with non GEF interventions) the project approach is fully in line with UNEP priorities on Ecosystem Management, Harmful Substances and Hazardous Waste, and Resource Efficiency, and UNEP's regional seas programmes. In particular, National Programmes of Action (NPAs) under the GPA provide a comprehensive, yet flexible framework for guiding a country's response to major pollution problems and facilitating implementation action. Importantly, in this regard NPAs set out a set of actions for mainstreaming the GPA into national policies, and planning. They can assist governments, industry, agriculture and other relevant sectors and local communities to prioritize their marine and coastal protection and development goals. Over 60 governments are addressing nutrient issues through NPAs, which will form one of the key mechanisms for implementing project outcomes, linked in with regional seas activity.

The development of nutrient reduction strategies in the Manila Bay watershed will be fully in line with national and local policy priorities to the extent that the development of nutrient reduction strategies will not only be based on full stakeholder participation, including government agencies, but will also be integrated with into a concerted attempt by the agencies and others to improve the water quality for the Manila Bay region.

Expected global benefits

The particular global environmental benefit of this project will be achieved through the enhanced knowledge, guidance and tools provided to countries and their application in developing and applying nutrient reduction strategies and measures. This will lead to the long-term effective management of the key sources of nutrients to the coastal zone and the reduction of nutrient enrichment and oxygen depletion from land-based pollution in LMEs. This will be to the direct improvement of coastal water quality with the benefits that brings to coastal communities around the world, including to human health and reduced fish kills, as well as strengthening the resilience and health of productive marine and coastal ecosystems and the services they support, including in relation to climate change.

The project will also help draw a line across the spread and expansion of human induced eutrophication and hypoxia from its current inner shelf focus (though not exclusive focus) to their expansion into open marine areas, which is recognized as a future threat.

Additionally, excess nutrients in the world's environmental media have a range of harmful effects of global significance that go beyond coastal waters – on air quality and human health, freshwater quality (and thus water availability) and on levels of greenhouse gas emissions (nitrous oxide is a powerful greenhouse gas). Though focused on coastal waters, effective nutrient reduction approaches developed under the project, including through the prism of integrated watershed and coastal management, can provide a strong lever to help engage and strengthen the various fora and processes addressing this broader range of environmental problems caused by excess nutrients. In so doing the project can in turn add clear value to global and regional programmes such as the GPA and regional seas.

In this way, addressing nutrient over-enrichment in coastal areas can also act as a lever for broader and necessary changes in nutrient management, helping ground moves to accelerated food and energy security and increased wastewater discharges in more sustainable and cost effective approaches to the benefit of countries and their citizens. These changes are necessary to the achievement of environmentally sustainable management of natural resources.

3.2 Project objective

The project objective is: '*to provide the foundations (including partnerships, information tools and policy mechanisms) for governments and other stakeholders to initiate comprehensive, effective and sustained programmes addressing nutrient over-enrichment and oxygen depletion from land based pollution of coastal waters in Large Marine Ecosystems'*.

To meet this objective the overall outcome aims for the provision of an applied, knowledge and stakeholder based managerial and technical framework, which:-

(a) enables and stimulates countries and their stakeholders to instigate and implement cost effective programmes and policies to improve substantially nutrient management to the benefit of countries' coastal water quality

(b) provides a replicable model, both in terms of tangible tools (programmes, policies and regional models) and process (stakeholder engagement, partnerships) , whilst recognizing that watersheds and coastal systems vary around the world

(c) works through a global partnership (and associated regional ones) to provide political, stakeholder and scientific impetus at global, regional and national levels

(d) draws on previous GEF interventions and seeks to link them systematically in an overall policy tool box approach, promoting also broader GEF International Waters portfolio efforts on development of knowledge based, integrated interventions by countries and partners

(e) contributes to the mainstreaming of integrated coastal zone management and environmental sustainability and related international and regional programmes

3.3 Project components and expected outcomes

3.3.1: The key project outcomes are reflected in 4 main operational components under which the project will be implemented – Component A, the global partnership, Component B, the development of the modeling techniques, Component C, the development of the Policy Tool Box and the integration of the tools with the modeling techniques, and Component D, the application of tools and modeling techniques in the Manila Bay watershed to produce actual nutrient reduction strategies both for mainstream adoption in that area, and as a model for the development and application of nutrient reduction strategies in other regions. Each component will contribute to overall lessons drawn and potential for replication and up-scaling, which will be disseminated in an inter-active way through the Component A partnership, which continues after project completion to provide sustainability.

In addition to the 4 operational components, two over-arching components are represented by *Component E - monitoring and evaluation, and Component F – effective project co-ordination, management and over-sight.*

The following gives a general description of the four operational components (A-D) through which the project will be implemented and under which activities will be carried out in order to achieve necessary outputs and outcomes. The general description is designed to illustrate the linkage among the components and the overall logic of the project. Separate, detailed work plans are then set out for each component, including components E and F.

Component A: ***Global Partnership on Nutrient Management addressing causes and impacts of coastal nutrient over-enrichment and hypoxia***

Component A is an over-arching and ongoing component, helping (through the initial establishment of the Global Partnership) to instigate the project and build momentum, including through stakeholder engagement. It will provide a platform for promotion and exchange of work from other components as they emerge, including for the consolidation, scaling up and sharing of final project outputs. The Partnership will provide ongoing sustainability for project outcomes after project completion

Overall this component will broker knowledge for stakeholders so that (a) they are better informed about the impacts and causes of nutrient over-enrichment of coastal zones and resulting eutrophication and dead zones in LMEs, including the associated environmental costs; and (b) they have access to ongoing guidance and support for the development of nutrient reduction strategies.

The Partnership will specifically target GEF projects and portfolio learning as well as other initiatives from various stakeholders. The web-based platform will be a critical interface for the project to interact with GEF projects and other stakeholders, and will be inter-actively linked with IW Learn as part of building a Community of Practice. Once the outputs from the nutrient source-impact analyses (component B) and the Policy Toolbox (component C) have been developed, they will be hosted on the platform. The platform will compile and make available information on major land-based and aquaculture emission sources and impacts, cross-media transfer of nutrients, environmental costs, outcomes of policies and measures applied to reduce emissions and impacts, and identification and analysis of impacts in LMEs.

A global overview of nutrient over-enrichment will focus on synthesizing knowledge and addressing knowledge gaps, with specific emphasis on the economic and environmental costs of nutrient over-enrichment and oxygen depletion. The synthesis report will integrate the information developed in the INI UNEP nutrient assessment, the WRI report, the work of the STAP, UNESCO global NEWS project, the working group on Harmful Algal Blooms and other relevant Agency projects and programmes, and include results from Trans-boundary Diagnostic Analyses (TDAs) and Strategic Action Plans (SAPs) developed for many LMEs with GEF funding

From the beginning, partnerships beyond GEF projects will be facilitated by UNEP/GPA, as well as other programmes, to assist with local data access and interpretation as well as engagement in the larger goal of the project, namely to achieve a reduction in the effects of nutrient enrichment in LMEs in terms of harmful algal blooms, hypoxia, degradation of coral reefs, and harm to fisheries

Component B: quantitative analysis of relationship between nutrient sources and impacts to guide decision making on policy and technological options

Component B addresses the need for more quantitative nutrient analysis, particularly in developing countries, and the exchange of information on this. It aims at improved predictive capability and use of tools, guidelines and modeling outputs by relevant stakeholders in order to attribute nutrient sources within watersheds and to quantitatively analyze relationships between nutrient sources in watersheds and impacts in coastal waters.

To establish linkages between watershed nutrient sources, controlling factors, and nutrient loading, an established spatially-explicit watershed modeling system -IOC's NEWS2USE model - will be used, the background to which and detailed functioning of is detailed at appendix 15. The strengths and feasibility of this system have been demonstrated in previous applications using global databases. The model approach integrates detailed data and knowledge on the different nutrient and sediment sources (food production systems, sewage, industry, atmospheric nitrogen deposition, and aquaculture) and the quantification of impacts in coastal ecosystems. The application of the NEWS model in the current project will be significantly enhanced by compiling and applying local and higher resolution model input data from the main demonstration area, Manila Bay watershed. From this additional data, high resolution, policy relevant river nutrient export and ecosystem models are developed under component B for practical application in the Manila Bay watershed area under Component D.

Information necessary to developing and applying the modeling under the component will be compiled making full use of existing knowledge, on major emissions sources and impacts, cross-media transfer of nutrients, outcomes of policies and measures applied to reduce emissions and impacts, and identification and analysis of impacts in LMEs. The impacts which will be considered will be harmful algal blooms, hypoxia and effects on fisheries and coral reefs.

The model approach adopted by SCOR-LOICZ on coastal based nutrient pollution and relationships to harmful algal blooms will also be used as well as model based estimates of atmospheric deposition. The various model approaches will be used to analyze the effects of future climate change on nutrient and carbon loads to, and impacts on, coastal ecosystems.

Resulting benefits from the nutrient source-impact analyses under this component include: improved long-term data records of coastal environmental conditions; improved quantitative relationships between nutrient loads and effects; improved regional models of coastal effects under different physical regimes; and better use of the outcomes of global, regional and local-scale models of nutrient loads and export. In particular, users will be able to assess the likely impact of various policy options in key nutrient source sectors such as agriculture, wastewater, and aquaculture. A community of model users will be developed within the global partnership that use the models and modeling results to attribute sources of nitrogen

(N), phosphorus (P) and Silica (Si), and develop estimates of the relative effectiveness of possible policy decisions on coastal water quality at regional and international scales.

Component C: establishment of scientific, technological and policy options to improve coastal water quality policies in LMEs and for national nutrient reduction strategy development

Component C will support national action and the development of nutrient reduction strategies by focusing on the application of existing knowledge and practices. Component C will result in the identification of cost-effective and sustainable technology and policy options, which will be made available in form of a Policy Toolbox to inform and strengthen the development of nutrient strategies. As part of this, component C will help support the next inter-governmental review of the Washington GPA.

The approach to the Tool Box development includes a global review, analysis and exchange of policy experiences, lessons learned and best-practices regarding scientific, technological and policy options for reducing nutrient over-enrichment from land-based sources, focusing on the most efficient low cost interventions where applicable. Intergovernmental organizations, regional and national programmes, GEF projects, industry stakeholders and civil society will be invited to the development and peer review of a Policy Toolbox for cost-effective technological and policy options.

Particular attention will be paid to agreements and partnerships with the agri-industry, sewage and wastewater sector. Financial mechanisms will be suggested to ensure long-term sustainability of actions, with special focus on agreements and partnerships with the private sector. GEF work on wastewater, including constructed wetlands, nutrient reduction interventions, and the Regional Seas Programme will feed into this component, including the exchange of training materials, drawing lessons from current nutrient and up-scaling projects, and so contributing to integrated nutrient management and the use of the Policy Toolbox.

Integration of components B and C: The modeling outcomes from component B will be applied under this component to the various best practice policy options collected under the Policy Tool Box. This is designed to assess the likely effects of the policy options against baseline, current and future scenarios established by the source-impact modeling. It is in this way that the project provides the capability for policy experts to develop road maps for cost-effective investments and planning on nutrient reduction, using the combination of Tool Box and modeling.

Focused workshops will be developed in which participants from various regions, including in the Manila Bay region, will be engaged in the use of modeling outputs and the policy toolbox in developing strategies to address key nutrient challenges, such as over-enrichment of coral reefs, intensive aquaculture and inadequate wastewater management.

Component D: development of nutrient reduction strategies through the application of quantitative source-impact modeling and best practices in the Manila Bay watershed

The Manila Bay watershed provides the opportunity to develop effective nutrient reduction strategies through the practical application of source-impact modeling and best nutrient reduction practices.

Component D will first focus on building the foundations for the development of nutrient reduction strategies in the area. A first step will be to contribute to the strengthening of Integrated Information Management System of the Manila Bay Coastal Strategy, establishing a nutrient baseline and indicators and identifying gaps and how they can be addressed. There will be an overall review of the nutrient status, applicable regulations and measures, linked to overall water quality efforts. This will include engagement with leading sectors and other stakeholders on best nutrient reduction practices, drawing fully on local experiences as well the benefit of work under Component C, and building support for the use of the source-impact modeling being developed under Component B.

The development of the first versions of the river nutrient export and ecosystem models for the Manila Bay watershed (using data collected and assembled in the region by local research bodies) would then provide a basis for the discussion and development of draft nutrient reduction strategies in conjunction with a full range of Manila Bay agencies, sectors and other stakeholders. This process would culminate in the development – as the models and best practices are refined in the light of ongoing dialogue and analysis – in the development of an agreement on cost effective nutrient reduction strategies (incorporating stress reduction and environmental quality status indicators) to be implemented as part of broader cross-agency efforts to improve coastal water quality in the watershed region.

Nutrient health reporting card: Lake Chilika, Orissa and Laguna de Bay, Manila: component D will also provide a vehicle for the development and application of an ‘ecosystem health report card’, capable of tracking and reporting the nutrient over-enrichment health of lakes, estuaries and deltas (many such ecosystems around the world are affected by elevated nutrient and sediment loads, resulting in the overall degradation of water quality and biological resources). Drawing on previous UNEP and GEF supported LOICZ work; this will first be applied in Lake Chilika, India, early in the project, with a view to providing an overall water quality status of the Lake and the coastal water quality in the adjacent Bay of Bengal. An implementation plan will be developed with the Lake authorities and stakeholders. The report card approach will then be applied in the Laguna de Bay, Manila Bay watershed, including as part of the development of overall nutrient reduction strategies for the watershed.

Finally, component D will provide the window for lessons to be drawn across the project, and in particular the potential for replication and up-scaling of the tools and mechanisms applied in the Manila Bay watershed (and Lake Chilika) in the development of effective nutrient reduction strategies.

Component E: monitoring and evaluation

UNEP best practices will be followed, including mid-term and terminal evaluation and use of SMART indicators.

Component F: effective project management and oversight

This component will provide effective day to day management and implementation of project activities through a project co-ordination unit, overseen by a project manager, with broader over-sight provided by a project steering committee comprising a mixture of government representatives, UN agencies, private sector and the scientific community.

Further details on components E and F are given in the following section – component work plans – as well as in section 4 on institutional framework and implementation arrangements, and section 6 on monitoring and evaluation.

SECTION 3.3.2: ACTIVITY WORK PLANS FOR PROJECT COMPONENTS

Introduction:

The following section focuses on the activities and outputs needed to achieve the outcomes described earlier. There are separate work plans for each of the Components. For ease of reference each work plan is introduced by the main expected outcomes for the component as described previously.

Each Component work plan entails a number of sub-projects, each of which is assigned a clear output(s) which coincide with the main outputs described earlier for each Component. For ease of reference, the sub-projects contained in the work plan contain the same references, e.g. SP A1 (sub-project 1 for Component A) to the references to outputs in key appendices to this document, such as the project results framework, key benchmarks and work plan and timetable. In a number of cases, sub-projects are broken down further into a number of separate work streams.

'Deliverables' are also set out under each sub-project, along with timings and who will be responsible for the delivery. Deliverables in this context are the form the output(s) take: in some cases this will be the same as the intended output, e.g. 'a global overview of nutrients' will be delivered in the form of an overview report; in other cases, e.g. an output such as 'engagement and capacity building on the policy tool box' will take the form of a number of deliverables, such as a workshop, communication materials etc. Activities describe the steps to be taken to achieve the deliverables and thus outputs.

Finally, the work plans (A-D) set out the resources budgeted for the carrying out of the various activities necessary to deliver the outputs, which together comprise the total activity budget. In addition to these discrete amounts budgeted for activities, each Component includes amounts budgeted to provide technical assistance. For each Component these are \$35,000 GEF grant and \$139,000 co-financing. These amounts have been set aside as representing each Component's (A-D) support – technical assistance – to overall project management resources provided under component E (project management).

This assistance represents the contribution of each Component to PSC/PCU meetings, communication and reporting, and some staffing necessary to ensure overall effective project management. This approach not only reflects practical linkage between activities, for example, attendance at various meetings – PSC and PCU meetings will be built around workshop and Global Partnership meetings to maximize impact and minimize costs – but will also allow each task manager for the component to establish project management units for their components to assist with component and overall project planning.

When the amounts of $35,000 GEF grant and $139,500 co-financing are added to the total activity budget for each Component they give the overall amount of resources provided for each component, so corresponding to overall levels for components set out in the summary section and the budget at section 7.

I WORK PLAN FOR COMPONENT A

Global Partnership on Nutrient Management addressing nutrient over-enrichment of coastal zones, its causes and resulting eutrophication and dead zones in LMEs

Overall activity budget $592,000: GEF grant: $281,000; co-financing: $311,000
Technical assistance $35,000 GEF grant, $139,500 co-finance

Main outcomes

1. Global partnership of stakeholders actively involved in addressing nutrient over - enrichment in coastal waters

2. GEF projects, countries, and stakeholders better informed about the importance of eutrophication & hypoxia, including environmental and economic costs, and

3. GEF projects, countries and stakeholders have access to ongoing guidance & support for development & implementation of nutrient reduction strategies

Management: UNEP/GPA will be task manager for this component. The aims of the component will be achieved through three sub-project activities which correspond to the main outcomes, with each producing a number of project outputs.

Sub-project A I (SP A1): Global partnership of stakeholders actively engaged in addressing nutrient over-enrichment in coastal waters

Outputs: partnership establishment and stakeholder involvement; partnership and project communication strategy; establishment of web based platform.

Total cost: $303,000: GEF grant $146,000: co-financing$157,000

Activities description

The launch of the Global Partnership on Nutrient Management (GPNM) provides an umbrella for this component. UNEP/GPA, working with GPNM and project partners, will produce the deliverables for this sub-project by carrying out the following activities:-

- engaging in international and regional fora to promote the GPNM and seek new members. The GPNM will be registered as Partnership under the UN Commission on Sustainable Development and will take part at the 2011 meeting of the CSD. The Government of the Netherlands has committed substantial resources to strengthening the partnership, including a focus on China. UN Habitat will engage in relevant wastewater fora to assist a nutrient focus in them.

- developing a communication and outreach strategy – in combination with project partners such as the US and Netherlands Government, and drawing on additional expertise from experts in particular fields, such as the International Fertilizer Industry Association,

- publishing and disseminating an advocacy manual on 'Effective Nutrient Management', which has been developed under an MoU with SCOPE/the International Nitrogen Initiative

-holding at least 2 GPNM (and associated regional stakeholder meetings) with the aim of deepening the impact of the GPNM but also to develop Regional Nutrient Management Partnerships, e.g. for India, and Indonesia.

-engaging with other GEF LME projects, notably the Bay of Bengal LME, to help establish nutrient management partnerships

-developing and maintaining a separate partnership and project web based platform to present and project outcomes (see also sub-project 3)

Deliverables and timing

Holding of two full GPNM and associated regional partnership meetings (years 1 and 3)
Full establishment of global partnership and stakeholder involvement (year one and ongoing)
Establishment of and maintenance of web based platform (year 1 and ongoing)
Establishment of nutrient management partnerships at regional (and national where appropriate) levels (year one and ongoing)
Communication strategy, Foundations Document

Responsible: UNEP/GPA

Sub-project A2 (SP A2) –Informing GEF projects, countries and stakeholders about the importance of nutrient over-enrichment and hypoxia, including economic and environmental costs

Outputs: global overview of nutrient over-enrichment; synthesis report

Total cost: $125,000: GEF grant $60,000, co-financing $65,000

Activities description

The deliverables will draw on the ongoing work of the INI in relation to global and regional nitrogen assessments; a number of previous assessments and reports, including a 2008 report commissioned by UNEP DTIE on nutrient impacts on the coastal zone; the work of the Energy Centre Netherlands in producing an analysis of Nitrogen and Climate Change, which was stimulated by the GPNM; and resources provided by the Government of Netherlands for a forthcoming report on Nutrient cycling, coastal effects, and greenhouse gas exchange.

The global overview will focus on knowledge gaps with specific emphasis on the economic and environmental costs of nutrient over-enrichment, while the synthesis report will integrate previous information sources. In this way, they will help lay the foundations for work under both this component A and other components in terms of pointing to relevant tools and cost effectiveness. The overview and synthesis reports will be disseminated on the web based platform and through the Partnership mechanisms.

Deliverables and timing

Global overview of nutrient over-enrichment, its causes sources and resulting eutrophication and hypoxia (year 1)
Synthesis report identifying emerging issues and knowledge gaps, with a focus on environmental and economic costs (year 1)

Responsible: UNEP/GPA working in conjunction with INI on the global overview and synthesis reports

Sub-project A 3 (SP A3): ensuring access to continued guidance and support for the development of nutrient reduction strategies

*Outputs***:** web based platform targeting GEG projects as part of IW Learn; Community of Practice on nutrient management targeting GEF projects, and incorporating and promoting eXtension agricultural services; replication and up-scaling of lessons learnt; participation at and input to GPA review and IW conferences

Total cost: $164,000: GEF grant $75,000, co-financing $89,000

Activities description

UNEP/GPA will provide for active participation in the GEF portfolio in conjunction with partners, and will ensure as overall task manager that outputs from other components are made available and fully shared on the component A platform, using the GPNM to promote engagement and dissemination.

An initial focus of activity will be the holding of a training workshop to establish the Community of Practice, including the participation of IW Learn and GEF projects.

The Community of Practice will strengthen as the material from other components emerges, notably the development of the tool box – best practices, technologies etc from component C, which will promote synergies with other GEF projects. UNEP/GPA will use the GPNM to help foster and strengthen the Community of Practice, making full use of the work of partners. Particular attention will be given to developing a community of practice based on eXtension agricultural services, where the US government will provide its expertise and model approaches. Workshop/side-events will be held at the GPA review and IW conferences in order to help inform governments, GEF projects and other stakeholders about the importance of nutrient management, the options available and strengthen the Community of Practice.

UNEP/GPA will lead the process of drawing conclusions and evaluation of lessons learnt in association with the main task managers for each component. This will be ongoing as project deliverables emerge from all components with a stock taking annually. The partnership platform will be used to ensure that the deliverables and lessons drawn have wide and inter-active engagement with a view to targeting activity in countries that wish to take nutrient reduction plans forward, so promoting up-scaling and replication.

Deliverables and timing

Web based platform targeting GEF projects as part of IW Learn (year 1and ongoing)
Holding of Community of Practice training workshop on nutrient management targeting GEF projects, and incorporating and promoting extension agricultural services (year 1 and ongoing)
Guidelines, tools and data for nutrient impact analysis developed under components B and C (tool Box) fully shared with GEF projects and other users (as they emerge in years 1 and onwards)
Replication and up-scaling of lessons learnt (year 1 and ongoing).

Responsible: UNEP/GPA

II WORK PLAN FOR COMPONENT B

Quantitative analysis of relationship between nutrient sources and impacts to guide decision making on policy and technological options

Overall activity budget: $1,018,347: GEF grant: $453,682; Co-financing: $564,665
Technical assistance budget: GEF grant $35,000, co-financing $139,500

Main outcomes:

Relevant stakeholders in developed and developing countries have basis and tools available tools to:-

(a) attribute sources of nitrogen, phosphorous and silicon within watersheds
(b) quantify past, current and potential future export of nitrogen, phosphorous, and silica
(c) develop estimates of relative effectiveness of nutrient increases/decreases on coastal water quality at regional to international scales

Management: IOC/UNESCO will be the task manager for this component. The main executing partners on their behalf will be the University of Utrecht, Washington State

University, and the University of the Philippines (Marine Science Institute), who will assist with data assembly for the modeling in connection with Manila Bay watershed.

Three main sub-projects are foreseen under Component B: (i) the initial overview of tools and initial data assembly (ii) modeling of the assembled data and related information to provide specific outputs such as global and regional models, maps and analysis (iii) communication to experts of the source-impact modeling outcomes through training, user guidelines and manuals, and summaries of the models, which can be applied in policy development. In a number of cases, the sub-projects comprise a number of different albeit work strands and so sub-projects are broken down into sub0project components.

There are two scales of modeling activity. First, the global scale – using and developing data bases from a variety of institutions, organization, processes and sectors to provide the basis for modeling and analysis of nutrient sources and impacts in relation to watersheds and coastal areas around the world. This will show how in relation to watersheds generally, past, current and future contributions of different nutrient sources (from e.g. wastewater, aquaculture and agriculture) have led to or most likely will lead to certain quantifiable impacts in coastal areas, namely eutrophication, hypoxia and consequent effects on fisheries, and coral reefs. Realistic user friendly models will be produced to illustrate these relationships and so make them applicable to scenario and policy impact analysis by policy makers in watersheds around the world with a view to determining overall cost effective nutrient reduction strategies.

The second level of modeling activity under this component is in relation to the Manila Bay watershed. Here the aim is to develop analogous (to the global level modeling activity and analysis described above) models, but which in this case are of particular application to the Manila Bay watershed region. The first stage of activity will be to ensure the modeling is sufficiently attuned to circumstances in the Manila Bay watershed by feeding into the NEWS2USE modeling a full range of relevant data from the Manila Bay watershed region itself, which will be assembled in the Manila Bay region using local institutions. This will enable realistic (but in this case higher resolution) models to be produced, which will show quantifiable relationships between nutrient sources and impacts – eutrophication, hypoxia, fisheries etc- in the Manila Bay region.

These models in turn will be applicable to scenario and policy impact analysis by policy makers in the Manila Bay region and so contribute to developing overall nutrient reduction strategies for the Manila Bay watershed. This part of the work will be carried out under Component D, though throughout the development of the models there will be regular co-operation and dialogue between Component B executors and stakeholders in the Manila Bay watershed area.

Data compiled in relation to project activities and stored in project data bases on line or with partners will be shared where appropriate with stakeholder and international data systems as a means to increase accessibility and long term storage and usage. This follows the policy on data of IOC/UNESCO.

Sub-project B 1 (SP B1): Overview of existing tools for source-impact analysis of nutrients in LMEs and their target audiences

Output: as for sub-project title in the form of the deliverable stated below

Total resources $55,000: GEF grant $27,000, co-financing $28,000

Activities description

This involves a summary of existing tools and models at global, regional and local scales for (i) estimating and modeling nutrient loading of coastal marine ecosystems and (ii) describing the impacts of increases nutrient loading and changing nutrient ratios. For coastal nutrient loading this will include models for estimating river export, atmospheric deposition, contributions from marine aquaculture at different scales, ranging from global to local. Regarding the impacts of nutrients, this will include various approaches ranging from those based on threshold values for nutrients to mechanistic ecosystem models. The advantages and disadvantages of all the approaches at the scale for which they were developed and target audience will be summarized. The summary will include relevant tools and models being used in Manila Bay in order to help inform the work under sub-project 4 regarding the development of models for Manila Bay.

Deliverable: Report
Completion: 9 months after project start
Responsible: University of Utrecht

Sub-project B 2 (SP B2) : ***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***.

Output: as for sub-project tile in the form of deliverables stated below for each sub-project component

Total cost: $189,000: GEF grant $65,000, co-finance $124,000

Activities description:

This task involves the collection of data with global coverage from a variety of sources. A number of data bases will result with associated documentation, the combination of which results in the overall global data base. The databases and documentation will be made available on the web site under component A. A number of sub-project components are foreseen, reflecting the different data sources.

Sub-project 2.1 ***Data base (a)****: Global-NEWS data for river nutrient export*

Activity

This entails bringing together data for river nutrient export (nitrogen, N; phosphorus, P; Silicon, Si) of dissolved (D) inorganic (I) nutrients (DIN, DIP, DSi), dissolved organic (DON, DOP) and particulate (PN, PP), as well as suspended solids, as published in the recent Global NEWS special issue of *Global Biogeochemical Cycles.*

This database includes estimates of nutrient export by individual form for the years 1970, 2000, and scenario runs using four Millennium Ecosystem Assessment scenarios for 2030 and 2050. The datasets include all the background data used to drive the Global NEWS models, such as atmospheric deposition estimates, fertilizer inputs, manure inputs, and N fixation inputs, as well as indicators like the Index for Coastal Eutrophication (ICEP).

These datasets are available, but would also benefit greatly from additional work including an effort to split DIN into reduced (ammonium, NH_4) and oxidized nitrogen (Nitrate, NO_3). This is necessary for better describing the impact of nutrient forms on the development of harmful algal blooms of some specific algae. Certain enhancements will also be made to the point source estimates, such as including non-urban sewage sources. The global modeling efforts in subproject 2.1 also allows for analyzing regional (scale of LMEs or seas) sources and impacts.

Deliverable: data base and documentation
Completion: 6 months after start of project
Responsible: University of Utrecht

Sub-project 2.2 ***Data base (b****): Nutrient release from aquaculture*

Activity

This activity will apply work performed in the framework of the SCOR-LOICZ work group on harmful algal blooms, and is readily available for use in this project. The data include model-based estimates of nutrient inputs and outputs for aquatic plants (seaweed), crustaceans, molluscs and finfish. Crustaceans and finfish in marine environments are generally fed various feedstuffs, while molluscs generally filter suspended material (algae, sediment, etc) and transform this to pseudo-faeces, faeces and dissolved nutrients. However, in the published work country-scale estimates are available, and application at the scale of LMEs will require additional work. This additional work includes improved allocation within the coastal seas of each country, and a split of the release of dissolved nutrients into specific nutrient species (ammonium, urea, nitrate). The global modeling effort in subproject 2.2 also allows for analyzing regional (scale of LMEs or seas) sources and impacts.

Deliverable: data base and documentation
Completion: 6 months after start of project
Responsible: University of Utrecht

Sub project 2.3 for Component B: ***Global database development with data on coastal conditions, non land based nutrient sources, as well as coastal effects collected from existing sources.***

Activity

This task involves the collection of required data needed to describe the physical and environmental conditions in coastal marine ecosystems worldwide. It will draw on existing work on coastal typology. The activity will also collect information on coastal upwelling, stratification, and productivity, as well as other necessary ancillary data.

Upwelling regions will be identified with globally available databases. For example, indices may be used to indicate the probability of upwelling, or classification of coastal systems as dominated by upwelling. Presently, there is no method available to estimate rates of coastal nutrient supply due to upwelling. Until such a method is developed, the degree of upwelling will be used as a characteristic that may be important for productivity and possibly the proliferation of HABs and nutrient-instigated syndromes.

Stratification is another important process determining the development of algal blooms and hypoxia. Global gridded databases will be obtained from the LOICZ programme, and additional approaches may be needed using, for example, tidal range, salinity gradients, and the variability of the mixed layer depth.

Chlorophyll concentration and primary productivity are two key factors with the potential to affect risk of hypoxia and harmful algal blooms. Global satellite data will be used in combination with observed chlorophyll-a concentrations to develop new or refine existing algorithms linking satellite-based signals to chlorophyll a concentrations and productivity. Satellite-derived information will also be used to test for relationships between chlorophyll a, primary production and occurrence of hypoxic events.

Deliverable: database and documentation
Completion: *mid term review (April 2013)*
Responsible: Washington State University

Sub-project 2.4 Observed impacts elements

This has two elements yielding databases which will be combined with those from subprojects 2.1-2.3:

2.4.1 Occurrences of hypoxia and harmful algal blooms

Activity

This activity involves the collection of available and published data on observed hypoxia events and harmful algal blooms (HABs). Data sources will include Diaz and Rosenberg's work on hypoxia, the SCOR-LOICZ work group for harmful algal blooms, and additional IOC databases, such as HAEDAT).

Deliverable: database and documentation
Completion: first version: midterm review (April 2013): final version end of year 3
Responsible: University of Utrecht and Washington State University, with support of IOC/UNESCO.

2.4.2 Impacts on fisheries

Collection of available data and model output from regions where Ecopath and EcoSim models have been run. So far these systems include more than 70 coastal systems worldwide. These systems will be used to develop relationships between fishery production and potential controlling variables such as nutrient inputs and hypoxia, and these relationships will be used to make global-scale estimates of anthropogenic impacts on fisheries at the global scale.

Deliverable: database and documentation
Completion: first version by mid-term review (April 2013); final version end of year 3
Responsible: Washington State University

Sub-project B 3 (SP B3): nutrient impact modeling for global and local to regional nutrient source impact analysis

Output: as set out in the sub-project title, in the form of deliverables set out below for each sub-project component.

Total cost: $214,000 GEF grant $100,000, co-finance $114,000

There are a number of components to this sub-project, which reflect the application of the data bases assembled under sub-project 2 above, and which are relevant to the global level modeling activity described in the introduction to the work plan for this component.

Sub-project 3.1: *Enhanced predictive capability of models with respect to nutrient sources, loads, and coastal impacts*

Activity

Data from the SCOR/LOICZ HAB work group will be used in conjunction with information about HAB risk indicators such as the ICEP indicator to develop quantitative models predicting the probability of HAB occurrence as a function of nutrient loads and sources. Similarly, a coastal filter model will be used to estimate transfer of nutrients from rivers to coastal waters. Estimates of Si and aquaculture-derived N and P will be included in this analysis. Results from this approach will be compared with results from the empirical approach based on chlorophyll-HAB and chlorophyll-hypoxia relationships described above. To the extent possible, information about nutrient impacts on fisheries will also be included.

Deliverable: Relationships and documentation
Completion: First version: Mid-term review (April 2013); final version end of year 3.
Responsible: University of Utrecht, and Washington State University

Sub-project 3.2 *Assessment of effects of nutrient loading in coastal marine ecosystems*

Activity

Relationships developed via work described in sections 2 and 3.1 will be used to develop maps indicating where hypoxia, HABs, and high chlorophyll *a* concentrations are likely to occur under current and recent historic conditions.

Deliverable: Maps and documentation
Completion: First version: mid-term review (April 2013); final version end of year 3.
Responsible: University of Utrecht and Washington State University

Sub-project 3.3 *Analysis and maps of past, current and future contributions of different nutrient sources, forms and ratios in watersheds to coastal effects*

Activity

Maps will be analyzed to identify regions likely to experience the rapid increases in nutrient-related problems over the next several decades. Primary sources of nutrients to these coastal regions will also be estimated as such information is necessary to support attempts at problem avoidance or mitigation.

Deliverable: Report
Completion: First version: Mid-term review (April 2013); final version end of year 3.
Responsible: University of Utrecht and Washington State University

Sub-project 4 for component B: development of regional models for the Manila Bay watershed of coastal effects

Output: as in the sub-project tile, in the form of the deliverables set out below for each sub-project component

Total cost $298,000: GEF grant $140,000, co-finance $158,000

Overall activity

With this sub-project the focus of activity turns to developing high resolution nutrient-source impact models for Manila Bay watershed. There are 4 components for this sub-project, which share the collective aim of producing validated models (using data assembled from Manila Bay institutions) on (i) river nutrient export loads to Manila Bay, and (ii) ecosystem effects and implications of that export for the Bay more generally. In this way, component B will provide relevant models which can then be applied under component D in Manila Bay (the demonstration area) in a policy relevant context, helping to guide cost effective nutrient reduction planning.

Sub-project 4.1 ***Data assembly for the Manila Bay watershed***

Activity

A variety of data is required, the most important being river discharge and nutrient concentration data for rivers discharging to Manila Bay, spatially explicit land use (including

N and P inputs from fertilizers and manure), location/size/residence time of reservoirs (if relevant), population density maps, information about connection to sewage systems, and presence, capacity and maintenance of sewage water treatment systems, waste flows for people that have no connection to sewage systems, atmospheric N deposition maps, and estimates of natural and agricultural N fixation. Data will be used on aquaculture (production by species, management, feed inputs). Finally, monitoring data on occurrences, duration and extent of harmful algal blooms and hypoxia will be used. This activity will contribute to data and research building capacity in the Manila Bay area, and be co-ordinated be with related data development activities under Component D.

Deliverable: database covering the watersheds discharging to Manila Bay
Completion: end of year 1
Responsible: University of Philippines, working through the Information Management Information System of the Manila Bay Coastal Strategy

Sub-project 4.2: ***High resolution river export model for Manila Bay rivers.***

Activity

Using the data assembled under sub-project 4.1, the Global-NEWS model approach will form the basis for developing spatially explicit river export models for the main Manila Bay rivers. There will be co-operation with other local models currently being applied in the Bay region to ensure that work reflects local circumstances, needs and priorities, and to complement current work. A criterion for full development of the river nutrient export model use is that models include C, N, P, Si, and sediment export, and are specific for nutrient forms (reduced-oxidized, dissolved-particulate, inorganic-organic). Decisions on how to apply and relate the models will be taken in the light of stakeholder consultation and engagement with relevant academic bodies and institutions in the Manila Bay region, as well as in the context of the overview of existing tools for source-impact analysis at sub-project 1 of this component.

Deliverable: river export model for regional scale
Completion: first version mid-term review (April 2013); final version end of year 3
Responsible: University of Philippines, Washington State University, and University of Utrecht

Sub-project 4.3: Ecosystem *model for Manila Bay*

Activity

A coupled water-column physics with pelagic and benthic biogeochemistry model will be used. In view of the long history of eutrophication and the importance of aquaculture in Manila Bay, the model will couple water-column physics with pelagic and benthic biogeochemistry. The pelagic biogeochemical model should explicitly describe phytoplankton, zooplankton, the sinking of detritus and the carbon and nitrogen therein. During the initial phase of the project a model will be selected on the basis of the overview in subproject 1 of component B, and on the basis of the required functionalities that will be defined in consultation with local stakeholders.

Deliverable: ecosystem model for Manila Bay
Completion: first version at mid- term review (April 2013); final version end of year 3
Responsible: University of Philippines, University of Utrecht

Sub-project 4.4: ***Validation of models and development of a summary model for Manila Bay***

Activity

This activity includes validation of sub-projects 4.2 and 4.3 above to past and current conditions in Manila Bay using the data assembled under sub-project 4.1.

Summary models of the river nutrient export and ecosystem models for Manila Bay will be produced by using regressions of the results of the detailed river export and ecosystem models. The effect will be to summarize the major features of the models in a realistic and user friendly way with the ultimate aim of helping policy makers develop nutrient reduction strategies for the Manila Bay area. The functionalities that the summary model should have will be discussed with stakeholders from the Manila Bay area in the first year of the project.

Deliverable: summaries of river nutrient export and ecosystem models for Manila Bay
Completion: first versions for mid-term review, final versions end year 3
Responsible: University of Philippines, University of Utrecht

Sub-project B 5 SP B5): contribution *of component B modeling and analysis outcomes to cost effective policy tool development under component C*

Output: as set out in sub-project tile in the form of the deliverables set out below

Total cost $109,517: GEF grant $51,682, co-finance $57,835

Activity
A summary of results of the impact modeling from the earlier activities carried out under this component will be delivered to component C in order to help guide the application of the best practice policy and other measures brought together in the Policy Tool Box developed under component C. Simplified but yet realistic models derived from the global as well as Manila Bay modeling will be developed from the more detailed relationships found in component B to make them suitable for scenario and policy impact analysis. The global modeling efforts in sub-projects 2 and 3 also allow for analyzing regional (scale of LMEs or seas) impacts. One of the aspects that will be considered is the impact of changing nutrient loading in the coastal marine ecosystems and the role of climate change.

Deliverable: Models, summary models, including documentation
Completion: First version: Mid-term review to coincide with Policy Tool box development under C; final version: end of year 3.
Responsible: Washington State University and Utrecht University in conjunction with task manager for component

Sub-project B 6 (SP 6)*: *Regional and national scientists and policy experts, particularly from developing countries, trained in using nutrient source-impact modeling, including in its use to analyze a range of nutrient reduction policies.

Output: as described in sub-project title in the form of deliverable set out below

Total cost $79,000: GEF grant $40,000, co-finance $39,000

Activities

A workshop with an international audience of scientists, policy specialists and other stakeholders, focusing on developing countries, will be held at the start of year 4, when the models at global and local (Manila Bay) region have been effectively completed. It will cover nutrient river export and coastal effect modeling on global and regional scales, including scenario analysis with different policy strategies.

The intention is for this to be held in the Manila Bay region, in conjunction with a similar activity focused on application of the source-impact models for Manila Bay and agreement to a nutrient reduction strategy for the Bay area: this latter element, i.e. for Manila Bay stakeholders, is resourced under Component D. By bringing an international audience together with experts from Manila Bay, the project will gain in the overall dissemination of effective information to stakeholders, and develop synergies between global and regional models and policy implementation.

Each target group will be trained in the use and application of the models and data sets produced under this component, in the analysis and development of scenarios and the impact of policies oriented towards sewage treatment and agriculture at the level relevant to their usage of the tools and data. **An overall minimum target has been set of training at least 30 experts from key countries significantly affected, or likely to be so by nutrient over-enrichment and hypoxia, as well as GEF nutrient related projects, in the application of source impact modeling to guide decision making with a view to their further influencing national and regional processes and international fora.**

Training materials will be developed and made available on-line in an e-learning platform to allow trainees to act as trainers to colleagues and students in due course. Feedback from trainees will be used for revisions and optimizing training materials and tools before end of project, contributing to overall project replication. The activity will use, test and apply the work under Component C in developing communication material to illustrate how the source-impact modeling can be applied to a range of policy measures and options.

Deliverable: Training workshop
Completion: Start year 4
Responsible (for component B element of overall workshop): Washington State University, University of Utrecht, and University of Philippines, with support of IOC/UNESCO

Sub-project B 7 (SP B7: ***Nutrient source-impact guidelines and user manuals for integrated eutrophication assessment and nutrient criteria development***

Output: as described in the sub-project title in the form of deliverable set out below

Total cost $61,000: GEF grant $30,000, co-finance $31,000

Activities

As part of the dissemination effort and capacity building component of the project, a comprehensive nutrient source-impact guidelines and user manual for integrated eutrophication assessment and nutrient criteria development will be prepared and published as a peer reviewed publication jointly by IOC and UNEP. The manual and guide will synthesize the project and will be a stand- alone publication which will serve both in the above mentioned training workshops as well as in any capacity development activity not related to this project. **The manual and guide will provide a comprehensive tool for both managers and applied research in planning and implementation of impact assessments, research and policy development. The manual and guide will be distributed to all IOC/UNESCO and UNEP member countries affected/likely to be by nutrient over-enrichment and hypoxia, as well as GEF projects, regional and scientific fora.**

Deliverable: Nutrient source-impact guidelines and user manuals
Completion: First version mid-term review; final 3.5 years after project start
Responsible: Washington State University, University of Utrecht, University of Philippines, and with support of IOC/UNESCO and UNEP/GPA

III WORK PLAN FOR COMPONENT C

The establishment of scientific, technological and policy options to improve coastal water quality policies in LMEs and national strategy development

Total activity budget $596,500: GEF grant $294,500; co-financing $302,000
Technical assistance budget: GEF grant $35,000, co-financing $139,500

Main outcomes:

Decision-makers have informed and interactive access, to cost effective, replicable tools and approaches to develop and implement nutrient reduction strategies in LMEs

Management: The Global Environment and Technology Foundation (GETF) will be task manager for this component, working with specified partners and experts as necessary to carry out particular activities. The Energy Centre for the Netherlands will have a lead partner role for linking the Policy Tool Box with the nutrient source-impact modeling under Component B.

The biennial GEF International Waters Conference in Autumn 2011, and 2013 and the inter-governmental Review of the Washington GPA (possibly later in 2011) provide opportunities to hold certain activities and build support for the best practices, their mainstreaming and the eventual development of the policy tool box.

The initial aim of the component is to identify, inventory, analyze best practice scientific, technological and policy options for nutrient reduction, and bring them together in a consolidated Policy Tool Box, which would also include a replication and up-scaling strategy. The information about the tools would include efficiency of use and the nutrient reduction targets they are seeking to achieve. The Policy Tool Box would be made widely available on the project platform. The second phase of Component C work would see the combination of the various tools in conjunction with the nutrient source-impact modeling work carried out under Component B to provide an overall approach to seeing which tools are most cost effective. Six sub-projects are foreseen in achieving the outcomes of Component C.

Sub-project C 1 (SPC 1): ***global overview and inventory of nutrient reduction best practices***

Output: as described in sub-project title, in the form of deliverable below

*Total cost**:** $145,000: GEF grant $75,000, co-finance $70,000*

Activities

GETF will

- leverage their work in Central and Eastern Europe, their relationships with global nutrient reduction experts, GEF project managers and associated GEF nutrient reduction activities.

- utilize and build on the current Living Water Exchange database of nutrient reduction best practices and criteria, and the work of the GEF STAP on best practice summaries.

- outreach to GEF project managers and other key organizations in 'hot spot' coastal geographies to inventory current nutrient reduction best practices

- outreach to key nutrient experts, agri-business, government, NGOs and other key organizations to help identify and develop priorities regarding cost effective options

- outreach to select land grant universities in the US and associated co-operative extension service experts, particularly those with experience in hot spot regions and low cost interventions, including dialogue with farmers

- attend the upcoming GEF Biennial Waters Conference and GPA review to build support and present deliverables

Deliverable: An inventory of nutrient reduction best practices, including evaluation and prioritization that are most efficient and cost effective for policy makers and farmers

Timing: 12 months after project inception
Responsible: GETF/University of Nebraska Co-operative Extension

Sub-project C 2 (SP C2): ***case studies of what works***

Output: as in sub-project title in the form of deliverable set out below

Total cost: $50,000: GEF grant $30,000, co-finance $20,000

Activity

- Analysis of the inventory and at least 15 face to face to face meetings with experts and sectoral representatives of key nutrient over-enrichment source categories

- Co-ordinate a working session with a small cadre of well trusted nutrient experts, agri-business, and other stakeholders to prioritize best practices and innovative approaches, and develop case study frameworks

- As for sub-project 1, build on Living Water Exchange and work of GEF STAP

Deliverable: at least 5 in depth case studies of selected technology and policy options:
Timing: by month 18 from project inception
Executor: GETF

Sub-project C 3 (SP C3): ***overview and synthesis of policy, technological, options etc***

Output: as above in the form of deliverable below

Total cost: $49,500: GEF grant $27,500, co-finance $22,000

Activity

Research and develop a global overview of technological etc options and a synthesis report of measures, regulations etc. It will be taken forward in conjunction with sub-project C1 and C2 above to maximize cost effectiveness.

Deliverables:
Synthesis report of measures, regulations, policies to reduce nutrients
Global overview of technological and policy options and tools, including multi-lateral instruments to reduce nutrient over-enrichment
Timing: 18 months after project inception
Responsible: GETF/Water Stewardship Inc

Sub-project C 4 (SP C4): ***replication and scaling up***

*Output***:** as in sub-project tile, in form of deliverable below

Total cost: $80,000: GEF grant $40,000, co-finance $40,000

Activities

- develop a strategy based on inventory, working session and prioritization discussion from previous sub-projects that outlines appropriate replication and up-scaling strategies

- identify and reach out to GEF project managers and key policy makers in nutrient hot spot geographies to replicate and scale up best practices in co-ordination with possible pilot regions in this project

Deliverables/Timing
Replication and up-scaling strategy - 12-18 months after project inception
Initial hot spot replication and up-scaling implementation – 24 months after inception
Responsible: GETF

Sub-project C 5 (SP C5): consolidated Policy Tool Box

Output: consolidated Policy Tool Box

The sub-projects 1-4 set out above will in combination produce a completed Policy Tool Box containing detailed summaries of policy options, technology measures to decrease nutrient inputs and their specific characteristics (e.g. costs, benefits): this would also include replication/up-scaling possibilities. *As the Tool Box combines the above sub-projects no discrete sub-project and funding is set out here.* Instead, the funding provided for the above sub-projects will support this consolidation activity.

Deliverable: Consolidated Policy Tool Box
Timing: completed for the mid-term review.
Responsible: GETF

Sub-project 6 for component C: *integration of component Policy Tool Box with Component B source-impact modeling*

*Output***:** as in sub-project title, in form of deliverable below

Total cost $147,000: GEF grant $67,000, co-finance $80,000

Activities

The overall purpose of this sub-project activity and the related sub-project 6 below is to provide the capacity to enable government and other policy makers to use the source-impact modeling developed under Component B to assess the effectiveness of relevant policy measures and other options brought together in the Policy Tool Box described above. This will help them judge where the most effective interventions can be made in the light of resources and likely planning scenarios. In this way governments can develop an overall road map to help them guide their investment decisions and underpin nutrient reduction strategies.

The first stage will be for experts from certain institutions involved in project execution under Components B and C to work together to provide an analysis and associated summary of the results of applying the modeling to the various policy measures. As part of this, the experts will clarify the necessary methodology and work up user friendly communication tools in showing how the integration of B and C should work and the policy relevant applications it produces. The activity will cover both the global level modeling developed under Component B and the higher resolution models developed in relation to Manila Bay.

Deliverables: conceptual approach and method, along with communication materials, which illustrates how the source-impact modeling can be used to test the efficacy of various best practice measures under the Policy Tool Box. Representative case studies

Timing: work will commence in detail once the first version of the modeling outputs from Component B are available at mid- term review. Substantial products will be available during year 3 to coincide with their presentation and use at the capacity building workshop at sub-project 6 below in engaging experts on the use Policy Tool Box and for activities under Component D in relation to Manila Bay.

Responsible: Energy Centre of Netherlands

Sub-project 7 of component C*: engagement and capacity building on the Policy Tool Box and how it can be applied, including in relation to the source-impact analysis*

Output: as in sub-project tile, in form of deliverables below

Total cost $125,000: GEF grant $55,000, co-finance $70,000

Activity

The activity here will focus on bringing the outcomes from sub-projects 1-4 (development of the Policy Tool Box) as well as sub-project 5 (linking Tool Box with component B) to bear in the context of an international workshop of policy experts, notably from developing countries. The aim will be to ensure support for the Tool Box approach and its wider dissemination, including its relationship to source-impact modeling to guide the development of nutrient reduction investment and planning. In this regard, the workshop will provide an opportunity for experts to assess the utility and relevance of the Component C outputs, and enable project task managers to make any necessary refinements. A preferred option, consistent with project aims, would be to hold the workshop in the context of the GEF IW Conference in 2013 in order to reach across the GEF portfolio, depending on timing of the IW conference.

An overall target has been set of training at least 30 experts from key countries significantly affected, or likely to be so by nutrient over-enrichment and hypoxia, as well as GEF nutrient related projects, in the application of the Policy Tool Box, in association with the source-impact modeling, to guide decision making with a view to those experts further influencing national and regional processes and international fora.

Deliverables

- Well attended capacity building workshop
- Testing of training and communication materials
- Case studies in nutrient reduction planning
- Regional/national policy experts trained in use of application of source-impact analysis to policy measures in order to develop cost effective nutrient reduction strategies

Timing: before end year 3
Executors: GETF in conjunction with Energy Centre, Netherlands, and UNEP/GPA

IV WORK PLAN FOR COMPONENT D

Development of nutrient reduction strategies through the application of nutrient source-impact modeling and analysis and best practice measures and options in the Manila Bay watershed.

main outcomes:

1. Strengthened information and decision support system on nutrient issues for the Manila Bay watershed as part of integrated approach to overall water quality for region
2. Agreement with government agencies and relevant stakeholders in the Manila Bay watershed on nutrient reduction strategies to be implemented, including their effective insertion into integrated national water quality planning for the Bay area
3. Application and implementation of ecosystem nutrient health report card in Lake Chilika, India and Lake Laguna, Manila Bay, including as part of overall nutrient reduction strategies for Manila Bay watershed
4. Accessible up scaling and replication strategy shared interactively with countries, GEF projects & stakeholders for development and implementation of nutrient reduction strategies, both for other watersheds in the Manila region as well as globally

Total activity budget $717,500: GEF grant$295,000: co-finance $412,500
Technical assistance budget 174,500: GEF grant $35,000, co-finance $139,500

Management: PEMSEA will be the task manager for this component and a member of the Project Co-ordination Unit. In carrying out their role, PEMSEA will make full use of the Technical Working Group on Pollutants in Manila Bay established by the Department of Environment and Natural Resources. This has representation from all the leading agencies and sectors involved in the overall strategy for the rehabilitation of the water quality of Manila Bay area, and so this arrangement will provide clear linkage between the project and Manila Bay stakeholders and ongoing regional and national priorities.

Overall activity

The work streams for the Manila Bay watershed area fall into a number of categories from helping to strengthen the decision support system (in terms of nutrient information, policy options and indicators), to stakeholder engagement and capacity building in modeling activities and application of best practices, to the final key stage of the development and completion of nutrient reduction strategies for the Manila Bay watershed, aligned with and contributing to overall national plans for improving the water quality of Manila Bay.

The activities work logically towards the final goal with a first emphasis on strengthening the nutrient information baseline, including the development of relevant nutrient indicators (stress reduction and environmental quality status) and engagement with key sectors on best practice nutrient reduction measures, starting the process of developing outline nutrient reduction strategies.

River nutrient export and ecosystem models will be developed (under Component B but using local data sources and institutions) for the Manila Bay watershed. They will illustrate where and when problem areas are likely to occur and will provide estimates of the relative importance of different nutrient sources within watersheds. They will allow users to assess the likely impact of various policy options for nutrient reduction in relation to key sectoral sources such as agriculture, wastewater, and aquaculture, which are relevant to the Manila Bay watershed.

Overall, this approach will enhance the capacity of resource managers and policy makers to anticipate problems, analyzing and visualizing the potential impacts and cost-effectiveness of alternative nutrient reduction and mitigation measures. Working with experts from the region, and recognizing the need for training and sharing of knowledge, the project will aim to build up agreement with stakeholders on how such reduction and mitigation measures should be pursued with a view to the development and presentation of actual nutrient reduction strategies for the region by the end of the project, including the use and application of relevant indicators.

The activities will require a number of related tasks, including preparing papers for meetings, preparing reports, facilitating meetings, and in particular working up draft strategies and nutrient reduction indicators for nutrient reduction, aligned with broader water quality efforts. In so doing, the project will work with and through institutions and stakeholders in the Manila Bay watershed. All opportunities, in the light discussion with PEMSEA and other stakeholders, will be taken for orientating funded tasks towards appropriate institutions and stakeholders as part of helping ensure project development and outcomes are owned locally.

Nutrient health reporting card: Lake Chilika, Orissa and Laguna de Bay, Manila: component D will also provide a vehicle for the development and application of an ‘ecosystem health report card’. The model - defined as the improvement of six indicators towards established ecological thresholds - will first be applied in Lake Chilika, India, early in the project, with a view to providing an overall water quality status of the Lake and the coastal water quality in the adjacent Bay of Bengal. An implementation plan will be developed with the Lake authorities and stakeholders. The report card approach will then be applied in the Laguna de Bay, Manila Bay watershed, including as part of the development of overall nutrient reduction strategies for the watershed, which would also make full use of the water quality status indicators utilized by the report card approach. Previous UNEP and GEF supported work by LOICZ, including in the Manila Bay and Bay of Bengal areas will provide a baseline for this work.

The final activity in this component will be the drawing of conclusions from the application of the source-impact modeling and tools and measures in the Tool Box on replication and scaling up, both in terms of wider application to the Philippines and other countries in the region and to countries in other parts of the world, consistent with the global reach of the project.

Sub-project D 1 (SP D1): ***strengthening the decision support system for Manila Bay watershed through improved nutrient data and information***

Output: strengthened information and reporting on nutrient management issues in Manila Bay in the form set out in the deliverables below.

Total cost: $147,000: GEF grant $45,000, co-finance $102,000,

Activity

The activity under this component will contribute to the strengthening of the Integrated Information Management System (IIMS) of the Manila Bay Coastal Strategy, and building awareness of the importance of nutrient management with key sectors through engagement on best practices.

The IIMS already contains highly relevant data for component B modeling purposes, including discharges from major rivers to Manila Bay and nutrient concentration at the river mouth; spatially explicit land use (including N and P inputs from fertilizers); population density map; population with land use; connection to sewage systems and sewage water treatment systems, waste flows for people that have no connection to sewage systems; atmospheric nitrogen deposition maps; aquaculture ; and monitoring data on occurrences, duration and extent of harmful algal blooms and hypoxia.

This sub-project component will contribute to overall data management capacity by (i) helping to clarify any gaps in data relevant to a systematic approach to most effective nutrient reduction modeling and strategies and how they can be addressed; (ii) in developing and strengthening nutrient reduction indicators, stress reduction and environmental quality status; and (iii) in contributing to the Manila Bay State of the Coast Reports by introducing a new element on status of nutrient over-enrichment and harmful impacts, including an overview of relevant regulations and policies. The State of the Coasts Report (SOC) system was tested in 2008-2009, and is currently being rolled out in all PEMSEA ICM sites. The SOC is used by local policy makers and other stakeholders a means to assess policy, social, economic and environmental conditions. It serves as a tool for improving integrated coastal management implementation. There will be close co-operation with institutions responsible for the IIMS, including the use of locally employed personnel.

The decision support system will also benefit under Component B (sub-project B1). The overview of available tools and models for nutrient source-impact modeling will also include available tools in the Manila Bay region, and the results of the sub-project B work will be passed to stakeholders in Manila Bay and help provide a basis for further modeling work in the region.

Strengthening the decision support system will also provide a vehicle for engagement (e.g. on discussion about relevant nutrient policies and regulations) with leading nutrient source sectors and user groups from the Manila Bay watershed at an early stage in the project cycle.

This will help raise awareness of project aims, including linkage with broader rehabilitation efforts for the Bay, build support for them and facilitate the involvement of the sectors, notably through the identification and analysis of best practices relevant to nutrient reduction strategies. Engagement will take place through face to face meetings, taking advantage of existing structures in the Manila Bay region, including the Technical Working Group of the Department of Environment and Natural Resources.

Deliverables:
(a) report with presentation of consolidated baseline data (using existing material) for nutrient reduction analysis along with indicators on nutrient sources and impacts;
(b) report on nutrient over-enrichment status as well as nutrient policies, regulations and best practices.
Timing: within first 12 months of project
Responsible: University of Philippines, Marine Science Institute; and Department of Environment and Natural Resources.

Sub-project D 2 (SP D2*): Building the Foundations and Agreement with government agencies and stakeholders on nutrient reduction strategies to be implemented in the Manila Bay watershed, including their integration into regional water quality aims*

Total cost $325,000: GEF grant $135,000, co-finance $190,000

There are two main sub-project activities, both of which revolve around substantial expert and stakeholder workshops linked to the availability and application of the source-impact modeling and analysis developed for the Manila Bay watershed. They are focused on developing the basis and agreement for the development and finalization of nutrient reduction strategies. A final sub-project would see the adoption (probably at a small workshop) of an agreed nutrient reduction strategy linked to broader water quality aims.

Sub-project D 2.1: *building the foundations for the nutrient reduction strategies*: *application of first version source-impact models and best practices*

Activity

The sub-project follows on logically from previous activities, which will have identified relevant indicators, best practice policies and measures of particular relevance to Manila Bay. It will centre on a workshop for experts from region - those who are likely to make use of the source-impact modeling in developing policies - as well as other stakeholders to promote engagement and buy in.

The focus will be on the first version of the river nutrient export and ecosystem models for Manila Bay (developed under component B), specifically their use in helping to assess the likely impact and cost-effectiveness of various policies and measures aimed at reducing nutrient over-enrichment. The activity will make use of the communication approaches, and methodology developed under Component C to illustrate the application of the source-impact analysis to best practice policies and measures. Realistic case studies relevant to Manila Bay will be developed using the modeling and best practices to inform the workshop, along with a proposed road map for developing a full nutrient reduction strategy.

The overall aim of the workshop will be to build on the road map by agreeing with stakeholders how to proceed towards full scale nutrient reduction strategies, linked to broader water quality planning for the region. In the light of the workshop, and recognizing the need for further institutional engagement, a draft of possible nutrient reduction strategies will be submitted to the DENR's Technical Working Group, along with relevant nutrient stress reduction and quality status indicators.

Deliverables:
Workshop and case studies. Discussions and agreements with experts and other stakeholders on process towards nutrient reduction strategies.
Report to Technical Working Group (TWG) after workshop with recommendations on next steps and containing draft of possible nutrient reduction strategies.
Agreement of TWG.

Timing:
Workshop shortly after mid-term review (April 2013) of project to coincide with availability of first version of river nutrient export and ecosystem models for Manila Bay.
Outline nutrient reduction strategies submitted within further 3 months to allow for further desk work by project task managers and any necessary additional engagement with Manila Bay institutions

Responsible:
PEMSEA in conjunction with UNEP/GPA for overall organization.
University of Utrecht and University of Manila for source-impact modeling
Energy Centre of Netherlands (for communication material and methodology developed under Component C for linkage of tool box and modeling)

Sub-project D 2.2–*development and application of the final source-impact models for Manila Bay in developing nutrient reduction strategies*

Activity

This activity follows the deliverables set out at sub-project 2.2 above. In the light of the outcomes from that workshop, the river nutrient export and ecosystem models will be further developed and refined under Component B in dialogue with Manila Bay watershed agencies and other stakeholders. The final version models will then be presented at the start of year 4 to a further workshop of relevant experts from Manila Bay. The workshop will be held in conjunction with the broader international workshop for scientists and experts on the use of global and modeling set out at sub-project 5 of Component B. This will enable full synergies to be developed between global and regional modeling and strengthen the science-policy interface on nutrient reduction, whilst maintaining the integrity of applying the models for Manila Bay in developing actual nutrient reduction strategies, which will be of wide interest. It will also maximize available resources across project components B, C and D for dissemination of scientific and management information and relevant training.

There will be a number of purposes in relation to the Manila Bay component of the workshop:-

- to illustrate the application of the final models in developing cost effective policy and investment making
- to use this to seek agreement with stakeholders for the finalizing of the draft nutrient reduction strategies drawn up following the earlier consensus building workshop
- train target users in the application of the modeling vis a vis policies and measures so that they own the approaches and the eventual nutrient reduction strategies

The workshop will be preceded by a number of papers, including summaries of the models (produced under Component B), communication and methods for applying the models to real world polices/circumstances, illustrated through case studies, and an outline nutrient reduction strategies. These will form the basis for dialogue between project experts and agencies and stakeholders from Manila Bay before the workshop.

Deliverables:
Workshop and final agreements among on stakeholders on nutrient reduction strategies. Report to and agreement of Technical Working Group of Department for Environment and Natural Resources.
Timing: first part of year 4
Responsible: PEMSEA in conjunction with UNEP/GPA and IOC/UNESCO.

Sub-project D 2.3– *presentation and adoption of final nutrient reduction strategies integrated with broader water quality objectives for region*

Activity

In the light of preceding components, this activity (in the last few months of the project cycle) will develop the outputs from sub-project 2.3 above, with a focus on finalizing the nutrient reduction strategies for the Manila Bay watershed, setting out cost effective policies and measures and likely scenarios.

The precise modalities as to how this will be done will be decided in conjunction with Manila Bay stakeholders through the Technical Working Group of the Department of Environment and Natural Resources. The intention would be to maintain a strong local participation through the Working Group, working with local staff engaged in related activities.
An appropriate opportunity will be taken to present the strategies to stakeholders, linked with overall aims to rehabilitate the Manila Bay. A final stakeholder meeting to focus on replication and up-scaling would be a suitable opportunity for presenting the final strategy.

Deliverable:
Final strategies for nutrient reduction aligned with broader water quality aims for region agreed with DENR
Timing: 1-0 months before end of Project
Responsible: PEMSEA in conjunction with UNEP/GPA and IOC/UNESCO.

Sub-project D 3 (SP D3) – *application in Lake Chilika and Laguna de Bay of an ecosystem health report card on nutrients*

Outputs: as described in sub-project title, in the form of deliverables set out below

Total cost $185,000. GEF grant $85,000, co-finance $100,000

Activities

For the report card, River/ estuary/ bay health is defined as the improvement of six indicators towards established ecological thresholds. The three water quality indicators are chlorophyll a, dissolved oxygen, and water clarity, and the three biotic indicators are aquatic grasses (submerged aquatic vegetation), Benthic Index of Biotic Integrity (BIBI - soft bottom only), and Phytoplankton Index of Biotic Integrity (PIBI).

In order to achieve this model report card the following activities will be carried out in and around Lake Chilika making full use of the LOICZ model:-

- understanding the role of river-catchment and freshwater nutrient input and associated nutrient fluxes to and in the Chilika Lake
- determining the transport of nitrogen from the major/ minor rivers into the lake
- assess the biogeochemical coupling of nutrient inputs with other physical components of the Chilika Lake system
- computing fluxes of nutrients from the lake to the Bay of Bengal, from the lake to the atmosphere and determine the air-sea boundary exchange process
- estimating overall water quality status of the Chilika Lake and the coastal water quality in the adjacent Bay of Bengal

Activities will be brought together in a stakeholder workshop in Lake Chilika, which will develop a draft management plan to implement the report card approach. A representative of the Laguna Lake Development Authority in the Manila Bay watershed (one of the stakeholders engaged in project activity generally under Component D) will be invited to the workshop. A workshop would then be held in Laguna de Bay (Year 2) with a view to applying the report card approach there. A representative from the Lake Chilika project would likewise attend the meeting in Laguna de Bay, allowing for further refinement of outputs and contributing to project replication and up-scaling.

Deliverables (Lake Chilika)

Workshop in Lake Chilika leading to agreement on and production of ecosystem health report card embracing nutrient budget model for Lake Chilika and of application to estuarine and delta areas more generally, including through application of relevant nutrient reduction/water quality status indicators.
Report on application of model and overall water quality status of Lake Chilika and adjacent Bay of Bengal.
Management plan for implementing model report card in the Lake area.

Timing: workshop to be held in year 1 of project. Finalized draft management plan within 3 months of workshop.

Responsible: Institute of Indian Ocean Management, Anna, Chennai in conjunction with LOICZ and UNEP/GPA

Deliverables Laguna de Bay:

Workshop in Laguna de Bay to consider and facilitate application of report card model to Lake Laguna in the light of project outcomes from Lake Chilika.
Management plan for application and implementation of report card and associated indicators, including incorporation into nutrient reduction strategies for Manila Bay watershed.

Timing: workshop in second year of project. Management plan agreed with Laguna Lake Development Authority 3 months after workshop
Management plan incorporated into nutrient reduction strategies – year 4
Responsible: Laguna Lake Development Authority in conjunction with PEMSEA and UNEP/GPA

Sub-project 4 for component D - *lessons drawn for replication and up-scaling*

Output: as described in sub-project title, in the form of deliverables below

Total cost $50,500: GEF grant $30,000, co-finance $20,500

Activity

Final lessons drawn will be compiled in the last two months of the project. However, the process will be ongoing during the project in that the project manager will secure feed-back and implications of work from task managers of each of the components, including component D. Moreover, Components B and C have potential for future scaling up and replication built into their overall approach in terms of modeling and Tool Box development.

Lessons drawn will operate on a number of scales in terms of application of key outputs and deliverables to the Manila Bay watershed more generally, to the Philippines and seas of South Asia, and to other regions consistent with the global reach of the project.

An overall draft report will be presented to a small workshop, probably in Manila Bay to coincide with the presentation of the overall nutrient reduction strategies for the area. This report will be for discussion and feedback with a view to circulating it on the web based platform under the Component A Global Partnership. The Global Partnership will ensure that the report is discussed at one of its meetings, and likewise the report will be submitted to the Technical Working Group for Manila Bay of the Department for Environment and Natural Resources, Philippines.

Deliverables: report with recommendations. Workshop
Timing: end of project
Responsible: UNEP/GPA in conjunction with IOC/UNESCO

V: WORK PLAN FOR COMPONENT E – MONITORING AND EVALUATION

Overall aim: fully meeting the standard monitoring and evaluation requirements and procedures off UNEP

Total cost: **$160,000 GEF grant $100,000: Co-financing $60,000**

The M&E plan comprises two main elements: (a) monitoring of progress, and (b) evaluation of performance and achievement. Both elements will be applied to the project using comparable sets of indicators. The project Co-ordination Unit (PCU) will be in charge of monitoring the progress of project execution against agreed benchmarks. The PCU will co-ordinate the independent mid-term and terminal evaluations and provide necessary and appropriate reports – technical, administrative, financial, and periodic progress reports to the Project Steering Committee. The latter as the main project authority will make recommendations to UNEP concerning the need to revise any aspects of the Results Framework or the M&E plan.

The role of the Project Co-ordination Unit in conjunction with that of the Project Steering Committee will comprise continuous monitoring and evaluation of the project and enable adaptive management changes to be recommended and appropriate action taken.

The M&E process will include the following reports (i) inception report (ii) quarterly progress reports (ii) quarterly and annual financial reports (iv) annual progress reports (v) financial audit annually and at project completion, including annual co-financing reports (vi) midterm evaluation and project completion reports and terminal evaluation. Full details of the M&E plan are at appendix 8 and summarized in section 6.

This concludes the presentation of the detailed work plans and associated activities under the project components. The activities and outputs are reflected in appendix 5, the results framework, appendix 6, work plan and timetable, and appendix 7, key deliverables.

VI: WORK PLAN FOR COMPONENT F - EFFECTIVE PROJECT MANAGEMENT AND OVERSIGHT

Overall aim: completion of a well managed project and associated activities under each project component which delivers the outcomes for each project component, a transformative overall project objective, and contributes substantially and on a sustainable basis to GEF and UNEP environmental management priorities as set out in this document.

Total cost: $344,000: GEF Grant $154,000; Co-financing: $190,000

This component will entail three strands of activity:-

(a) Day to day project management through the PCU

The PCU will be responsible for co-ordinating the project oversight activities and for ensuring that all M&E requirements are implemented according to best practice. This means ensuring quality of products, outputs and deliverables; compiling and submitting progress, financial, and audit reports and budget revisions to the PSC; addressing problems raised by the PSC; and staff and consultant management. A new project manager post will be established to provide overall project co-ordination, and who will lead the PCU.

(b) Overall project guidance by the PSC

The key activities for the PSC will be to guide the execution of the project, notably through approving key steps and outputs; and consideration and approval of annual operation plans and budgets, quarterly and annual technical and financial reports and final technical reports.

(c) Overall project supervision by UNEP

UNEP as the GEF implementing agency for the project will be responsible for overall project supervision to ensure consistency with GEF and UNEP policies and procedures.

Section 4 gives further details about the institutional and implementation arrangements, including the roles of the PCU and the PSC.

3.4 Intervention logic for project and key assumptions

The logic for intervention has been already been set out in the project summary and section 3.1 – project rationale – in terms of the nutrient over-enrichment and nutrient management context, project objectives, timing (e.g. readiness of techniques, development of GEF portfolio, risk of exacerbation of problems), likelihood of success and global benefits. The design and sequencing of the project components and the work plans detailed in section 3.3 are consistent with this logic and logical in themselves in aiming to deliver project outcomes and objectives successfully, that is enabling transformative action by countries and stakeholders in reducing the adverse consequences of nutrient over-enrichment and improving coastal water quality. Section 3.3 (description of components)shows how work under the components proceeds logically, working from the baseline analysis with component A providing an overall framework for political and institutional engagement, and subsequent components providing for the development, and practical application of policy relevant and cost effective investment and management tools (including in the Manila Bay watershed), concluding in replication and up-scaling.

The key assumptions to delivering project outcomes and the overall objectives are reflected in the risk analysis below. In brief they revolve around:-

- the willingness of countries and other stakeholders to (i) engage fully with the project objectives, notably in terms of addressing coastal nutrient over-enrichment and oxygen depletion through the combination of source-impact modeling in conjunction with best practices; and (ii) to take up project outcomes and initiate appropriate nutrient reduction strategies and programmes

The key risks determining that willingness are for countries and stakeholders to recognize:-

- that there are cost effective benefits in terms of resource management and their sustainable development, notably in the coastal zone, in addressing nutrient management in a concerted way, and

- that there are approaches and tools available and accessible – the source-impact modeling and best practices prominent among them - which can deliver these cost effective and wider benefits.

The catalytic and practical approach of the project, delivering and helping to mainstream best practices and in providing an integrated analysis and guide to planning and investment by policy makers, are designed to meet these risks.

In this context (though the same arguments of willingness and perception of benefits apply) a particular risk management element is whether the main private sectors, not least the agri-business sector, and main user groups such as farmers, will work with governments (and also take their own nutrient reduction initiatives) in taking action. The project meets this in the way it goes about Tool Box design and emphasizes engagement with stakeholders, including in the Manila Bay watershed.

3.5 Risk analysis and risk management measures

The following indicates risk, including climate change risks, which might prevent the project objectives from being achieved, and risk measures that may be taken.

Project related risk	Mitigation measures	Risk level
1.Governments and stakeholders willing to engage and take action There may be constraints in terms of willingness and ability to take nutrient reduction measures the face of resource problems and lack of recognition of benefits vis a vis more overt food and energy security benefits	Project design in terms of global and associated partnerships for triggering political, institutional and stakeholder engagement and wider benefits of nutrient management; focus on practical and global gains of water quality, stronger ecosystems, and fisheries. Project work streams in working with stakeholders on tool box design; eventual outcome in terms of cost effective analytical measures to guide decision making The GEF IW Conference and GPA inter-governmental review will be used as key opportunities to engage and build support See also demonstration area	Low/Medium
2. Comprehensive experts involvement It is essential that this project utilizes existing research and experiences from other projects and initiatives in order to provide a thorough and solid assessment of nutrient over-enrichment, their emission sources and socioeconomic and environmental impacts, along with their economic costs.	This risk is minimized by ensuring the involvement of key research institutes, networks and programmes. In particular, the project design reaches across the full range of the GEF portfolio and uses a leading and experienced manager for tool box development. The Global Partnership provides full stakeholder engagement, including access to non GEF initiatives	Low

3.Limited private sector involvement Lack of clear understanding of the cost-benefit of nutrient reduction measures, will impede the uptake and/or buy in of such measures by the target key economic sectors notably the agricultural and industrial sectors.	The project must work closely with the industrial and agricultural sectors. Industry is considered a key partner in this project and a targeted approach toward this group of stake-holders will be developed in the context of the project. The activities for the development of the tool box have a strong element of engagement with the agri-business sector in particular. The added value of UN agencies such as Habitat and FAO will be used to engage agriculture and wastewater sectors	Medium
4.Lack of engagement and take up in demonstration area There needs to be effective testing of key component outputs in an appropriate application area in order to show tangible benefits of project outcomes to countries and stakeholders and so form basis for replication and up-scaling.	Institutional/policy and stakeholder needs/analysis has been thorough and demonstrates clear willingness to work with and apply outcomes to benefit of water quality clean up, including adverse nutrient impacts, in Manila Bay by cross agency and cross sectoral alliance to benefit of citizens.	Low
5.Data and information gaps There needs to be sufficient and appropriate data and information available globally, and in the application area, across a full range of sectoral sources and watersheds/coastal areas in order to fully develop the quantitative modeling and analytical work. The data sets form the essential basis regarding the analysis of costs and benefits of future implementation of nutrient reduction technologies and policy measures.	The key Global NEWS model has already been tested, including in its relationship with and collaboration with other data and modeling effort. A range of accessible data sets are available for the development of the global model and there is a clear willingness for co-operation. IOC/UNESCO in particular will make use of the full range of their programmes and related initiatives, and UNEP/GPA will likewise facilitate in relation to their programmes, including regional seas. Stakeholder analysis has demonstrated that the main demonstration region has a wide range of information available and accessible and that stakeholders are willing to play a full role	Low
6.Science-policy linkages (a) the importance of nutrient reduction strategies is relatively not well known outside of scientific circles and there needs to be good linkage and inputs between the scientific community and policy makers (b) related to 1. above, the process of developing the policy toolbox and national/regional nutrient strategies may not be as effective in identifying the most cost-effective key policy and technological options to be implemented if policy makers are not supportive of the project and involved in the project development cycle at the appropriate time.	The Global Partnership on Nutrient Management has been established to bring stakeholders together. The International Nitrogen Initiative has played a full role in project development and leading governments also consulted. Scientists and policy makers are part of the GPNM steering committee and will also form part of the project steering committee. The communications strategy and web based platform with links to IW Learn will also mitigate risks. Project development is geared to ongoing strong involvement with scientists through INI and	Low

	IOC/UNESCO and with governments through the GPA review	
7.Climate change risks The type of activities developed under this project are not expected to pose any project-related climate change risks. On the contrary, the project impact (i.e. implementation of nutrient reduction strategy) is intended to improve water quality and address degradation of ecosystems, thereby contributing to their ability (and coastal areas more generally) to address climate change.	The project pays specific attention to climate change risks by evaluating the potential effect on coastal ecosystems of climate change and, through the model approach developed under component B, the possible effects of future climate change on nutrient and carbon loads. Climate proofing will be applied to the policy toolbox.	Low
8. Lack of effective replication, up-scaling, mainstreaming, and sustainability To prompt transformational change the project will need to deliver tools and approaches of wide application, and which will be applied as a substantial part of country/sectoral planning	The design of the tool box is predicated on determining and determining best practices in conjunction with stakeholders, including key private sector sources of nutrients. The project promotes frameworks such as integrated water and coastal management to help embed best practice measures, and focuses on the need for assisting policy makers with a cross sectoral 'road map' approach to assist policy makers with investment and planning. Replication is a key outcome, reflecting testing in a carefully chosen and highly policy relevant (to other regions) demonstration region The GPNM and associated partnerships will continue after project completion to provide a platform for project results	Low
9. Environmental and Social Safeguard There is a risk that the project outcomes and activities will lead to harmful environmental and social impacts.	It is not anticipated that the project outcomes and activities will lead to harmful environmental and social impacts. On the contrary, the project aims to provide tools, measures and mechanisms to governments and other stakeholders, the application of which will lead to an improvement of the environment in which coastal communities in particular live. These improvements are in relation to water quality and strengthening of ecosystems and the services and livelihoods they provide, including fisheries. In addressing multiple nutrient over-enrichment sources and impacts and promoting cost-effective integrated management, including through frameworks such as integrated watershed and coastal management, the project embraces the potential for trade-offs (albeit also the potential synergies) to arise between longer term ecosystem well being and perceived more immediate economic and social needs.	Low

	Further, the site based applications in the area of the Manila Bay watershed and the supplementary area of Lake Chilika are designed to help conserve various important ecosystems, such as mangroves, wetlands, biodiversity etc as part of broader improved water quality improvements and for which environmental assessments are built into the planning and investment regimes by national and local agencies into which the project application is inserted. There is also a strong stakeholder engagement theme in project design, reflected in the arrangements for Manila Bay watershed and Lake Chilika which will help assist efforts to bring major groups such as farmers and fishermen together around shared interests in environmental resource management. See also appendix 18.	

3.6 Consistency with national priorities or plans

GEF International Waters (IW) initiatives are primarily for the benefit of developing countries, countries in transition and Small Island Developing States (SIDS). Although global in scope, this project can potentially contribute to all current and future LME GEF IW projects - most of which have been endorsed by country operational Focal Points and approved by the GEF Council. In addition, many of the Strategic Action Programmes agreed to by participating countries identified actions to address nutrient over-enrichment as a priority threat to coastal waters and LMEs.

National Programmes of Action (NPAs) implement the Washington Global Programme of Action for the Protection of the Marine Environment from Land-based activities (GPA). They are a proven tool to advance the sustainable development of coastal areas and their associated watersheds. NPAs are developed through national multi-stakeholder processes and are a strategic tool that can assist governments, industry, tourism, agriculture or other relevant sectors and local communities to prioritise their coastal and marine protection and development goals.

NPAs assist relevant authorities to formulate affordable short, medium and long-term programmes of action to achieve these goals, and to mobilise the political, legal, institutional and financial support required for implementation. Over 60 governments are currently addressing nutrient concerns through their national programmes of action, and new NPAs under development will also be encouraged to address nutrients.

The project objective reflects requests from countries through the Intergovernmental Review of the GPA in Beijing 2006 to devote additional efforts to address point and non-point nutrient sources.Stakeholders also called on Governments and others implementing the GPA to give a high priority to identifying and implementing appropriate, cost-effective programmes and measures to address point and non-point sources of nutrient discharges, particularly programmes for the management and prevention of nitrogen and phosphorus runoff from agriculture activity. This followed the World Summit of 2002, which recognized that addressing nutrients was a key issue for UNEP/GPA. The project objective is also consistent with countries better achieving the Millennium Development Goals as it contributes specifically to water quality and environmental sustainability. In this context, more effective nutrient management generally (notably through fertilizer application and associated soil management) will also contribute significantly to accelerated efforts on food security.

The institutional policy and sectoral context (section 2.4.2) and stakeholder analysis (section 2.5.2) demonstrate how the testing proposed under the project of work from various components is aligned and can contribute effectively to the priorities established for the Manila Bay by the government of the Philippines, notably the clean up and restoration of the water quality of the Bay and the addressing of root causes, including nutrient over-enrichment. The leading agencies and bodies in the area have come together (reflecting also a Supreme Court verdict on interpretation of national statute and government Ministry and agency obligations) to take action as a national priority.

3.7 Incremental cost reasoning

Baseline: Incremental cost reasoning reflects the baseline position described earlier, which in turn underpins the project rationale and the global benefits derived from intervention in the way proposed by the project. Appendix 4 sets out in full the incremental cost analysis. Also relevant is section 7.3 on cost effectiveness, which supports a number of the arguments set out here from a different perspective.

The essence of incremental cost reasoning in support of project intervention is that:-

- in the face of global trends and institutional weaknesses, the current range of initiatives are not sufficiently likely to have the right overall global and regional impact on countries and stakeholders to draw a necessary line against further nutrient over-enrichment and hypoxia and the damage they cause. Indeed, the effect of current efforts is likely to be diminished
- there needs to be substantive change with countries taking a more productive, strategic approach to nutrient management in association with their stakeholders, in order to address in a systematic way institutional weaknesses and bringing out the benefits to sustainable development
- there is, for example, no single place (to the benefit of GEF projects and others) where a global overview of available information, tools and mechanisms can be found, including what works and why and where knowledge gaps lie, helping to distil the complexity of and range of nutrient issues into improved governance
- in this regard, and in the light of the scarce resources available for addressing global environmental issues, there needs to be a clear focus on cost effective nutrient management investments, linked to integrated water quality planning, to help realize multiple benefits and more sustainable, bankable projects

More generally, there are substantial incremental agency programmatic and institutional agency cost benefits from addressing nutrient over-enrichment and coastal water quality in the way the project proposed.

First, coastal eutrophication and hypoxia have multiple causes and scales of action and require cross sectoral integrated management in the form of IWRM and ICM. It is in this integrated management context that project action is set, and indeed on which it depends, including in relation to the Manila Bay watershed. There can be significant benefits from the global stimulus to action predicated under the project in promoting trans-boundary water management and country co-operation in line with GEF IW focal areas.

Moreover, this stimulus, linked as it is to wider benefits of nutrient management, means there are significant incremental cost benefits available in terms of biodiversity conservation, addressing land degradation and climate change. There is a significant opportunity for GEF to build on it initial leadership in supporting nutrient work in a way that brings multiple cross focal and cross UN agency benefits, including in countries better achieving the Millennium Development Goals related to water quality and environmental sustainability.

UNEP: in the case of catalyzing effective nutrient management is of strategic added value. It is not only central to UNEP's marine and coastal programme, but also to resource use efficiency, ecosystem management, harmful substances and water quality. Substantial incremental institutional benefits are realizable in stimulating countries to take forward work under the Washington GPA, including in relation to NPAs, and under the regional seas programmes. There are substantial one UN win to win policy and investment opportunities, working with FAO and UN Habitat to the benefit of water quality, farmers (more available cash), fishermen and tourism, using interventions on nutrients to promote environmental resource management generally, including integrated watershed and coastal zone management and the role of wetlands, sea grasses and corals. Finally, the need for an estimated 70% increase in food production by 2050, as well as changing diets, will require intensification of food production and fertilizer use. The move towards a Green Economy needs to embrace a new focus on effective nutrient management.

Manila Bay watershed: the application of project activities in the Manila Bay watershed region illustrates and amplifies incremental cost reason for the project as a whole. The nature of the watershed and its institutional and stakeholder structure (set out in full in the summary document for Manila Bay at appendix 3) will enable highly policy relevant interventions – nutrient reduction strategies as part of broader water quality improvements, which address the root causes of nutrient over-enrichment.

3.8 Sustainability

The sustainability (which also relates to mainstreaming and replication) of the project outcomes is essential to project success in terms of providing countries and stakeholders with the means and incentive to initiate nutrient reduction strategies and actions. It applies in a number of ways.

Institutional and financial sustainability: sustainability is essential in terms of building partnerships with countries and stakeholders, notably in the Manila Bay watershed. It is important to recognise in this context that addressing the root causes of coastal nutrient over-enrichment and then seeing the benefit of that action in terms of reduced eutrophication and hypoxia and improved water quality is not a short term initiative. The lead in time before substantial improvements can be seen in practical terms can be up to 5-10 years, and countries and stakeholders need to have confidence in the continuity of available cost effective tools and measures and that they will provide lasting capacity benefits.

Secondly, the specific products of the project are designed with policy sustainability as an integral element. A key aim, as highlighted previously in this document, is for the quantitative modelling and analysis work to analyze and predict the impact of specific measures and tools brought together in a Policy Tool Box. This will help provide policy makers with a guide to more integrated, cost effective and environmentally beneficial planning and investment decisions, fostering a more sustainable policy structure. There are important, long term institutional and managerial capacity gains to be made.

Moreover, the strength of the project approach will be tested in a highly policy relevant demonstration area with a view to both contributing on a lasting basis to the long term clean up and rehabilitation of coastal water quality in that area, and providing a replicable model for use in other watersheds and coastal areas.

The project design will also aim to leave lasting improved human capacity both more generally and in the demonstration region, where local staff will be employed along with local institutions to develop information and research capacity. The project provides for training in the use of the Policy Tool Box and the modelling and analytical techniques.

Project sustainability: the project addresses issues of and need for sustainability in a number of ways. First, the Global Partnership on Nutrient Management (GPNM) established under Component A will provide a platform and interface for the active promotion and exchange among countries and stakeholders of the project outcomes. In this regard, it will be fully linked and engaged with IW Learn. The Partnership will in this context also provide a vehicle for promoting the replication and up-scaling lessons and implications developed under Component D of the project in the light of work in the demonstration area. The Global Partnership (and analogous and associated regional and national stakeholder partnerships, which it will have stimulated) will continue after the completion of the project to provide an ongoing active platform, as well as continuing to stimulate political attention to nutrient management.

3.9 Replication

Replication, as partly touched on in the preceding section to which it is related, is integral to the project objective. It has a number of aspects and related activities under the project components:-

- first, the collection, development and testing of best practices in a systematic way across the GEF portfolio and other initiatives and their effective dissemination using the Global Partnership and analogous regional and national partnerships, linked fully to IW Learn

- secondly, the development of integrated quantitative models which in conjunction with best practices can be applied to different watersheds, as well as regional levels to guide cost effective action and investments

- thirdly, replication and up-scaling of good practices and lessons learnt is an essential output from project work, a process which is ongoing throughout the project with an annual summary. There is a specific replication and up-scaling strategy function under Component C (Tool Box development), along with a concluding one under Component D in relation to work in the Manila Bay watershed and more generally.

- fourthly, the project establishes a model for nutrient partnerships and associated communities of practice which bring stakeholders together at different levels around common messages and approaches

- practical knowledge sharing and training in use of the tool box and modelling work is a central part of the project

- and finally, the use of the global partnership under component A as a platform to disseminate replication and up-scaling strategies, and trigger political and stakeholder engagement and take up of project outcomes, including the use of replicable approaches such as NPAs under the GPA and ICZM approaches.

3.10 Public awareness, communications and mainstreaming strategy

Lack of general public awareness among consumers of end products involving nutrients, such as food/diet and transport was included in the barrier analysis at section 2.3. Generally such awareness is not high about nutrient over-enrichment and its impacts in terms of eutrophication and hypoxia, though 'red tides'/harmful algae and 'dead zones' are generally associated with pollution from land.

Component A envisages the development of a communications strategy as a key deliverable under its sub-project A1 – establishing the overall partnerships, mechanisms and architecture for the project. This will be primarily be focused on raising awareness, in conjunction with the Global Partnership on Nutrient Management (and its regional and national spin offs), about the importance of reducing nutrient over-enrichment and its adverse consequences among policy makers, key sectors (both drivers of adverse impacts and potential beneficiaries like tourism) and major user groups such as farmers, and fisherfolk. Outside of scientific circles the complexity of nutrient related issues and their connection with development and pollution is not well known.

To help pave the way, the Global Partnership on Nutrient Management published *'Building the Foundations for Sustainable Nutrient Management – Global advocacy for productive discussion and action by countries and their stakeholders'* at the INI Conference in New Delhi, 3-7 December 2010. This links closely with the project aims. In particular, it commends four main foundations focused around the building of a shared interest and agenda among and within countries; stakeholder engagement and partnerships*; and the communication and mainstreaming of best practice tools and integrated approaches to guide cost effective decision making.*

In short, a key part of the communications approach is to promote 'mainstreaming' which is at the heart of project approach activities and outcomes. As highlighted previously, the main outcomes of a best practice Tool Box and quantitative modelling and analysis, supported and promoted by the Global Partnership to engage policy makers and stakeholders, is aimed at placing cost effective nutrient reduction planning as an important part of cross agency investment and planning. This is well illustrated in the approach to be taken in relation to the Manila Bay watershed, and is reflected in section 3.8 above on ‘sustainability’. The promotion and use of integrated frameworks under the project, such as IWRM and ICM and NPAs under the GPA will assist the mainstreaming process. Replication and up-scaling of specific project outcomes is also part of the mainstreaming strategy.

Finally, the project, through the Component A platform, will also embrace and benefit from the launching by project partners of regional nitrogen assessments under the INI umbrella – the European one is to be launched in Spring 2011, along with a Rapid African Assessment. These will contribute to global overview work on nutrients and include as their aims to increase awareness about the importance of nutrient management and to bring sustainable nutrient management more centrally into national and sectoral planning.

3.11 Environmental and social safeguards (see also Appendix 18)

It is not anticipated that the project outcomes and activities will lead to harmful environmental and social impacts. On the contrary, the project aims to provide tools, measures and mechanisms to governments and other stakeholders, the application of which will lead to an improvement of the environment in which coastal communities in particularly live. These improvements are in relation to water quality and strengthening of ecosystems and the services and livelihoods they provide, including fisheries.

This said, the need for the project to address multiple nutrient over-enrichment sources and impacts and promote cost-effective integrated management, including through frameworks such as integrated watershed and coastal management, means that the project embraces the potential for trade-offs (albeit also the potential synergies) to arise between longer term ecosystem well being and perceived more immediate economic and social needs. For example, farmers may be reluctant to change fertilizer practices in up-stream locations, which impact adversely on coastal communities many miles away. Not least when perceived benefits in terms of addressing euthrophication can be 5-10 years in development.

The site based applications in the area of the Manila Bay watershed and the supplementary area of Lake Chilika are designed to help conserve various important ecosystems, such as mangroves, wetlands, biodiversity etc as part of broader improved water quality improvements and for which environmental assessments are built into the planning and investment regimes by national and local agencies into which the project application is inserted.

There is also a strong stakeholder engagement in project design and activities. This is well shown in the Manila Bay watershed and Lake Chilika, where stakeholder participation is an essential part of the current management philosophy and which the project fully recognizes and works with. More generally, the project recognizes the importance of national priorities and plans.

The Project Co-ordination Unit will have the responsibility to consider and check the possible socio-economic impacts of project activities and propose remedial action if necessary. This is consistent with the adaptive management approach of the project set out under the monitoring and evaluation plan.

SECTION 4: INSITUTIONAL FRAMEWORK AND IMPLEMENTATION ARRANGEMENTS

Overall project management and leadership

The project will be implemented through UNEP who will have overall project management lead. The executing partners will be UNEP/GPA and IOC/UNESCO. UNEP will be responsible for final decisions about budgets, terms of reference and contracts proposed for the project's execution**.**

Project Steering Committee (PSC)

The project steering committee will be established in advance of and hold its first meeting at the project inception meeting. It will comprise representatives of UNEP, the US and Dutch governments, FAO and UN Habitat, INI and IFIA, as well as the executing partners and STAP. The chair will be chosen at the first meeting. The PSC will guide the overall project execution and approve key steps and outcomes as well as annual plans and budgets and technical reports. It will operate on the basis of consensus and make any necessary recommendations about project management and oversight to UNEP as overall project lead agency. The PSC will meet annually, taking advantage of the various stakeholder workshops and GPNM meetings to minimize costs, and receive progress reports from the project co-ordination unit (PCU) to prepare for meetings. The PCU will operate as the secretariat to the PSC.

Project Co-ordination Unit

A project co-ordination unit will be established for day to day project management. It will be led by the overall project manager – a post established under the project budget. The PCU would also coordinate with the main Component Coordinators as described below. These would entail UNEP/GPA, IOC/UNESCO, the Global Environment and Technology Foundation, and PEMSEA in relation to the Manila Bay watershed. The unit would be based in Nairobi at UNEP HQ. There would be monthly virtual meetings called by the PCU with PMUs and the UNEP Task Manager, as well as a minimum of one annual face to face meeting to coincide with PSC meetings. Periodic opportunities will be taken to facilitate additional meetings, linked to carrying out project outputs. The PCU will be responsible for coordinating the project oversight activities and for ensuring that all M&E requirements are implemented according to best practice. This means ensuring quality of products, outputs and deliverables; compiling and submitting progress, financial, and audit reports and budget revisions to the PSC; addressing problems raised by the PSC; and staff and consultant management.

Project Management Units (PMUs): reflecting the need for each operational Component (A-D) to provide technical assistance to support overall project management, that is support for the PSC/PCU, reporting, communication and staff time, and the fact that activities under the components will be delivered by a number of partners working together, the Component Coordinators will establish project management units (PMUs) for their respective components. This will assist with budgeting and accounting, overall project management and delivery of outputs.

Manila Bay Watershed

There is a strong partnership based institutional structure in the Manila Bay watershed area. The implementation arrangements for the Manila Bay area (Component D) would be integrated into the overall project structure. Accordingly, PEMSEA would be part of the overall project PCU in their capacity as project Component Coordinator for Component D. Under the proposed work plan for Component D, the Technical Working Group of the Department of the Environment and Natural Resources (DENR) would play a key role. The Working Group (on which PEMSEA is represented) was established as a cross agency and stakeholder entity to help co-ordinate the rehabilitation of the water quality of the Manila Bay area, including root causes such as nutrient over-enrichment. The key point is that the project does not need to create a separate implementation structure or unit to implement the Component D activities, but instead can make full use of existing structures, which are geared to the key water quality decision making processes and agencies in the region. To create a separate implementation structure would miss the mainstreaming opportunity offered by PEMSEA and the DENR's cross agency Working Group, which in particular will allow a process to obtain step by step agreement among government and other agencies to the development and adoption of nutrient reduction strategies. It would also tend to militate against the linked nature of the overall project components.

Scientific and Technical assistance

The Scientific and Technical Advisory Panel (STAP) has been engaged in taking forward expert consultations on hypoxia and nutrient reduction in the coastal zone. Its aim is complementary to this project and helps provide the scientific and technical basis for project approaches and activities. The STAP work has already been drawn on in producing the PIF and in the PPG phase. This co-operation and assistance will continue as the project develops and work executed. The STAP will be part of the PSC.

The International Nitrogen Initiative (INI) embraces leading scientific and research experts and programmes on nutrients, and has played a full role in the development of the project and as a leading member of the Global Partnership on Nutrient Management. This involvement will continue and the INI will also be part of the PSC.

UNEP

UNEP as the GEF Implementing Agency will have overall responsibility for project supervision and procedures. UNEP will ensure consistency with GEF and UNEP policies, and will provide guidance on linkages with UNEP and GEF funded activities as well as reviewing the quality of draft project outputs, provide feedback to project partners, and establish peer review procedures to ensure quality of scientific and technical outputs. The project task manager will develop a project supervision plan at the inception of the project, which will be communicated to partners at the inception meeting.

SECTION 5: STAKEHOLDER PARTICIPATION

The stakeholder analysis and institutional and sectoral analyses at sections 2.4 and 2.5 illustrated a broad and variegated pattern, reflecting the multi-source and multi-impact nature of coastal nutrient over-enrichment, and how that pattern had influenced project construction and implementation. Progress on addressing root causes of eutrophication and hypoxia and harmful impacts is not achievable without strong stakeholder participation, not just from leading sectors such as agri-business and wastewater, but also in terms of forging partnership approaches with key user groups such as farmers and potential beneficiaries such as coastal communities, including fisherfolk.

Stakeholder engagement is at the core of component A in terms of the full establishment of the Global Partnership on Nutrient Management, which is itself a partnership of leading nutrient management related stakeholders – governments, scientists, private sector, government policy makers, NGOs and UN agencies – aimed inter alia at brining a new focus on the benefits of effective nutrient management to sustainable development. Component A work will also stimulate a Community of Practice, and similar partnerships at regional and national levels, which in turn will aim to build constituencies of action focused on orientating stakeholders around effective nutrient management and the benefits it brings.

Component C work on the development of a Tool Box is also founded on stakeholder participation, in particular drawing on experiences and practices from the leading sectors and involving face to face meetings and training with sectoral representatives.

Finally, the work in the Manila Bay watershed is predicated on strong stakeholder engagement, reflecting the importance attached to this by PEMSEA, and other institutions in the area. Local stakeholders will be used in taking forward the work. The intent is to leave lasting capacity in the region regarding nutrient management and research.

Currently, the stakeholder approach of nutrient partnerships under the project does not embrace end consumer groups, notably purchasers of products such as food or transport, which produce nutrient emissions. This is currently seen as too diffuse for the project focus and objective, and the concentration has been on sectors/key user groups, scientists and policy makers. Further consideration will be given to involving consumers as the project develops, including as part of the communication strategy under component A.

SECTION 6: MONITORING AND EVALUATION PLAN

The M&E plan comprises two elements (a) monitoring of progress (b) evaluation of performance and achievement

The project will follow standard UNEP monitoring, reporting, and evaluation processes and procedures. Substantive and financial project reporting requirements are summarized in Appendix 8. The project M&E plan is consistent with the GEF Monitoring and Evaluation policy. The Project Results Framework presented in Appendix 5 includes SMART indicators for each expected output as well as mid-term and end-of-project targets. These indicators along with the key deliverables and benchmarks included in Appendix 7 will be the main tools for assessing project implementation progress and whether project results are being achieved. The means of verification and the costs associated with obtaining the information to track the indicators are summarized in Appendix 8, the costed M&E plan. Other M&E

related costs are also presented in the costed M&E Plan and are fully integrated in the overall project budget.

The M&E plan will be reviewed and revised as necessary during the project inception workshop to ensure project stakeholders understand their roles and responsibilities. Indicators and their means of verification will be fine-tuned at the inception workshop. Day-to-day project monitoring is the responsibility of the PCU, though task managers for each component will have responsibilities to collect specific information to track the indicators.

The Project Steering Committee will receive periodic reports on progress and will make recommendations to UNEP concerning the need to revise any aspects of the Results Framework or the M&E plan. Project oversight to ensure that the project meets UNEP and GEF policies and procedures is the responsibility of the UNEP Task Manager. The Task Manager will also review the quality of draft project outputs, provide feedback to the project partners, and establish peer review procedures to ensure adequate quality of scientific and technical outputs and publications.

Project supervision will take an adaptive management approach. The Task Manager will develop a project supervision plan at the inception of the project, which will be communicated to the project partners during the inception workshop. The emphasis of the Task Manager supervision will be on outcome monitoring but without neglecting project financial management and implementation monitoring. Progress towards delivering the agreed project global environmental benefits will be assessed with the Steering Committee at agreed intervals. Project risks and assumptions will be regularly monitored both by project partners and UNEP.

Risk assessment and rating is an integral part of the Project Implementation Review (PIR). The quality of project monitoring and evaluation will also be reviewed and rated as part of the PIR. Key financial parameters will be monitored quarterly to ensure cost-effective use of financial resources.

A mid-term management evaluation will take place as indicated in the project workplan (Appendix6). The review will include all parameters recommended by the GEF Evaluation Office for terminal evaluations and will verify information gathered through the GEF tracking tools, as relevant. The review will be carried out using a participatory approach whereby stakeholders will be consulted. The Project Steering Committee will participate in the mid-term review and develop a management response to the evaluation recommendations along with an implementation plan.

An independent terminal evaluation will take place at the end of project implementation. The Evaluation and Oversight Unit (EOU) of UNEP will manage the terminal evaluation process. The standard terms of reference for the terminal evaluation are included in Appendix 10. These will be adjusted to the special needs of the project. The GEF tracking tools are attached as Appendix 12. These will be updated at mid-term and at the end of the project.

SECTION 7: PROJECT FINANCING AND BUDGET

7.1 Overall project budget

	Project preparation	Project	Project and Preparation	Agency fee	GEF &co-financing at PIF
GEF financing	86,000	1,718,182	1,804,182	171,818	1,718,182
Co-financing	130,000	2,398,165	2,528,165		1,900,000
Total	**216,000**	**4,116,347**	**4,332,347**	**171,818**	**3,618,182**

Figures below for sub-projects are for activities. For the total budget for each component $35,000 GEF grant and $139,500 of co-financing are added to each Component representing the budget for technical assistance to overall project management.

Project Components and sub-projects	GEF Funding $	Co-financing $	Total Budget $
Component A (global partnership on nutrient management)	**281,000 activity (+35,000) = 316,000**	**311,000 activity(+139,500) = 450,500**	**766,500** (activity budget plus technical assistance)
(SP A.1) partnership(s) establishment and stakeholder involvement; web based platform; and communication strategy	146,000	157,000	303,000
(SP A.2) global overview and synthesis report	60,000	65,000	125,000
(SP A.3) Fully establishing the Community of Practice, including linkage with IW Learn, GEF projects, and access to best practices and lessons learnt	75,000	89,000	164,000
Component B (quantitative nutrient source-impact modeling/analysis)	**453,682 activity (+35,000) = 488,682**	**564,665 activity (+139,500) = 704,165**	**1,192,847** (activity plus technical assistance)
(SP B.1) overview of existing tools for source-impact analysis of nutrients in LMEs and their target audiences	27,000	28,000	55,000
(SP B.2) global data base development on nutrient loading and occurrence of HABs, hypoxia, and effects on fish landings, abundance and populations	65,000	124,000	189,000
(SP B.3) nutrient impact modeling for global and local to regional nutrient source impact analysis	100,000	114,000	214,000

(SP B.4) development of regional models of nutrient source-impact modeling for the Manila Bay watershed demonstration area to help guide cost effective nutrient reduction planning for the watershed area	140,000	158,000	298,000
(SP B.5) contribution of component B modeling and analysis to policy tool development under Outcome C below	51,682	57,835	109,517
(SP B. 6) regional and national scientists and policy experts, particularly from developing countries, trained in using nutrients source-impact modeling/analysis	40,000	39,000	79,000
(SP B.7) integrated eutrophication assessment and nutrient criteria development nutrient source-impact guidelines and user manuals for	30,000	31,000	61,000
Component C (establishment of policy, technological etc options)	**294,500activity (+ $35,000) = 329,500**	**302,000activity (+$139,500) = 441,500**	**771,000** (activity budget plus technical assistance)
(SP C.1) global overview &inventory of nutrient reduction best practices	75,000	70,000	145,000
(SP C.2) case studies of selected technology and policy options for nutrient over-enrichment reduction	30,000	20,000	50,000
(SP C.3) overview and synthesis of policy, technological options, measures and regulations	27,500	22,000	49,500
(SP C. 4) replication and up-scaling of best practice options, measures etc	40,000	40,000	80,000
(SPC.5) Completion of consolidated Policy Tool Box	nil	nil	
(SP C. 6) integration of component Policy Tool Box with Component B source-impact modeling	67,000	80,000	147,000
(SP C. 7)knowledge sharing and training in the Policy Tool Box and how it can be applied, including in relation to the source-impact analysis	55,000	70,000	125,000
Component D (development of nutrient reduction strategies in Manila Bay watershed)	**295,000activity (+35,000) = 330,000**	**412,500activity (+139,500) = 562,000**	**882,000** (activity budget plus technical assistance)
(SP D.1) strengthened information and	45,000	102,000	147,000

reporting in Manila Bay watershed on nutrient issues			
(SP D. 2) building the foundations for nutrient reduction strategies in Manila Bay through source-impact models and best practices	70,000	100,000	170,000
(SP D 2) development and finalization of nutrient reduction strategies	65,000	90,000	155,000
(SP D.3) application in Lake Chilika of an ecosystem health report card for nutrient over-enrichment and hypoxia in lakes, deltas and estuaries	45,000	50,000	95,000
(SPD.3) application of nutrient health report card to Laguna de Bay, Manila Bay watershed	40,000	50,000	90,000
(SP D.4) replication and up-scaling strategy	30,000	20,500	50,500
Component E (M & E)	**100,000**	**60,000**	**160,000**
MTE & TE	100,000	60,000	160,000
Component F (project management)	**154,000**	**190,000**	**344,000**
PCU management and co-ordination Project manager Travel for project manager	 134,000 20,000	 170,000 20,000	 304,000 40,000
TOTAL	**1,718,182**	**2,398,165**	**4,116,347**

7.2 Project co-financing

SOURCES OF CONFIRMED CO-FINANCING

Sources of Co-financing	Type of Co-financing	Amount	%
Governments: Netherlands, US, India	In kind	397,600	16.57
GEF Agency- UNEP	Cash and in kind	761,765	31.76
Multi-Lateral Agency – IOC/UNESCO	Cash and in kind	380,000	15.84
Regional agency – PEMSEA	In kind	305,000	12.71
Private sector- GTEF	In kind	141,800	5.91
NGO – INI	In kind	180,000	7.54
Academic institutions - University of Utrecht, Washington State University, Institute of Ocean Management, Anna, Chennai	In kind	232,000	9.67
Others			
Total co-financing		**2,398,165**	

7.3 Project cost-effectiveness

Project cost-effectiveness has a number of aspects. First, it is at the very core of the objectives and design of the project. The quantitative modeling and analytical techniques, reflecting information from watersheds around the world, and applied in the Manila Bay watershed (offering a highly policy relevant application area) will be used to analyze the economic costs of nutrient over-enrichment to coastal waters. The analysis will reflect a number of approaches: first, future costs against the scenario whereby no measures are implemented to reduce nutrients from land-based sources; and secondly to predict the impact of specific best practice measures and tools brought together in a Policy Tool Box under the project. That Tool Box itself will be constructed with cost-effectiveness as a key component. This will enable policy makers to judge the likely effectiveness of various measures, including looking at overall effect of measures implemented together. This will be an important tool to assist governments in prioritizing the issue of nutrient reduction in their national planning and investment decisions, including addressing root causes in a systematic, integrated manner. Cost-effectiveness in this context should be understood as embracing the costs of environmental degradation.

A second aspect to cost-effectiveness is that the project builds on and adds value to the GEF portfolio of nutrient related initiatives (and indeed initiatives from elsewhere). A number of regional GEF projects have focused on identifying trans-boundary issues and formulating regional agreements for LMEs in line with the GPA and Regional Seas Conventions. These projects have resulted in analysis of nutrient over-enrichment to LME's, their causes and impacts. Agreed remedial measures have been defined and action plans developed. Currently there are some dozen or so of such projects underway, with Strategic Action Programmes (SAPs) at various stages of preparation and implementation, each with its underpinning Trans-boundary Diagnostic Analysis (TDAs) and its own extensive database.

The project will enable these GEF nutrient projects to be brought together into a global partnership consolidating them into one platform for sharing of data, information and tools, and able to draw on the systematic collection and cost-effective analysis of best practice measures described above. This will be to the overall benefit of countries, stakeholders and projects taking cost-effective nutrient reduction measures.

On a similar basis, the project will build upon a wide range of other nutrient-related initiatives and studies, including the work of UNEP, IOC/UNESCO and key programmes such as LOICZ. The project will not only benefit from the technical work and significant investments made by such programmes over the years, but add value back in assisting in effect their more focused and practical development.

Cost-effectiveness underlies the work in the Manila Bay watershed, where policy makers are charged with establishing a cost effective plan for cleaning up the Bay, including from the adverse impacts of nutrient over-enrichment In the range of nutrient sources and impacts, and the watershed setting in a large conurbation, the watershed area provides an almost paradigmatic opportunity to develop a practical, cost-effective approach to developing nutrient reduction planning of benefit to the region and of wider application.

Finally, making full use of the Global Partnership on Nutrient management and its aim to trigger a strategic shift towards sustainable use of nutrients generally, the project, including through best practice measures) will help instill in countries the growing economic costs to countries and their citizens of inaction regarding more effective nutrient management and the win-win benefits of action (e.g. savings from more efficient fertilizer use, cleaner water and health, tourism, more resilient ecosystems and biodiversity, such as sea-grasses, corals, and fisheries.

APPENDICES

List of appendices

APPENDIX 4: INCREMENTAL COST ANALYSIS

Baseline: Incremental cost analysis reflects the baseline position described earlier, which in turn underpins the project rationale and the global benefits derived from intervention in the way proposed by the project.

The context for incremental cost reasoning is that a range of human activities have caused an excess of nutrients in the world's environmental media and these are causing substantial impacts of eutrophication and hypoxia around the world, reducing water quality, killing fish and degrading important ecosystems. These impacts and associated problems are set to intensify and spread in the light of accelerated efforts from countries on food and energy security and in the light of increased coastal urbanization.

Regarding current response to nutrient over-enrichment pressures, it is the case that an increasing number of GEF projects are focusing on nutrient related issues. There is, therefore, a substantial body of knowledge and management approaches being built up under these projects as well as by countries under other important initiatives such as UNEP's regional seas programme (as well as regional seas organizations outside UNEP's umbrella) and through National Programmes of Action under the Global Programme of Action (GPA). Other UN agencies such as FAO and UN Habitat also have important nutrient related activities.

However, the complexity of nutrient management issues, including the range of sectors involved and the importance of key development drivers such as food security, which tend to override effective consideration of environmental impacts from excess nutrients, means there is among and within countries a relatively weak political, institutional and financial engagement with effective nutrient management, notably in developing countries and countries in transition.

Accordingly, countries and their stakeholders are not perceiving clearly enough the benefits of nutrient reduction and more effective nutrient management, notably in relation to coastal water quality, biodiversity and ecosystems, but also more generally in terms of overall cost effectiveness and environmental sustainability. The value of ongoing and past initiatives are not being sufficiently realized.

Business as usual: under business as usual the overall position described above is unlikely to change. This does not mean that if this project fails to go ahead, then there will be no effective action on reducing the impacts of nutrient over-enrichment and hypoxia. This would not be a realistic proposition given the current initiatives. However, there is a substantial risk that the global nutrient over-enrichment problem will worsen, undermining current efforts, unless there is transformative change on nutrient management, a change which this project can help instigate and lead.

The essence of incremental cost reasoning in support of project intervention is that:-

- in the face of global trends and institutional weaknesses, the current range of initiatives are not sufficiently likely to have the right overall global and regional impact on countries and stakeholders to draw a necessary line against further nutrient over-enrichment and hypoxia and the damage they cause. Indeed, the effect of current efforts is likely to be diminished
- there needs to be substantive change with countries taking a more productive, strategic approach to nutrient management in association with their stakeholders, in order to address in a systematic way institutional weaknesses and bringing out the benefits to sustainable development

- the project will enable GEF nutrient projects (and other initiatives) to be brought together into a global partnership consolidating them into one platform for sharing of data, information and tools, and able to draw on the systematic collection and cost-effective analysis of best practice measures described above. This will be to the overall benefit of countries, stakeholders and projects in taking cost-effective nutrient reduction measures, and distilling the complexity and range of nutrient issues into improved governance
- in this regard, and in the light of the scarce resources available for addressing global environmental issues, there needs to be a clear focus on cost effective nutrient management investments, linked to integrated water quality planning, to help realize multiple benefits and more sustainable, bankable projects

More generally, there are substantial incremental agency programmatic and institutional agency cost benefits from addressing nutrient over-enrichment and coastal water quality in the way the project proposed.

First, coastal eutrophication and hypoxia have multiple causes and scales of action and require cross sectoral integrated management in the form of IWRM and ICM. It is in this integrated management context that project action is set, and indeed on which it depends, including in relation to the Manila Bay watershed. There can be significant benefits from the global stimulus to action predicated under the project in promoting trans-boundary water management and country co-operation in line with GEF IW focal areas.

Moreover, this stimulus, linked as it is to wider benefits of nutrient management, means there are significant incremental cost benefits available in terms of biodiversity conservation, addressing land degradation and climate change. There is a significant opportunity for GEF to build on it initial leadership in supporting nutrient work in a way that brings multiple cross focal and cross UN agency benefits, including in countries better achieving the Millennium Development Goals related to water quality and environmental sustainability.

In the case of UNEP, catalyzing effective nutrient management is of strategic added value. It is not only central to UNEP's marine and coastal programme, but also to thematic priorities such as resource efficiency, ecosystem management, harmful substances and hazardous waste..Substantial incremental institutional benefits are realizable in stimulating countries to take forward work under the Washington GPA, including in relation to NPAs, and under the regional seas programmes.

There are *substantial one UN win to win policy and investment opportunities*, working with FAO and UN Habitat to the benefit of water quality, farmers (more available cash), fishermen and tourism, using interventions on nutrients to promote environmental resource management generally, including integrated watershed and coastal zone management and the role of wetlands, sea grasses and corals. Finally, the need for an estimated 70% increase in food production by 2050, as well as changing diets, will require intensification of food production and fertilizer use. The move towards a Green Economy needs to embrace a new focus on effective nutrient management.

Manila Bay watershed: the work in the Manila Bay watershed amplifies the above arguments. There national and local officials are charged with establishing a cost effective plan for cleaning up the Bay, including from the adverse impacts of nutrient over-enrichment In the range of nutrient sources and impacts, and the watershed setting in a large conurbation, the Manila Bay watershed provides an almost paradigmatic opportunity to develop a practical, cost-effective approach to developing nutrient reduction planning of benefit to the region and of wider application.

APPENDIX 5: PROJECT RESULTS FRAMEWORK

Component A	**Global Partnership on Nutrient Management addressing causes and impacts of coastal nutrient over-enrichment and hypoxia**				
Outcome 1	***Global Partnership of stakeholders actively involved in addressing nutrient over-enrichment in coastal waters***				
Output (with cross references to sub-project work set out in Component work plans)	**Indicator**	**Baseline**	**Target**	**Verification**	**Risk/ Assumption**
(SP A.1) Partnership established at global and regional levels with stakeholders fully involved. (SP A. 1) Establishment of web based partnership platform (SP A.1) partnership communication strategy	Holding of at least one global partnership meeting annually with all stakeholders - governments from all leading regions, key sectoral representatives, scientific community, UN agencies - fully represented & objectives, work plan, and communication strategy agreed (Y1,2,3,4) P Partnership Steering Committee holds quarterly virtual meetings (Y1 and ongoing) P At least 2 regional partnerships established in year one and year 2 of project, including the holding of their first meetings with objectives agreed (Y1 and Y2) P Publication of agreed (by partnership stakeholders) substantive outreach material each year by global and regional partnerships in form of updated overall 'Foundations of Effective Nutrient Management' as well as regular newsletters and contributions to UNEP and other UN agency, and scientific publications within each year of project.	Relative lack of institutional and management capacity (and awareness of importance of nutrient management) among countries & stakeholders to instigate transformative change. GPNM launched and has held first meeting to provide umbrella for triggering productive discussion and action among governments and other stakeholders	By midterm, fully established global partnership, embracing analogous regional partnerships to build political, institutional and stakeholder support and engagement for nutrient reduction. By midterm, partnership playing active role in relevant international and regional fora on nutrient management, building on outcomes from IGR3. By end of project, partnership established in relevant fora as ongoing (post project) platform and mechanism for effective engagement with countries and stakeholders on catalyzing take up by countries of nutrient management reduction strategies Within year 1 and updated annually, effective and adaptive communication strategy which reflects and communicates (i) importance and	Reports of Partnership meetings, PCU reports, PSC minutes, Mid Term Review	Willingness of full range of stakeholders to engage and work productively in partnership, including individual representatives providing time and commitment Partnership(s) will evolve from networking meetings into effective platform for political engagement and dissemination of best practice measures

			benefits of nutrient management to governments and stakeholders countries to sustainable resource management, including food security, water quality and ecosystem conservation management, and (ii) the means, in terms of best practices, cost effective investment, ICZM etc as to how policies can be 'nutrient proofed' .		
Outcome 2	***GEF projects, countries and relevant stakeholders better informed about the importance of nutrient over-enrichment, including environmental and economic costs***				
Output	**Indicator**	**Baseline**	**Target**	**Source of verification**	**Risk /assumption**
(SP A.2) Global overview of nutrient over-enrichment/eutrophication/hypoxia – causes, effects etc (SP A.2) Synthesis report identifying emerging issues and gaps	Documented global overview and synthesis reports peer reviewed, published and disseminated on web based platform (Y1) targeted at relevant GEF projects, governments, and fora, such as regional seas P	Large amounts of information available but information dispersed	Systematic and accessible baseline of information established which readily informs GEF projects, countries, in order to meet outcome 2 above (year one)	Peer reviewed by scientific and policy experts PCU reports, PSC minutes accessible on the web-based partnership platform.	Willingness of experts and organizations holding information to engage.
Outcome 3	***GEF projects, countries, relevant stakeholders have access to continued guidance and support for development and implementation of nutrient reduction strategies***				
Out put	**Indicator**	**Baseline**	**Target**	**Sources of Verification**	**Risk/ Assumption**
(SP A.3) Web based platform targeting GEF related projects connected/linked to IW:LEARN (SP A.3) Community of Practice targeting GEF nutrient related projects, incorporating	Fully functioning web site:- (i) containing access to all relevant GEF nutrient projects (Y1), including focus on availability of tested eXtension agricultural service. P (ii)able to provide interactive exchange among stakeholders as project outcomes,	GEF projects have a lot of information and experience, but no one place to provide systematic global overview and analysis	GEF projects and other stakeholders have interactive and informed access, supported through replication and up scaling output and maintained by ongoing partnership platform and mechanism to full range of replicable	Summary reports by PCU to PSC Mid Term review	Willingness of stakeholders to engage and play an effective role Best practice tools and source-impact modelling from other components is replicable

eXtension services on agriculture (SP A.3) Participation at, input to and support for outcomes from GPA inter-governmental review. Participation at and input to GEF International Waters Conferences	eg best practices, emerge for dissemination (Y1-3) P (iii) culminating in availability of final lessons learned, replication etc (Y4) P ***Re GPA review:*** By Y1 (a) documented agreement by governments and stakeholders to ***importance of nutrient reduction strategies and measures as central contribution to integrated coastal zone management and environmental resource management generally.*** ***(b) Commitments by all governments at IGR review to development and incorporation of nutrient reduction strategies into national and sectoral planning*** Holding of well attended workshop & IW Conferences , which recognizes importance of nutrient reduction		best practice tools, options, technologies, and nutrient impact analysis developed under other project components . Timing in line with output indicators set out in column 2. Countries by midterm have ongoing and supported access through the partnership platform to a tested and policy relevant model approach to agricultural eXtension services linked to regional partnerships. ***Governments (building on commitments from IGR review) from all GEF nutrient related projects and leading sectoral stakeholders committed to incorporating (and showing how this is to be done) guidance and lessons learned into development of nutrient reduction strategies within 4 years of project end.***		

(SP A.3) Replication and up-scaling of best practices and lessons learnt	strategies to effective achievement of GEF IW portfolio (Y1 & 3) P ***Effective and accessible replication and scaling up strategy published and endorsed by all governments involved in all GEF nutrient related projects (Y4)***				

Component B	**Quantitative analysis of relationship between nutrient sources and impacts to guide decision making on policy and technological options**				
Outcome 1	***Relevant stakeholders in developed and developing countries have basis and tools available to (a) attribute sources of nitrogen (N), phosphorous (P) and silica(S) within watersheds; (b) quantify past, current and potential future export of N,P and Si to the coastal zone (c)develop estimates of the relative efficacy of increases/decreases in nutrient export on coastal water quality at regional to international scales***				
Output	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risk/ Assumption**
(SP B.1) Overview of existing tools for source-impact analysis of nutrients in LMEs and their target audiences	Peer reviewed report received and published (Y1) giving necessary information and targeted at GEF projects/LMEs and relevant scientific and regional organisations - P	Number of regional seas and national initiatives as well as programmes such as LOICZ, but no systematic overview of what works and why.	Systematic overview of existing tools and models (with advantages and disadvantages) for estimating and modeling nutrient loading of coastal systems, in order to set strengthened baseline, inform policy makers of potential benefits and, raise awareness of project aims by Y1	Peer reviewed by experts, including from IOC/UNESCO programmes and INI Summary report by PCU to PSC	Availability of information (reports, analysis) and data from regional and national institutions
(SP B.2) Global data base development on nutrient loading and occurrence of HABs, hypoxia, and effects on fish landings, abundance and populations.	Timely receipt and dissemination on web site (targeted at relevant scientific bodies and regional organizations) of good quality, well presented and informative global data bases and associated documentation covering all target (column 4) components effectively, and reflecting the full	Data available and in some cases developed into data bases. However, dispersed around various sources and developed work largely sectorally based, though coherent approaches under regional seas such as OSPAR illustrate can be effectively done with clear benefits	Experts have access to global data bases and documentation on river nutrient export, nutrient release from aquaculture, coastal conditions, nutrient sources and observed impacts - eutrophication, harmful algal blooms, (HABs) hypoxia, and fish by Y3.	Oversight of data assembly by IOC and other experts Technical and summary reports to PSC from PCU; PSC minutes Mid Term review	Availability and compatibility of data, including willingness of institutions and sectors to assist Ability to standardize &/synchronize data

	engagement of institutions contacted. Specifically:- -Y1 – data bases & documentation on river nutrient export and release from aquaculture); Y2 – data base & documentation on coastal conditions and coastal effects; Y3 – final data base &documentation on observed impacts – eutrophication etc, but with first version of this for Y2 to enable review at mid term. P - providing basis for SR&ES		Databases in right form and sufficiently comprehensive in order to inform source-impact modeling and analysis (SP B.3 etc) – By Y3		
(SP B.3) Nutrient impact modeling for global and local to regional nutrient source impact analysis	Maps and supporting documentation and methodology (using data bases & documentation from S B2), which indicates probable location and scale of hypoxia, HABs, and high chlorophyll (first version Y2, final version Y3) - P providing basis for SR&ES Presentation and effective dissemination of above on web based platform under outcome A (Y3) P	Overview of existing modeling tools – S B.1 above) provides the baseline	The development of accessible (to stakeholders):- -enhanced predictive capability of models with respect to nutrient sources, loads and coastal impacts -effective assessment of effects of nutrient loading in coastal marine ecosystems, and -analysis and maps of past, current and future contributions of different nutrient sources, forms and ratios in watersheds to coastal effects by Y3	Use of well established academic & research institutions to carry out and review work Technical and Summary Reports from PCU to PSC; PSC minutes Mid Term review	Sufficient quantitative data and information available to establish necessary cause-effect linkage between nutrient sources, over-enrichment and harmful impacts
(SP B.4) Development of regional models of nutrient source-impact modeling for the Manila Bay watershed demonstration area to help guide cost effective nutrient reduction planning for the watershed	Cross sectoral data base and supporting documentation for Manila Bay watershed on river discharge, concentration of nutrients, land use, run off, fertilizer use, manure production, population density, sewage connections	Manila Bay watershed, through PEMSEA, and Manila Bay coastal strategy and operational plan has well advanced information management systems to provide and help generate data	High resolution river export model for Manila Bay rivers, and ecosystem model for Manila Bay to provide enhanced capacity for experts/resource managers to analyze nutrient source-impacts in	Oversight by IOC Technical and Summary Reports from PCU to PSC; PSC minutes. Mid Term Review Support of Government agencies and	Sufficient quantity and quality of data (arising from work above) to develop quantitative relationships

area	and treatment, atmospheric nitrogen deposition, and aquaculture (Y1) P providing basis for SR &ES Publication of validated:- (i) high resolution nutrient export model for main Manila Bay rivers ; (ii) ecosystem model for Manila Bay (first versions Y2, final versions end Y3) . P providing basis for SR&ES	No river export and ecosystem models exist for Manila Bay	Manila Bay area, so contributing to cost-effective nutrient reduction planning by Y3.	regional organizations (PEMSEA) for work and outputs as part of overall planning for Manila Bay area	
(SP B.5) : Contribution of component B modeling and analysis to policy tool development under Outcome C below	Summaries of results from modeling activities along with simplified but realistic models, which enable scientific and policy experts to carry out scenario and impact analysis (First version Y2, final version end Y3) – targeted at relevant scientific bodies, policy for a and regional organizations. P	New work and no baseline	Decision makers both globally/regionally and in relation to Manila Bay watershed have accessible tools and mechanisms to guide cost effective and integrated policy and investment decisions on nutrient reduction by Y3	Technical and Summary reports by PCU to PSC; PSC minutes	Assumptions and risks relate to those arising in relation to the development of the source-impact modeling under outputs described above, and in relation to the development of the Policy Tool Box under Outcome C.
(SP B. 6) Regional and national scientists and policy experts, particularly from developing countries, trained in using nutrients source-impact modeling/analysis	Organization and implementation of a training workshop targeting at least 30 experts from key countries (significantly affected/likely to be so by nutrient over-enrichment and hypoxia), as well as GEF nutrient related projects, trained and have ongoing access to the application of source impact modeling to guide decision making, with a view to their further influencing national and regional processes and international fora	N/A	Regional and national scientists and policy experts trained in source-impact modeling and its practical application in a way which provides lasting capacity improvements by Y3	Report of workshop Summary Report by PCU to PSC; PSC minutes	Ability to ensure attendance of right mix of experts

	(Y3) P				
(SP B.7) Nutrient source-impact guidelines and user manuals for integrated eutrophication assessment and nutrient criteria development	Timely publication of peer reviewed, comprehensive, guidelines and manuals and their dissemination on the web based platform under Component A (first version Y2, final version Y4), distributed/targeted at all UNEP/IOC member governments, GEF projects, regional bodies and scientific fora. P	N/A	Managers and applied researchers have effective guidance on use and implementation of nutrient source-impact analysis for research, impact assessments, and policy development by Y4	Technical Reports Summary Reports to PSC Peer review by experts	This output synthesizes certain of the previous outputs set out under Outcome B and so is dependent on their being successfully carried out
Component C	**Establishment of scientific, technological and policy options to improve coastal water quality policies in LMEs and national strategy development**				
Outcome 1	***Decision makers have informed and interactive access to cost effective, replicable tools and approaches to develop and implement nutrient reduction strategies in LMEs***				
Outputs	**Indicators**	**Baseline**	**Target**	**Sources of Verification**	**Risk/ Assumption**
(SP C.1) global overview &inventory of nutrient reduction best practices	Inventory report published and disseminated on web based platform (Y1), which builds on Living Water Exchange data base, and reflects substantial outreach to (i) GEF nutrient project managers/ key organizations (ii) key nutrient experts, agri-business, government, NGOs P.	Wide range of potential best practices, but no overall and systematic evaluation and prioritization to assist policy makers and others	Accessible and comprehensive overview and inventory of nutrient reduction best practices, including evaluation and prioritization that are most efficient and cost effective for policy makers and key user groups such as farmers to utilize by Y1	Summary report from PCU to PSC; PSC minutes	Sufficient usable information on available on cost effectiveness and nutrient reduction efficiency Willingness of stakeholders to engage, notably private sector
(SP C.2) case studies of selected technology and policy options for nutrient over-enrichment reduction	At least 15 face to face meetings with experts and sectoral representatives of key nutrient sources (Y1) Working session held with cadre of well trusted nutrient experts to prioritize best practices Production, publication and dissemination of in depth case studies (Y2) P	Baseline is set by SP C.1 above	At least 5 in depth case studies of selected technology and policy options to analyze and better understand which options work and why by Y2	Peer review by experts Summary and technical reports to PSC from PCU; PSC minutes.	Experts and sectoral representatives willing to engage effectively
(SP C.3) overview and synthesis of policy, technological options, measures and regulations	Reports published and disseminated on web based platform (Y2) and targeted towards GEF projects and relevant fora P	No overview and synthesis of measures, options etc available	Synthesis of measures and regulations, and global over-view of technological and policy options to	Summary report to PSC from PCU; PSC minutes	N/A

			assist policy makers by Y2		
(SP C. 4) replication and up-scaling of best practice options, measures etc	Strategy document produced (Y2) and disseminated on web based platform. P	No baseline as this is a new activity and follows from previous sub-projects	Strategy for replication and up-scaling to help structure Policy Tool development by Y2	Summary report to PSC from PCU; PSC minutes	Options etc are replicable etc
(SPC.5) Policy Tool Box established comprising consolidation and systematic presentation of above outputs from Component C	Report and model presentation of Policy Tool Box, including replication strategy (Y3) P providing basis for SR &ES, and distributed/targeted to all GEF projects, and governments attending GPA review Web based forum established (as part of overall Partnership platform under component A): (Y2 first version, Y3 for completed version) for the broad exchange, and continual updating of the contents of the Tool Box. P	N/A	Decision makers, including all GEF nutrient related projects have access to full range of available tools with rationale for use, including in relation to replication and up-scaling by Y3	Summary report to PSC from PCU; PSC minutes	The Tool Box is a compilation of outputs from previous sub-projects
(SP C. 6) Integration of Policy Tool Box with Component B source-impact modeling and analysis	Report detailing conceptual approach and method, along with communication materials and case studies, which illustrate how the source-impact modeling can be used to test the efficacy of various best practice measures from the Policy Tool Box (initial version Y2, final version end Y3). P providing basis for SR & ES	N/A	Accessible method for integration of outputs of source-impact analyses with Policy Tool Box to support cost effective, environmentally sound decision making by Y3	Summary report to PSC from PCU; PSC minutes. Mid Term review	Dependent on successful completion of other sub-projects in producing Policy Tool Box and source-impact modeling
(SP C. 7) Engagement with and training of experts on practical application of Policy Tool Box and source-impact modeling and analysis	Well attended knowledge sharing and capacity building workshop (Y3) P: target: at least 30 experts from key countries affected significantly/likely to be so by nutrient over-enrichment and hypoxia, as well as GEF projects, trained in and have ongoing access to the application of the best practice policy tool box to guide decision making with a view to their further influencing national and regional processes, international for a and key sectors	N/A	Regional/national policy experts trained in use of application of source-impact analysis to policy measures in order to develop cost effective nutrient reduction strategies	Summary report to PSC from PCU; PSC minutes	Successful completion of Policy Tool Box Attendance of right range and quality of experts to workshop

	Case studies (disseminated on web based platform) in nutrient reduction strategies (Y3) in order to produce ongoing training material post workshop. P				
Component D	**Development of nutrient reduction strategies through the application of quantitative source-impact modeling and best practices in the Manila Bay watershed**				
Outcome 1	***Strengthened decision support system on nutrient issues in Manila Bay watershed as part of integrated approach to overall water quality in region***				
Output	**Indicator**	**Baseline**	**Target**	**Sources of verification**	**Risk/ Assumption**
(SP D.1) strengthened information and reporting on nutrient issues in Manila Bay watershed	Report (Y1) with presentation of consolidated baseline data for nutrient reduction analysis along with indicators (including stress reduction and environmental quality) on nutrient sources and impacts. P providing basis for SR &ES Report (Y1) on nutrient over-enrichment status as well as nutrient policies, regulations and best practices P	Wide-ranging information available but lack of overview of nutrient status and indicators No current inventory or single source of best practices: information dispersed	Strengthened Integrated Management Information System (IMIS) under PEMSEA, including insertion of nutrient over-enrichment and reduction issues in State of Coastal Report by Y1 Nutrient baseline substantially improved along with awareness of importance and raised awareness of project aims/importance by Y1 Development and application of appropriate stress reduction and environmental quality status indicators by Y1 Baseline established as to what best practices are available and key sectors engaged on importance of tackling nutrient issues as part of overall water quality efforts by Y1	Summary report to PSC from PCU; PSC minutes	Willingness of stakeholders to make data available and engage in project and see benefits of engagement
Outcome 2	***Agreement with government agencies and relevant stakeholders in Manila Bay***				

	watershed on nutrient reduction strategies to be pursued and implemented, including their effective insertion into integrated national water quality planning for the Watershed area				
Output	**Indicator**	**Baseline**	**Target**	**Source of Verification**	**Risk/ Assumption**
(SP D.2) establishing the foundations for nutrient reduction strategies in the Manila Bay watershed based on source-impact modeling and best practices	Workshop and case studies on how modeling/best practices work (Y3 – after mid term review) P providing basis for SR&ES Agreements (Y3) with stakeholders on process towards nutrient reduction strategies, including on draft nutrient reduction strategies with illustrative stress reduction and environmental quality status indicators.P with SR&ES Outline nutrient reduction strategies produced before workshop and agreed with stakeholders (Y3) P with SR &ES	Strong policy commitment (underpinned by legal requirement) for comprehensive clean up of Manila Bay, including addressing root causes of poor water quality, albeit lack of specificity on role of nutrient over-enrichment	Demonstration of efficacy and policy relevance of first version of models developed under Component B for Manila Bay. Support among stakeholders for taking forward nutrient reduction strategies based on application of modeling by Y3	Report of workshop Summary report by PCU to PSC; PSC minutes	Source-impact modeling under B and C successfully completed Attendance of appropriate range of experts
(SP D. 2) Development and application of the final source-impact models for Manila Bay in developing nutrient reduction strategies	Workshop (Y4) with agreements with different stakeholders on nutrient reduction strategies to be implemented, along with appropriate indicators. P with SR &ES Experts from all appropriate agencies, scientific bodies and key sectors, trained in application and use of source-impact modeling/tool box Report to DENR Technical Working Group (Y4) P	Baseline provided by previous outputs	Effective development and application of source-impact modeling and Policy Tool Box by Y4	Summary report to PSC by PCU; PSC minutes. Mid Term Review and Final Review (for nutrient reduction plan/strategies	Willingness of stakeholders to engage Alignment with national/regional priorities and planning processes
(SP D. 2) Development and adoption of final, integrated nutrient reduction strategies	Final draft nutrient reduction strategies (agreed with agencies and other stakeholders, including alignment with broader water quality aims for region),				Source-impact modeling and Policy Tool Box deliver cost effective basis for

	submitted to DENR Technical Working Group for final agreement. (Y4) P with SR&ES				nutrient reduction plan/strategies
Outcome 3	***Effective application of an ecosystem nutrient health report card for lakes, deltas, and estuaries, including as part of overall nutrient reduction strategies***				
Output	**Indicator**	**Baseline**	**Target**	**Source of Verification**	**Risk/ Assumption**
(SP D.3) development and application in Lake Chilika, Orissa of the ecosystem health report card for nutrient over-enrichment and hypoxia , containing stress reduction and environmental quality status indicators	Stakeholder workshop held in Lake Chilika (Y1) attended by all leading stakeholders/agencies/sectors P Draft Management plan for applying Report Card (Y1) P with SR&ES Applied model ecosystem health report card published and disseminated on web based platform Y2) P with SR&ES Management plan for implementation of health report card in Lake Chilika/Bay of Bengal (Y2) P with SR&ES	LOICZ has produced an ecosystem health report card matrix ready for testing and has built up stakeholder engagement in region	Ecosystem health card embracing nutrient budget model and implementation plan for Lake Chilika and estuarine/delta areas generally, including estimates of water quality for Lake Chilika and Bay of Bengal and associated stress reduction and environmental quality status indicators by Y2	Peer review by LOICZ Summary and technical reports by PCU to PSC; PSC minutes	Willingness of local institutions and stakeholders to engage and provide data
(SPD.3) Development and application of ecosystem nutrient health report card to Lake Laguna, Manila Bay	Stakeholder workshop in Lake Laguna (Y2)attended by all leading stakeholders/agencies/sectors P Draft Management for applying Report Card (Y2) P with SR&ES Agreed (with stakeholders) ecosystem health report card for Lake Laguna published and disseminated on web based platform (Y2), containing stress reduction and environmental quality status indicators P with SR&ES	Baseline set by work in Lake Chilika and earlier LOICZ work, as well as current reporting system for Lake Laguna	Ecosystem health card embracing nutrient budget model and implementation plan for Lake Laguna, including stress reduction and environmental quality status indicators, and contributing to overall nutrient reduction strategies for Manila Bay watershed by Y3	Summary and technical reports by PCU to PSC; PSC minutes	Effectiveness of work in Lake Chilika and willingness of stakeholders in Lake Laguna/Manila Bay watershed to engage

	Management Plan for implementation of report card in Lake Laguna area, including as part of broader nutrient reduction strategies (first version Y 2, final version Y3) P with SR&ES				
Outcome 4	***Accessible up scaling and replication strategy shared interactively with GEF projects, countries and stakeholders for development and implementation of nutrient reduction strategies***				
Output	**Indicator**	**Baseline**	**Target**	**Source of Verification**	**Risk/ Assumption**
(SP D.4) Replication and up-scaling strategy	Report, following small feedback workshop, published on implications and potential for replication and up-scaling and disseminated on the web based platform for catalytic exchange among stakeholders, including policy makers and GEF projects. P, incorporating relevant material on SR &ES derived from nutrient reduction strategy development	N/A	Effective testing and development of source-impact modeling and Policy Tool Box with conclusions clearly drawn as to potential for up-scaling and replication by end of project as contribution to overall project outcomes and sustainability at component A replication and upscaling.	Summary and technical reports by PCU to PSC; PSC minutes; Final evaluation reports	Effective application of modeling and tools which enables potential for up-scaling and replication to be realized
Components E &F	**Effective project co-ordination, management and oversight**				
(SP F .1) Project Coordination Unit (PCU) established	Approved (by PSC) work plan and budget for staffed PCU.P	No PCU	PCU staffed and project executed according to approved work plan and budget with agreed terms of reference for PCU & follows the requirements of the M&E plan, including response to unforeseen changes to circumstances through approved adaptive management	SC minutes APR/PIR reports Mid-term and terminal evaluations Financial audit reports	PCU staff successfully recruited Agreement on location of PCU Support for work plan by SC

			procedures		
(SP F.1) Established Project Steering Committee (PSC	PSC meetings. P	No PSC	SC meetings completed according to plan. Adaptive management changes to project recorded	SC, and IA and EA minutes	Representatives of SC participate in meetings
(SP F.1) Establishment of implementation arrangements in Manila Bay watershed	Arrangements via PEMSEA as task manager and member of PCU . P	N/A	Arrangements and meetings completed according to plan	PCU reports to PSC; PSCminutes	Willingness of Manila Bay stakeholders/institutions to participate
(SP F.2) Exit Strategy	Strategy accepted. P	N/A	Exit Strategy	PSC	Agreement from all stakeholders to continue activities Willingness of countries to adopt project outcomes and to replicate/upscale
(SP F.2) Effective M&E mechanism established for project	Approval of Inception Report by SC with detailed and revised M&E plan. P	N/A	SC with support from PCU to implement agreed M&E plan	Reports to PSC MTE and TE reports	PCU with support from PSC establish and operate M&E plan
(SP F.2) Appropriate M&E indicators addressing P, SR and ES reviewed and adopted to monitor progress	Approval of detailed and revised set of indicators to be used to assess mid-term and terminal stages of the project. P	N/A	PCU to oversee development and use of GEF indicators and report to PSC progress to achievement.	Reports to SC MTE and TE reports APR/PIR reports	PCU with support from PSC establish and operate revised indicators to monitor project performance

P – Process; **SR** – Stress Reduction¸ **ES** – Environmental Status
Y- Year

APPENDIX 6: WORK PLAN AND TIMETABLE
(Successive +s indicate ongoing activity)

Components & work plan outputs	Year One				Year 2				Year 3				Year 4			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Component A – Global Partnership on Nutrient Management addressing causes and impacts of coastal nutrient over-enrichment and hypoxia																
Partnership establishment and stakeholder involvement at global and regional levels (SPA 1)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Communication strategy (SPA1)	+															
Web based platform (SPA1)	+															
Global overview of nutrients etc (SPA 2)			+	+												
Synthesis report -gaps, emerging issues etc (SPA 2)			+	+												
Participation at and input to GEF IW Conferences and GPA review (SPA 3)			+	+							+					
Web based platform targeting GEF related projects as part of IW Learn (SPA 3)		+	+													
Community of Practice (including training workshop) targeting GEF nutrient related projects, (SPA 3) and incorporating eXtension services on agriculture]			+	+	+	+	+	+	+	+	+	+	+	+	+	+
Replication and up-scaling of best practices and lessons learnt (SPA 3)				+				+				+				+
Component B – quantitative nutrient source-impact modeling and analysis to guide decision making																
Overview of existing Modeling tools (SP B1)		+														
Consolidated global data bases (1st and final versions) (SP B2)		++					++ +					++				
Global source/impact models (1st/final) (SP B3							+									
Manila Bay Data Base (DB) & source- impact Models(1st/final) (SP B4)				+ DB			+					++				
Summary source/impact models for policy use with Component C (1st/final)(SP B5)								+				+				
Training in Source-impact modeling													+			

application (SP B6)																
User Manuals for source-impact models (Ist, final versions) (SP B7)								+						+		
Component C – establishment of scientific, technological and policy options to improve coastal water qualities in LMEs and national strategy development																
Global overview & inventory best practices (SP C1)			+													
Case studies of best practices (SP C2)						+										
Overview &Synthesis of policy options (SP C3)						+										
Replication & up-scaling strategy (SP C4)						+										
Full Policy Tool Box (Ist and final versions) (SP C5)								+			+					
Integration of Tool Box with modeling from Component B (1st&final versions) (SP C6)								+				+				
Stakeholder engagement & capacity building in application of Tool Box and modeling (SP C 7)										+						
Component D : development of nutrient reduction strategies through the application of source-impact modeling and best practices in Manila Bay Watershed																
Strengthened information/decision support system (SP D1)		+	+													
Establishing the foundations for nutrient reduction strategies in the Manila Bay watershed based on source-impact modelling and best practices (SP D2)					+	+		+	+	+	+	+				
Development and application of the final source-impact models for Manila Bay in developing nutrient reduction strategies(SP D2**)**													+			+
Development & adoption of final, integrated nutrient reduction strategies (SP D2)																+
Development and application in Lake Chilika +1, Lake Laguna, +2 of nutrient health card (SP D3)		+1	+1		+2	+2										
Replication & up-scaling strategy (yearly to end) (SP D4)				+				+				+				+

APPENDIX 7: KEY DELIVERABLES AND BENCHMARKS

Full details of all Sub-Project output and associated work activities are given in the main project document under 'Work Plans for Components' at section 3.3. A summary of the key outputs and activities for each component are presented below.

Project Outputs	Description of indicator	Baseline level	Mid-term target	End-of-project target
Component A: – global partnership for nutrient reduction addressing nutrient over-enrichment and hypoxia in coastal areas in LMEs				
Output SPA.1: partnership establishment at global and regional levels with stakeholder involvement	Holding of annual global partnership meeting with all stakeholders fully represented, objectives, work programme and communication strategy agreed Fully functioning web site containing access to all relevant GEF nutrient projects	Lack of awareness among countries of nutrient reduction importance and lack of institutional and management capacity to instigate effective, lasting action	Full establishment of global partnership, incorporating all GEF projects in inter-active exchange, and analogous regional partnerships to build political, institutional and stakeholder support and engagement for nutrient reduction	As for Mid Term target, but also incorporating fully functioning Community of Practice and inter-active dissemination of tested cost effective best practices and source-impact analysis from other components, as well as possibilities for replication and up-scaling
Output SP A.2: global overview and synthesis of nutrient over-enrichment: causes, impacts, gaps.	Global overview and synthesis reports published and disseminated on web based platform	Large amount of material available but information dispersed	Stakeholders, GEF projects, and partnerships better informed through and making use of global overview of nutrient over-enrichment, causes and effects, and synthesis report identifying emerging issues, knowledge gaps, environmental & economic costs	As for Mid Term but in conjunction with other project outputs from B, C and D
Output SP A.3: Fully establishing the Community of Practice targeting GEF projects, with inter-active linkage to IW Learn, and project outcomes	Holding of well attended training workshop for CoP Effective input to GPA review and IW conferences Outputs from	GEF projects have a lot of information and experience, but no one place to provide global overview and analysis	GEF projects and other stakeholders have full access through CofP and associated web based platform to tools and data for nutrient impact analysis developed under components	As for Mid Term. And : implications and outcomes from nutrient reduction strategies development in demonstration region recognized and incorporated,

Project Outputs	Description of indicator	Baseline level	Mid-term target	End-of-project target
	components B and C (best practice measures, guidelines etc) disseminated on web based platform as they become available, along with final report on lessons leant, replication and up scaling		Band C	including replication and up-scaling
Component B – Quantitative modeling and analysis to guide cost effective decision making				
Output SP B.1:overview of existing tools for source-impact analysis of nutrients in LMEs and their target audiences	Report published and disseminated on web based platform	No systematic overview of what works and why	Summary to establish baseline and inform stakeholders of existing tools and models (and advantages and disadvantages) for estimating and modeling nutrient loading of coastal systems, and impact of increased nutrient loading	As for Mid Term review
Output SP B.2:global data base development on nutrient loading and occurrence of HABs, hypoxia, and effects on fish landings, abundance and populations	Dissemination on web site of global data bases and documentation covering elements set out in Mid-Term Target column	Data available and in some cases developed into data bases. But dispersed around various sources and developed work largely sectorally based.	Global data bases &documentation on river nutrient export, nutrient release from aquaculture, coastal conditions, nutrient sources and observed impacts - eutrophication, harmful algal blooms, (HABs) hypoxia, and fish	As for Mid Term review. And effective application of data bases in meeting overall Component B outcomes (analysis and modeling)
Output SP B.3:nutrient impact modeling for global and local to regional nutrient source impact analysis	Maps &supporting documentation published and disseminated on web based platform	Overview of existing modeling tools (Output S B.1 above) provides the baseline	The development of -enhanced analytical capability of modeling with respect to nutrient sources, loads and coastal impacts	As for Mid Term review. And application of maps etc in pilot testing in Manila Bay demonstration area

Project Outputs	Description of indicator	Baseline level	Mid-term target	End-of-project target
			-effective assessment of effects of nutrient loading in coastal marine ecosystems, and -analysis and maps of past, current and future contributions of different nutrient sources, forms and ratios in watersheds to coastal effects	
Output SP B.4: development of regional models of nutrient source-impact modeling for the Manila Bay watershed demonstration area	Publication of:- (i)a high resolution nutrient export model for main Manila Bay rivers ; (ii) ecosystem model for Manila Bay	Manila Bay watershed has well advanced information systems to provide and generate data No current river export and ecosystem models exist	First versions of high resolution river export and ecosystem models for Manila Bay rivers to provide enhanced analytical capacity for nutrient source-impacts in Manila Bay area	Final versions of models providing accepted (by stakeholders) basis for analyzing and assessing cost – effectiveness of nutrient reduction policy measures, and so providing basis for nutrient reduction strategies
Output SP B.5 : contribution of component B modeling and analysis to policy tool development under Outcome C below	Summaries of results from modeling activities along with realistic models (First version Y2, final version end Y3).	New work and no baseline	First versions available by Mid Term review and ready for testing post Mid Term	Decision makers have access to tools and mechanisms to guide cost effective and integrated policy and investment decisions on nutrient reduction
Output SP B. 6:training of regional/national experts trained in using nutrients source-impact modeling/analysis	Holding of a well attended and effective training workshop	N/A	N/A (workshop will be after Mid Term review	Regional/national scientists/policy experts, notably from developing countries, trained in source-impact modeling & application
Output SP B.7:integrated eutrophication assessment and nutrient criteria development	Publication and dissemination on web based platform of guidelines and manuals	N/A	N/A: output after Mid Term Review	Effective nutrient source-impact guidelines/manual to guide managers & experts in research &

Project Outputs	Description of indicator	Baseline level	Mid-term target	End-of-project target
nutrient source-impact guidelines and user manuals				implementation of nutrient impact assessments & policy making
Component C – Establishment of scientific, technological and policy options to improve coastal water quality policies in LMEs for national nutrient reduction strategy development				
Output SP C.1: Global overview &inventory of nutrient reduction best practices	Inventory report published and disseminated on web based platform for use of global partnership, GEF projects, policy makers.	Wide range of potential best practices, but no overall and systematic evaluation	Inventory of nutrient reduction best practices, including evaluation & prioritization as to efficiency & cost effective for policy makers and farmers to utilize	Full and effective application of inventory in development of Policy Tool Box under this component
Output SP C.2:case studies of selected technology and policy options for nutrient over-enrichment reduction	Report on in depth case studies, which establish best practice priorities, and full input of experts (at least 15 face to face meetings with experts &sectoral representatives)	Baseline is set by SP C.1 above	At least 5 in depth case studies of selected technology and policy options to enable project and stakeholders to analyze and better understand which options work and why	Effective application of output in development of Policy Tool Box
Output SP C.3:overview and synthesis of policy, technological options, measures and regulations	Reports published and disseminated on web based platform	No overview and synthesis of measures, options etc available	Synthesis of measures and regulations, and global over-view of technological and policy options to inform stakeholders of potential tools	Effective application of output in the development of the Policy Tool Box
Output SP C. 4:replication and up-scaling of best practice options, measures etc	Strategy document produced	N/A	Strategy for replication and up-scaling to help structure Policy Tool development	Effective application of output to Policy Tool Box development and eventual (under component D) of replication and up-scaling conclusions

Project Outputs	Description of indicator	Baseline level	Mid-term target	End-of-project target
Output SPC.5: completion of consolidated Policy Tool Box	Report and model presentation (Y3) of Policy Tool Box, including replication strategy Web based forum established (Y2 first version, Y3 for completed version) for exchange of information from Tool Box to facilitate up-scaling/replication of best practices	N/A	Initial Tool Box development as described above – first version of Tool Box placed on web based forum	Decision makers, including all GEF nutrient related projects have inter-active access to full range of available tools with rationale for use
Output SP C. 6:integration of component Policy Tool Box with Component B source-impact modeling	Report detailing conceptual approach and method, along with communication materials and case studies (initial version Y2, final version end Y3).	N/A		Accessible method fully tested and accepted by wide range of stakeholders for application of source-impact analysis to policy tools to support cost effective, environmentally sound decision making
Output SP C. 7:knowledge sharing and capacity building on the Policy Tool Box and application, including in relation to the source-impact modeling	Well attended capacity building workshop (Y3) Case studies in nutrient reduction planning (Y3)	N/A	N/A	Regional/national policy experts trained in use of application of source-impact analysis to policy measures in order to develop cost effective nutrient reduction strategies
Component D – Development of nutrient reduction strategies through application of quantitative source-impact modeling and best practices in Manila Bay watershed				
Output SP D.1: strengthening the decision support system for Manila Bay watershed	Report on baseline data, nutrient status, and indicators.	Wide-ranging information available but lack of overviews and analysis	Strengthened Integrated Management Information System (IMIS)	As for Mid Term. And: contributing on an ongoing basis to the development and

Project Outputs	**Description of indicator**	**Baseline level**	**Mid-term target**	**End-of-project target**
	Report and analysis (Y1) on nutrient policies, regulations, and best practices		under PEMSEA, and associated State of the Coast Reporting Key sectors engaged and supportive of project aims	implementation of nutrient reduction strategies
Output SP D.2 Knowledge and capacity building on application of source-impact modeling as a basis for nutrient reduction strategies for Manila Bay	Workshop and case studies (Y3) Agreements with Stakeholders on process for nutrient reduction strategies. Report (Y3) to Technical Working Group of DENR with road map for nutrient reduction strategies	Strong policy and stakeholder commitment comprehensive clean up of Manila Bay, including addressing root causes of nutrient over-enrichment	Support among stakeholders for taking forward nutrient reduction strategies based on application of modeling	Demonstration of efficacy and policy relevance of models developed under Component B for development of nutrient reduction strategies for Manila Bay.
Output SP D. 2application of the final source-impact models for Manila Bay and policy tools in developing nutrient reduction strategies	Workshop (Y4) entailing agreements with stakeholders on nutrient reduction strategies to be implemented Report (Y4) to DENR Technical Working Group with draft nutrient reduction strategies	Follows from above	N/A	Agreement of stakeholders to apply final models and associated policy tools as basis for developing final versions of nutrient reduction strategies
Output SP D. 2adoption of final nutrient reduction strategies	Final draft nutrient reduction strategies, aligned with broader water quality aims for region, submitted to DENR Technical Working Group	Follows from above	N/A	Broad support among policy makers and other stakeholders for use of completed nutrient reduction strategies in implementing regional plans for

Project Outputs	Description of indicator	Baseline level	Mid-term target	End-of-project target
	(Y4)			rehabilitation of water quality of Manila Bay
Output SP D.3 application in Lake Chilika of ecosystem health report card for nutrient over-enrichment and hypoxia in deltas and estuaries	Stakeholder workshop held in Lake Chilika (Y1) Management plan for applying Report Card (Y1) Applied model ecosystem health report card published and disseminated on web based platform (Y2)	LOICZ following UNEP and GEF support has produced an ecosystem health report card matrix ready for testing and has built up stakeholder engagement in region	Ecosystem health card embracing nutrient budget model/implementation plan for Lake Chilika and estuarine/delta areas generally, including estimates of water quality for Lake Chilika and Bay of Bengal	Uptake of Report card and management plan as part of mainstream activity for improved water quality in Lake Chilika and contributing effectively to Bay of Bengal LME project activity
Output SPD.3:application of nutrient health report card to Laguna de Bay, Manila	Stakeholder workshop in Lake Laguna (Y2) Report to Technical Working group of DENR	Baseline set by work in Lake Chilika and earlier LOICZ work in region supported by UNEP and GEF	Initial engagement with stakeholders on applicability of report card, including analysis of results from Lake Chilika	Health Card and management plan applied to Lake Laguna and contributing to overall nutrient reduction strategies

Project Outputs	Description of indicator	Baseline level	Mid-term target	End-of-project target
Output SP D.4 replication and up-scaling strategy	Report published on implications and potential for replication and up-scaling and disseminated on the web based platform for catalytic exchange among stakeholders, including policy makers and GEF projects	N/A	Lessons from each component will be drawn each year to provide an ongoing basis for replication and up-scaling	Effective testing and development of source-impact modeling and Policy Tool Box with conclusions clearly drawn as to potential for up-scaling and replication. Wide inter-active access of above to GEF projects and other stakeholders
Component E – M&E				
Output E: Agreed list of P, SR and ES indicators and baseline Monitoring reports against indicators MTE report TE report	Reports	Draft M&E plan	List of indicators available and used for routine monitoring and reporting of progress Completion of MTE	Revised indicators clearly assess benefits of project intervention Completion of TE
Component F– Project Management				
Output F.1: All reports and outputs of the project	Report and output dates compared to workplan	N/A	All expected results delivered	All expected results delivered
Output F.2: Exit Strategy	Strategy developed and accepted	N/A	Work beginning on Exit Strategy	Exit Strategy approved and in process of implementation

APPENDIX 8: COSTED M&E PLAN

The project M&E plan is consistent with the GEF Monitoring and Evaluation policy. The Project Results Framework presented in Appendix 5 includes SMART indicators for each expected outcome as well as mid-term and end-of-project targets. These indicators, along with the key deliverables (outputs) and benchmarks included in appendix 7, will be the main tools for assessing project implementation progress and whether project results are being achieved.

The M&E plan will be reviewed and revised as necessary during the project inception workshop to ensure project stakeholders understand their roles and responsibilities. Indicators and their means of verification will be fine-tuned at the inception workshop. Day-to-day project monitoring is the responsibility of the PCU but other project partners will have responsibilities to collect specific information to track the indicators.

The Project Steering Committee will receive periodic reports on progress and will make recommendations to UNEP concerning the need to revise any aspects of the Results Framework or the M&E plan. Project oversight to ensure that the project meets GEF policies and procedures is the responsibility of UNEP.

A mid-term management evaluation will take place. The review will include all parameters recommended by the GEF, and UNEP Evaluation Offices for evaluations and will verify information gathered through the GEF tracking tools, as relevant. The review will be carried out using a participatory approach whereby stakeholders will be consulted. The Project Steering Committee will participate in the mid-term review and develop a management response to the evaluation recommendations along with an implementation plan.

An independent terminal evaluation will take place at the end of project implementation.

The GEF tracking tools (appendix 13) will be updated at mid-term and at the end of the project.

Type of M&E activity	Responsible Parties	Budget US$	Time frame
Inception Workshop and Report Project execution plan: updated and operational implementation plan for project progress and monitoring	Executing agency with PSC, and PCU	30,000 GEF (these costs are included within the specific activities) 38,750 co-financing	Workshop within first two months of project start up Draft plan developed before inception workshop. Final version within 4 weeks of end of workshop
Annual Operating Plan -List of activities to be implemented each year -Timelines	PCU reporting to PSC with oversight by Executing agency	As part of overall project management (PM) costs at component F (i.e. part of 154,000 GEF grant, and 190,000 co-financing	Draft for first year developed before inception. Final version for first year within 4 weeks of inception. Then annually.

Type of M&E activity	Responsible Parties	Budget US$	Time frame
Quarterly Progress Report -Progress and activities completed - Progress against annual work plan - Review of implementation plan -Summary of problems and adaptive management -Activity plans for next quarter -Project outputs for review	Executing agency with co-ordination by PCU	. As part of overall PM costs at component F	Quarterly within 15 days of each reporting period
Quarterly and Annual Financial Report -Project expenditures according to established project budget and allocations -Budgetary plans for next quarter -Requests for further cash transfers -Requests for budget revisions	Executing agency with co-ordination by PCU	As part of overall PM costs at component F	Quarterly within 15 days of each reporting period

Type of M&E activity	Responsible Parties	Budget US$	Time frame
Annual Progress Reports (Project Implementation Review) -Consolidated review of progress and outputs of project activities -Progress against work plans -Best practices and lessons leant -Progress plans and budgetary requirements for following reporting period -PIR	Executing agency with co-ordination by PCU	As part of overall PM costs at component F	Annually
Co-financing report *-Co-financing provided to the project* *-co-financing inputs against GEF approved financing plans*	Executing agency with co-ordination by PCU	As part of overall PM costs at component F	Annually
Mid-term Evaluation -Detailed independent evaluation of PM &actions -outputs and impacts at mid term -recommendations for remedial action, and revision of work plans	Independent evaluator hired by UNEP	25,000 GEF 20,000 co-finance	Quarter immediately mid-point of project implementation.
Project completion report -Consolidated review of project effectiveness -Final best practices and lessons learnt -repot on project expenditures	PCU with input from UNEP	As part of overall PM costs at component F	Two months after end of project implementation

Type of M&E activity	Responsible Parties	Budget US$	Time frame
Terminal Evaluation -independent evaluation of project management, actions, outputs and impacts -sustainability analysis -project effectiveness -technical outputs -lessons learned -progress towards outcomes	Independent evaluator hired by UNEP	35,000 GEF grant 30,000 co-finance	Within 6 months of project completion
Audit -audit reports of project accounts and records		No figure attributed	Annually and at project completion

APPENDIX 9: REPORTING FRAMEWORK

At the outset of the project, a project inception meeting will be held comprising the PSC and PCU. This will ensure that all partners understand and take ownership of the project's objectives and aims, including roles, functions and responsibilities within the project's decision-making structures, including reporting and over-sight. The PSC will also take this opportunity to review the results framework (indicators, targets, means of verification, risk) and finalize the work plan for the year.

The project supervision plan developed by the project manager will be communicated to the project partners at the inception meeting, along with a briefing on GEF and UNEP M&E requirements, financial procedures and reporting schedule.

There will be annual meetings of the PSC. They will review progress (in particular at midterm) and provide guidance to the project. Periodic monitoring of implementation progress will be undertaken by both UNEP as implementing agency and UNEP/GPA and IOC/UNESCO as executing agencies.

The following reports are a key part of the M&E process:-

Inception Report: This will be prepared by the project manager in conjunction with other members of the PCU following the inception meeting. It will include the first Annual Work Plan detailing the activities and indicators that will guide the project in its implementation. The report will include the detailed project budget for the first year; monitoring and evaluation requirements; details on institutional roles, responsibilities, co-ordinating actions and feedback mechanisms of project partners; a summary of progress to date on project establishment and start up activities. The report will be

Project Implementation Review: The PIR will be prepared on annual basis by UNEP as implementing agency in consultation with UNEP/GPA and IOC/UNESCO as executing agencies. The PIR will address: project performance, including in meeting the project's annual work plans and progress in meeting intended outcomes through outputs and activities; constraints experienced and reasons why; lessons learned; and recommendations to deal with problems met. Risk assessment and rating will be an integral part of the PIR, and the quality of project monitoring and evaluation will also be reviewed and rated as part of the PIR.

Project Final Report (PFR): during the last two months of the project, the PCU will start to prepare the comprehensive PFR, summarizing all objectives, outcomes, outputs, activities met and those not met; and lessons learned. It will be the definitive statement of the project's activities and will lay out recommendations for further action to promote sustainability of project outcomes.

Mid Term Review/Evaluation (MTR/MTE): The MTR/MTE will assess project performance and effectiveness at the mid-term point of the project. The evaluation will include a review of the Inception Report, the Project Implementation Review, scientific and technical advice and summaries, and progress to date. It will be based on the objectively verifiable indicators set out in the Project Results Framework (appendix 4). The Terms of Reference for this evaluation will be prepared by UNEP in line with GEF evaluation requirements.

Terminal Evaluation (TE): The independent TE will assess: project performance, effectiveness and lessons learned; the impact and sustainability of results; contributions to capacity development; achievement of global environment goals; and follow up activities. The evaluation will include a review of all project reports, and will be based on the objectively verifiable indicators set out in the Project Results Framework at appendix 4. The Terms of Reference for this evaluation will be prepared by the UNEP-Evaluation and Oversight Unit in line with GEF evaluation requirements.

Financial Statements: UNEP/GPA will provide UNEP with quarterly financial reports, certified annual financial statements, and a terminal audit of the financial statements for all GEF project funds. The financial certification and audit will be conducted in accordance with United Nations accounting and reporting procedures.

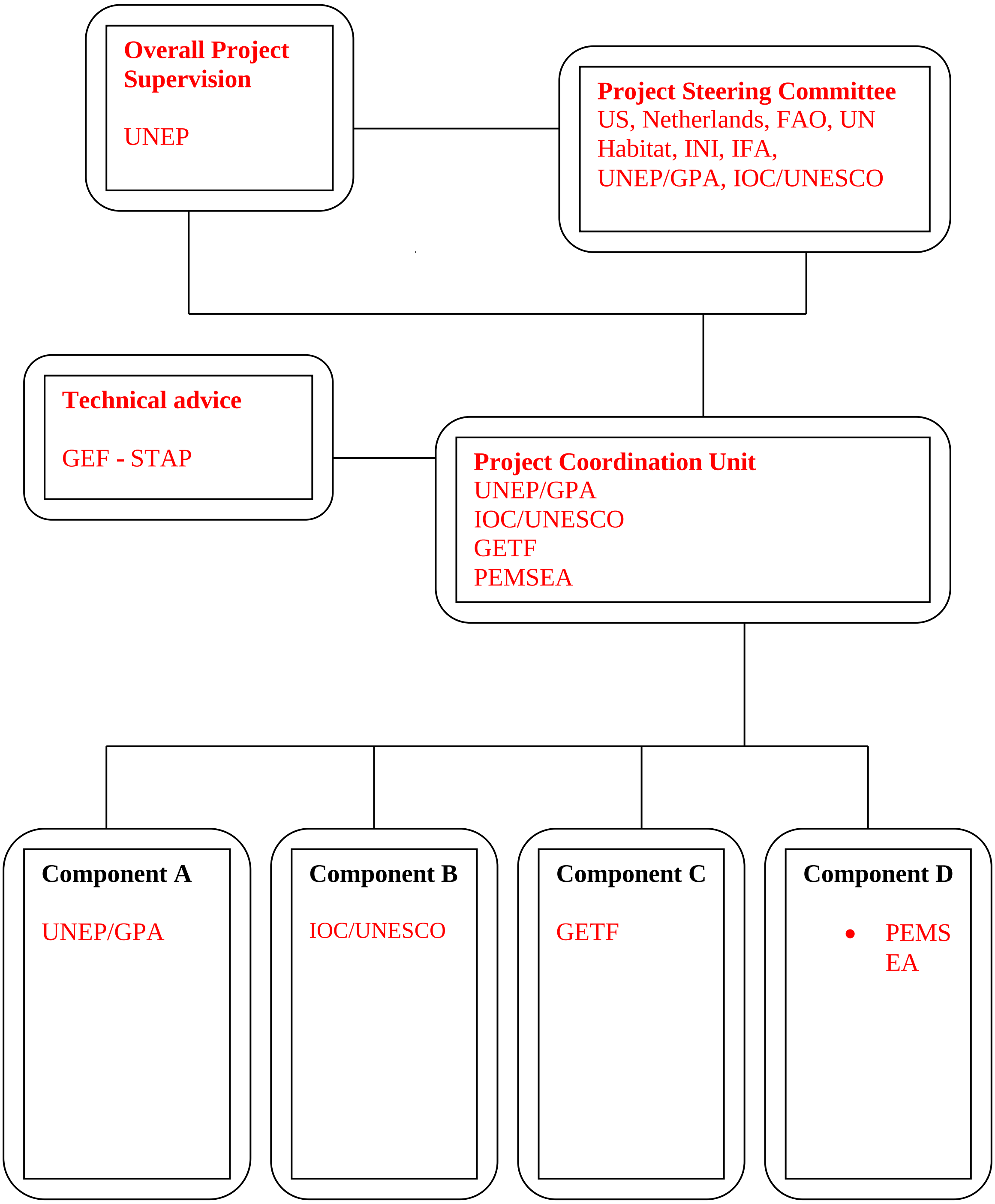
APPENDIX 10: STANDARD TERMINAL EVALUATION TOR

The objective of the terminal evaluation will be to establish whether the project achieved its objective ‘to provide the foundations (including partnerships, information tools and policy mechanisms) for governments and other stakeholders to initiate comprehensive, effective and sustained programmes addressing nutrient over-enrichment and oxygen depletion from land based pollution of coastal waters in Large Marine Ecosystems’

The evaluation will also assess project performance and the implementation of planned project activities and planned outputs against actual results. In addition, the evaluation will review the recommendations of the mid-term Evaluation and their implementation. It will focus on the following main questions:

- To what extent has the project been successful in strengthening IW portfolio delivery and impact?
- Did the project effectively capture and disseminate project results and experiences from the IW projects?
- Did the project activities foster efficiency and effectiveness of GEF IW projects to deliver tangible results in partnership with other IW initiatives and enhance the technical capacity of the recipients?
- How did the project activities translate into benefits for trans-boundary water management?
- What mechanisms are in place to ensure stakeholder ownership and sustainability of the benefits?

APPENDIX 11 – ORGANISATIONAL DIAGRAM



Components are headed by a task manager with overall responsibility for ensuring component outcomes. They will establish project management units for each component.

APPENDIX 12 – TERMS OF REFERENCE

Terms of Reference for the Project Co-ordination Unit

The project objective is to provide the foundations (including partnerships, information, tools and policy mechanisms) for governments and other stakeholders to initiate comprehensive, effective and sustained programmes addressing nutrient over-enrichment and oxygen depletion from land based pollution of coastal waters in Large Marine Ecosystems. This is to be achieved through a number of core project outcomes and outputs, and can be summarized as:

- the development and application of quantitative modeling approaches: to estimate and map present day contributions of different watershed based nutrient sources to coastal nutrient loading and their effects; to indicate when nutrient over-enrichment problem areas are likely to occur; and to estimate the magnitude of expected effects of further nutrient loading on coastal systems under a range of scenarios

- the systematic analysis of available scientific, technological and policy options for managing nutrient over-enrichment impacts in the coastal zone from key nutrient source sectors such as agriculture, wastewater and aquaculture, and their bringing together an overall Policy Tool Box

- the application of the modeling analysis to assess the likely impact and overall cost effectiveness of the various policy options etc. brought together in the Tool Box, so that resource managers have a means to determine which investments and decisions they can better make in addressing root causes of coastal over-enrichment through nutrient reduction strategies

- the application of this approach in the Manila Bay watershed with a view to helping deliver the key tangible outcome of the project – the development of stakeholder owned, cost-effective and policy relevant nutrient reduction strategies (containing relevant stress reduction and environmental quality indicators), which can be mainstreamed into broader planning

- a fully established global partnership on nutrient management to provide a necessary stimulus and framework for the effective development, replication, up-scaling and sharing of these key outcomes.

The key outcomes outlined above are reflected in 4 main operational components – Component A, the global partnership, Component B, the development of the modeling techniques, Component C, the development of the Policy Tool Box and the integration of the tools with the modeling techniques, and Component D, the application of tools and modeling techniques in the Manila Bay watershed to produce actual nutrient reduction strategies both for mainstream adoption in that area, and as a model for the development and application of nutrient reduction strategies in other regions. Each component will contribute to overall lessons drawn and potential for replication and up-scaling, which will be disseminated in an inter-active way through the Component A partnership, which continues after project completion to provide sustainability. In addition to the 4 operational components, two over-arching components are represented by Component E - effective project co-ordination, management and over-sight, and Component F – monitoring and evaluation.

To accomplish the above the Project will be implemented through UNEP which will have overall project management lead. The executing partners will be UNEP/GPA and IOC/UNESCO. UNEP will be responsible for final decisions about budgets, terms of reference and contracts proposed for the project's execution. Overall day to day project management and leadership will be vested on the Project Co-ordination Unit (PCU) under the leadership of a Project Manager, a P5 post that will be established under the project budget. The other members of the PCU will be the Leaders of each of the project components as identified under the work plans. This would entail UNEP/GPA, IOC/UNESCO, the Global Environment and Technology Foundation, and PEMSEA in relation to the Manila Bay watershed. The PCU will be supported by a pert-time Secretary (UNEP staff member).

The intention would be that the unit as such would be based in Nairobi at UNEP HQ. There would be monthly virtual meetings, as well as a minimum of one annual face to face meeting to coincide with PSC meetings. Periodic opportunities will be taken to facilitate additional meetings, linked to carrying out project outputs. The PCU will be responsible for coordinating the project oversight activities and for ensuring that all M&E requirements are implemented according to best practice. This means ensuring quality of products, outputs and deliverables; compiling and submitting progress, financial, and audit reports and budget revisions to the PSC; addressing problems raised by the PSC; and staff and consultant management. The Component Leaders in consultation with the Project Manager may establish functional management unit and delegate implementation responsibilities to the representatives of their respective partners for their components.

Terms of Reference and Qualification of the Project Manager

The Project Manager (Level P5) will lead and manage the day-to-day implementation of the work plan and budget of the Project based on the UNEP Project Document. The Project Manager will head a multidisciplinary team composed of the Component Leaders, Secretarial staff and consultants working within the framework of the PCU at various locations. The Project Manager is responsible for calling the Project Steering Committee meeting to secure approval of work plan and budget, and eventual implementation of the work plan in respect of the allocated budget and timetable. The job of the Project Manager will include, but not be limited to the following:

- Day to day management of the project, maintain liaison with Component Leaders, the PSC and UNEP Project Task Manger
- Day to day technical inputs into various project planning and implementation processes
- Develops the agenda for the PSC meetings, prepares all technical background documentation in consultation with others partners; Act as a Member-Secretary for the PSC meetings
- Coordinating and facilitating the work of the bodies created under the Project
- Organising and supervising the reporting activities to UNEP, the GEF and to the Project Steering Committee and ensuring adherence to the Agencies' Administrative, Financial and Technical Reporting requirements
- Overseeing the development of information management tools to ensure evaluation, monitoring and replication activities
- Provide strategic guidance and technical support to the PCU teams, design policies/strategies for efficient and integrated management of nutrients and facilitating their application
- Overseeing and directing the organisation and execution of training and communication activities including workshops, training sessions, conferences and other meetings required by the work plan
- Liaising, consulting with and networking with appropriate and relevant national and regional partner agencies
- Promoting actively the Project vision and UNEP principles and the project components in all relevant media and for a
- Following UN rules, he/she approves administrative and financial reports, external communications and travel requests, as well as the acquisition of equipment

- Co-ordinates the communications to and from the different bodies created under the Project and coordinates the organisations of their meetings, notably for the Project Steering Committee and other advisory groups as appropriate and;

- In consultation with UNEP, the Project Manager shall facilitate selection of staff/consultants (professionals, technical, admin and support) and their supervision.

Educational Qualifications and Work Experiences

- Post Graduate Degree in Economics/ Environmental studies/Natural resources management or related field.

- At least 10 years of work experience in leading and managing projects involving multi-disciplinary teams at national and international levels

- Demonstrated understanding of sustainable development, including financial and institutional sustainability

- Ability to mobilize various stakeholders, including opinion and decision makers to promote sustainable development agenda, raising environmental awareness, and promoting and implementing change

- Experience in successfully working with adaptive management/monitoring and best practice assessment.

- Detailed knowledge of project design and implementation arrangements and experience.

- Well developed leadership, inter-personal, communication and negotiating skills, as well as a proven ability to work effectively in groups.

- Reliability, initiative, thoroughness and attention to detail.

- Experience in implementing UN, GEF and/or donor funded projects would be an additional asset.

Language proficiency: English is the working language.

APPENDIX 13– GEF TRACKING TOOLS

The GEF 4 International Waters (IW) Tracking Tool (TT) is designed to support GEF's new approach to Results-based Management. The TT provides reporting of outcomes at the level of strategic programmes (SP 1 to SP 4) and the IW portfolio level as well as for targets associated with the GEF 4 Replenishment. The TT allows GEF Agencies and the Secretariat to monitor and aggregate individual project results on yearly basis in order to characterize program results quantitatively.

1. Projects should be able to report annual results on a special GEF 4 IW TT reporting form nested in the GEF PMIS database. The TT form should be filled in by the required project identifiers and by using the scroll down menus providing options to choose appropriate indicators, ratings, and additional text field to justify the rating chosen and to provide information on the results achieved, in a maximum of 250 characters. If the project by default is not expected to provide results described by certain indicator, then the term N.A. should be used. These instructions are accompanied with two annexes, which describe in full the rating scales for each of the types of GEF IW indicators.
2. The GEF 4 IW TT does not replace the existing annual PIR/AMR project performance reviews, which agencies conduct with their own review forms but provides an additional, global quantitative picture for results achieved by the GEF 4 IW portfolio.
3. The GEF 4 IW TT includes all indicators in the GEF 4 IW Focal Area Strategy. These indicators represent the normal three types of IW indicators used in this focal area: process, stress reduction, and environmental/water resources & socioeconomic status indicators. The process indicators are the same for all Strategic Programmes (except for one additional one for private sector involvement in SP 4). The stress reduction indicators are divided into two larger groups (national/local reforms and demonstrations/investments). Each group provides a menu of specific indicators for each SP, as listed in the GEF 4 IW Focal Area Strategy. Although the Strategy requires use of environmental/water resources & socioeconomic status indicators only for SP 1 projects, GEF agencies may wish to report on project progress or results in environmental/water resources and socioeconomic status in the other programs if available. More information on GEF IW Indicator is located on the GEF IW knowledge management website www.iwlearn.net.
4. For programmatic approaches in the IW focal area, special results frameworks are developed and used for Investment Funds Programmes. Results for individual projects should be reported within this TT, while separate reporting is also expected at the level of Investment Fund each year.
5. When a project is being implemented by more than one GEF agency, only one agency should report within GEF 4 IW TT. The agency with larger portion of GEF grant should report on behalf of the entire project, and cooperating GEF agencies are requested to provide the reporting agency with relevant input.
6. If a project is being implemented within two GEF 4 IW SPs, reporting for both SPs should be undertaken on relevant indicators and an asterisk "*" should be added to the end of the project title in both reporting forms in order to avoid double counting.
7. Project ratings are subject to self-assessment; a zero mark means no results achieved, while mark three represents 100% achievement of projected results. Ratings will be averaged within each GEF 4 IW indicator to provide a program level and portfolio level

view, not a project specific view. This roll-up will allow additional analysis and qualitative description of program and portfolio level results for reporting to the GEF Council and to Replenishment discussions.

GEF 4 IW Results-Based management Tracking Tool

	GEF ID	
	Name	
	IA	
	GEF allocation	
	Strategic Objective (indicate 1 or 2)	
IW PROCESS INDICATORS	Functional National Inter-Ministry Committees (IMCs)	
	Agreement on TB Priorities and Root Causes (TDA)	
	National commitments to policy, legal & institutional reforms (Ministerial level adoption of SAP, ICM or IWRM Plans, etc.)	
	Regional Legal Agreement	
	Functioning and Sustainable Regional TB Waters Institution	
	Incorporation of (SAP, etc.) priorities into CAS, PRSPs, UN Frameworks, UNDAF, etc.	
	Mechanisms in Place to Monitor Stress Reduction & Environmental/Water Resources and Socioeconomic Status of the Water body	
	Project website established and maintained in line with the IW:LEARN template/guideline	
	Participation in IW learning activities	
	Knowledge management/experience sharing tools/materials produced, distributed and used	
	Co-financing/Resource Mobilization target met (realized vs. expected)	
	Catalytic results	
	Others	

APPENDIX 14:CO-FINANCING COMMITMENT LETTERS FROM PROJECT PARTNERS – Separately attached

APPENDIX 15: GLOBAL NEWS MODEL FOR WATERSHEDS AND COSASTAL AREAS

Summary

Nutrient over-enrichment of coastal ecosystems is a major environmental problem globally, contributing to problems such as harmful algal blooms, dead zone formation, and fishery decline. Yet, quantitative relationships between nutrient loading and ecosystem effects are not well defined. The development of such relationships, concurrent with an improved understanding of the complexity of these relationships is critical to effective management of coastal resources; without such understanding degradation of aquatic systems will almost certainly continue, resulting in increased social, economic, and environmental hardship. The Global Nutrient Export from Watersheds 2, User Scenario Evaluation (Global NEWS2USE), aims to address the need for more quantitative analysis of impacts of nutrient loading and changing nutrient stoichiometry in coastal ecosystems. It will explore and quantify relationships between nutrient inputs, coastal chlorophyll, the occurrence of harmful algal blooms (HABs) and hypoxia, and related effects on coastal fish and fisheries, with the ultimate goal of developing novel datasets and innovative, predictive models, which will be shared with stakeholders.

The modeling directly addresses a critical gap in scientific understanding and an important coastal management need while establishing a necessary, but currently missing, link between several IOC of UNESCO-programs and projects. The coastal zone ecosystem stresses on organisms that will be considered by NEWS2USE are HAB, hypoxia and impacts on fish and fisheries (abundance, composition, landings). The scope of NEWS2USE is global; the aim is to investigate relationships between nutrient loading and nutrient transformations in coastal marine ecosystems, develop models that quantitatively describe such relationships, and to identify regions where conditions are prone to the development of HABs and hypoxia and where further in-depth research is needed.

NEWS2USE will provide a sophisticated quantitative approach to analyze spatial correlations between nutrient loading and HAB and hypoxia occurrences, and will employ a retrospective analysis using time series of hypoxia and HAB occurrences to study changes occurring over recent decades. NEWS2USE will also use Millennium Ecosystem Assessment scenarios for 2030 and 2050 to examine how coastal ecosystems are likely to respond to expected changes in coastal nutrient loading over the next several decades.

The intention is that scientists will use this tool in close collaboration and with feedback from managers and policy makers at various levels (national, international) to assess the effects of management and policy alternatives on coastal marine ecosystems. This will allow visualizing the potential impacts of alternative development and mitigation strategies, a process that has proven effective in promoting conservation of resources in a number of cases worldwide. To be an effective aid to managers and policy makers, this model must be as useful and accessible as possible. The activity includes training workshops for scientists and policy makers in developing countries. A web facility will initially be a forum for data exchange of the NEWS2USE activity, and later on a facility for disseminating the data, results and tool developed in NEWS2USE.

Why a new integrative activity?

Nutrient inputs (nitrogen N; and phosphorus P) to watersheds associated with agriculture, sewage and fossil fuel combustion are projected to more than double by 2050 unless technological advances and policy changes are implemented (Tilman et al. 2001; Millennium

Ecosystem Assessment 2006). Therefore, understanding the quantitative relationships between nutrient sources throughout watersheds, nutrient transport by rivers to coastal systems, and the effects of that nutrient loading on receiving coastal ecosystems is critical to effective and integrated management of water resources and coastal zones. Without a quantitative and whole watershed perspective, and without an effective and efficient means of implementing programs that respond to current understanding of watershed-coastal ecosystem linkages, aquatic systems are likely to continue to be degraded by both nutrient over-enrichment and by changes in nutrient ratios due to human activities.

The modeling builds on work performed by the IOC of UNESCO Global NEWS project, which has developed datasets and models of river nutrient export at the river mouth and information on land-based nutrient sources. The strengths of this Global NEWS system and the feasibility of using it to establish links between land-based nutrient loading and coastal impacts have been demonstrated in previous applications using global databases. For example, comparison between Global NEWS-predicted nutrient export and HAB occurrences suggests that high values of dissolved inorganic N river export correspond to locations of hypoxia and blooms of specific algal bloom species (Figure 2, Seitzinger et al., 2005, Harrison et al., 2005a and b, Dumont et al., 2005, Beusen et al., 2005, Glibert et al., 2008).

This kind of qualitative comparison represents the extent to which the effects of nutrient loading in coastal marine ecosystems have been linked to coastal impacts at the global scale.
IOC programs with which NEWS2USE will help unify include Global Ocean Observing System (GOOS), the Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) program, the Integrated Coastal Area Management (ICAM) program. Non-IOC programs with which NEWS2USE will interact directly or indirectly include Land-Ocean Interactions in the Coastal Zone (LOICZ), the SCOR/LOICZ Work Group 132, UN Environment Program Global Programme of Action for the Marine Environment (UNEP/GPA), the International Nitrogen Initiative (INI), and the International Human Dimensions Programme (IHDP). Depending on the group, interactions with other entities will include sharing personnel, sharing data, formal and informal scientific collaboration, co-hosting/co-funding workshops and open science meetings, outreach, identification of stakeholder groups, publication, peer review, dissemination of results in less formal venues.

Detail

It is well-established that eutrophication, due to nutrient over-enrichment, is a major environmental problem in many coastal ecosystems around the world (e.g., National Research Council, 2000, Smil, 2001, Cloern, 2001, Howarth et al., 2002, Seitzinger et al., 2002, 2005; Bouwman et al., 2005a; Wassmann 2005; Conley et al., 2009). Nutrient sources driving coastal eutrophication are primarily associated with increasing human population, food, and energy production in watersheds and, in some cases, coastal aquaculture. The effects of eutrophication are many and include increased algal biomass, toxic and high-biomass HABs, hypoxia/anoxia, seagrass decline, increased water turbidity, and change in fisheries yields, among others. Yet, the relationships between nutrient loading and ecosystem effects, such as HABs or fisheries landings, are complex and variable and depend on the specific nutrient sources, ratios and forms, as well as the physical dynamics of the receiving waters, among many other factors (Glibert et al., 2005; Glibert and Burkholder, 2006; Heil et al., 2005). Predicting the effects of nutrient loadings on abundances of finfish and shellfish species targeted by fisheries are further complicated by the influence of fisheries removals

and the complex interactions between nutrient enrichment, hypoxia and fishing practices in coastal waters (Caddy, 1993; Nixon and Buckley, 2002; Breitburg et al., 2009).
Many coastal systems that exhibit eutrophication effects have been identified and in many cases the nutrient loading rates have also been quantified (Beman et al., 2005; National Research Council, 2000; Selman, 2007).

To date, however, predictive (quantitative) relationships between nutrient loading rates (and changes in element ratios) and ecosystem effects (e.g., algal biomass, HABs, hypoxic/anoxic regions, seagrass decline, increases in turbidity, and changes in fisheries yields) applicable across a range of coastal systems have been lacking as outlined in a recent report (Seitzinger and Lee, 2008). A large amount of data, and increasingly sophisticated analytical approaches are now available to develop such relationships, including nutrient loading rates and quantitative measures of eutrophication, and physical properties (flushing rates, depth, etc.) for a wide range of coastal systems.

Through improved global, spatially explicit models of nutrient loading from watersheds to coastal systems, better understanding of coastal dynamics, and the expansion of global databases on coastal algal biomass and production, including HAB occurrences and hypoxia, we are now in the position to begin linking patterns of eutrophication with coastal effects around the world in a more rigorous and quantitative way. Enhanced observing systems are also advancing our knowledge base of coastal effects.

There is a need for integration of knowledge and data on the impacts of nutrient loading in coastal marine ecosystems, particularly in developing countries, for managers and policy makers of national governments and international organizations like IOC of UNESCO and UNEP. Often policies with respect to nutrient management are oriented towards local solutions, such as wastewater treatment. However, the impact of nutrient loading often spreads across boundaries, and particularly in the marine environment problems associated with eutrophication may have multiple and multinational sources. Examples of such regional integrative activities are the OSPAR Commission for the Northeast Atlantic, the Helsinki Commission (HELCOM) for the Baltic Sea and the different programmes established under the UNEP Regional Seas Programme. Global integration of data, models and knowledge with a focus on the developing countries is therefore a useful addition to these existing regional activities, and NEWS2USE will coordinate with these groups to minimize overlap and maximize scientific output and policy effectiveness.

Estimating nutrient export to the coastal zone has been a challenge, but enormous advances have been made with respect to global models over the past several years. The first global model of N loading to coastal systems was published just over 10 years ago (Seitzinger and Kroeze 1998). Since then, several other global and regional nutrient export models have been developed, including six compared in Alexander et al. (2002). Models that describe total phosphorus export have also been developed (e.g. Johnes, 1995, Caraco 1995, Smith et al, 2003). However, these models have focused on a single nutrient (N or P) and a single nutrient form (most often total N or P, though some predict dissolved inorganic N or P). Also, because these models have been developed largely in isolation from each other, using inconsistent input datasets, it is often very difficult to apply these models in a common framework. For investigating the impact of nutrient loading on HABs, hypoxia and fisheries it is important to know both the total load of carbon, nitrogen, phosphorus and silica and also the different forms of each of these elements. For example, it has been suggested that some

HAB species have a preference for specific nutrient forms such as ammonia or urea (Glibert and Burkholder, 2006).

The IOC Global Nutrient Export from WaterSheds project (Global NEWS) has now developed models of nutrient export for dissolved inorganic, dissolved organic and particulate N, P and carbon (C), as well as for dissolved silica (DSi). Global NEWS is unique as a global nutrient export model because it provides an integrated, internally consistent approach to modeling river export of nitrogen, phosphorus, silica and carbon, and the different forms of these elements. The Global NEWS framework includes the Integrated Model for the Assessment of the Global Environment (IMAGE) to generate spatially explicit land use, greenhouse gas emissions, and climate fields (Bouwman et al., 2006), the Water Balance Model (WBM) for predicting river discharge (Fekete et al., 2002), and the Global NEWS river-basin scale nutrient export models The Global NEWS framework can be used to evaluate effects of socio-economic developments, climate change, food consumption, agricultural nutrient management, dam construction and consumptive water use, and sewage treatment trends on river nutrient export.

The Global NEWS models utilize relatively simple approaches to simulate in-stream retention of nutrients (e.g. denitrification and burial in rivers, lakes, reservoirs, etc.). The global NEWS system uses consistent input databases for predicting export of dissolved inorganic nitrogen and phosphorus (DIN, DIP), dissolved organic carbon, nitrogen and phosphorus (DOC, DON, DOP), total suspended solids (TSS), particulate organic carbon (POC), particulate nitrogen and phosphorus (PN and PP), and dissolved silica (DSi). These models account for nutrient sources (natural as well as anthropogenic, including fertilizer, atmospheric deposition, crops, manure and sewage), hydrology, land use, and physical factors in watersheds. Results for estimates of the 1995 global condition were published in a special issue of *Global Biogeochemical Cycles* in 2005 (see especially Beusen et al., 2005; Bouwman et al., 2005a,b; Dumont et. al., 2005; Harrison et al., 2005a,b; Seitzinger et al., 2005). Since 2005, the Global NEWS project has advanced models of global nutrient stoichiometry, and developed a model for describing river dissolved silica export (Beusen et al., 2009).

In addition, the Global NEWS work group has developed scenarios for river nutrient export for the years 2030 and 2050 based on the Millennium Ecosystem Assessment (Alcamo et al., 2006) assumptions. The Millennium Ecosystem Assessment (MEA) (Alcamo et al., 2006) developed four scenarios: Global Orchestration (GO), Order from Strength (OS), Technogarden (TG) and Adapting Mosaic (AM). On the basis of these scenarios and their storylines, scenarios for nutrient management in agriculture and for wastewater management have been developed to assess possible future river nutrient export using the Global NEWS model framework.

The development of the multi-element and multi-form Global NEWS models has positioned the scientific community to develop quantitative relationships between coastal nutrient loading and coastal impacts at the global scale, such as eutrophication, HAB development, hypoxia, and the attendant effects on fish and fisheries.

The key issue for NEWS2USE is:

Prediction as to how natural and anthropogenic factors interact to modulate coastal zone ecosystems and stresses on organisms ranging from phytoplankton to fish?

This can be broken down into the following sub-issues:

- Whether anthropogenic increases in coastal N and P delivery result in elevated chlorophyll concentrations, greater coastal primary productivity, increased frequency and severity of coastal hypoxia, HAB development, and/or negative impacts on fish and fisheries

- What is the relationship between anthropogenic changes in element ratios (N:P:Si) and forms (inorganic/organic, dissolved/particulate) of land-based nutrients delivered to coastal ecosystems and observed changes in abundance and species composition of coastal primary producers, often favouring the development of HABs.

- How are effects of anthropogenic alteration of coastal nutrient inputs modulated by natural factors, such as the type of coastal system, rates of upwelling, conditions favouring stratification, inputs from the open ocean and inter-annual climate variability

- What is the occurrence of some specific HAB species related to nutrient inputs from finfish aquaculture in coastal marine ecosystems, and nutrient transformations in shellfish and aquatic plant production systems?

The primary product resulting from NEWS2USE will be an assessment tool for use by scientists as an aid to, and in close collaboration with, managers and policy makers from developed and developing regions to use in the evaluation and implementation of policies to improve coastal water quality. The capacity building aspect of NEWS2USE will be a critically important component.

This NEWS2USE tool will provide:

a. Estimation of present-day contributions of different watershed-based nutrient sources to coastal nutrient loading and effects of nutrient loading on receiving waters;

b. Models to estimate the magnitude of expected effects of further changes (reductions or increases, changing stoichiometry) in nutrient loading on coastal systems under a range of scenarios and to assess the effect of management and policy options on nutrient impacts in coastal marine ecosystems.

c. Capability to apply models and visualize the results for any selected coastal sea, LME, region, country or river basin(s) with coastal marine area of influence.

Approaches and data needs

One essential activity concerns the development of a common database. A preliminary list of data that will be collected and integrated includes:
a. River nutrient loading data: Global NEWS models and data (seasonal scale for dissolved, particulate, inorganic and organic) from SCOR/LOICZ work group.
b. Aquaculture: Spatially explicit models for nutrient inputs from finfish aquaculture, nutrient transformation by filter-feeding shellfish and uptake by aquatic plant production systems

evolving from the SCOR-LOICZ work group on “Land-based Nutrient Pollution and the Relationship to Harmful Algal Blooms in Coastal Marine Systems”.
c. Data on environmental conditions: A common database which includes information about physical and biological conditions in coastal marine systems, such as:
-Physical conditions; Stratification regime; Water residence time; Tidal excursion/height Sea-surface temperature; Type of coastal system; Extent of river plumes (seasonal and annual);Nutrient (N-P-C-Si) loading data ;Upwelling and inputs from the open ocean and other downstream water bodies; Burial of nutrients (C, N, P, Si) ;Data on nutrient effects; Chlorophyll and primary production ;Hypoxia ;HAB occurrences and types; Fish and invertebrate abundances and fisheries landings

Key sub-models

Aquaculture: Spatially explicit models will be developed that describe the nutrient flows in aquaculture for the current situation and for the four Millennium Ecosystem Scenarios, consistent with the Global NEWS scenarios. This includes finfish, shellfish and aquatic plant (seaweed) production. Finfish production includes freshwater and marine production systems, and herbivore and carnivore species. The marine finfish systems directly add to nutrient loading, and the carnivore production systems have an important link to fishery because of the large input of fish, fish meal and fish oil. Freshwater systems are an important component of food production systems, particularly in Asia, and play an important role in nutrient cycling on the land. These freshwater systems therefore need to be linked to the Global NEWS models for predicting river nutrient export.

Shellfish includes crustaceans and molluscs, and some of these systems also use imported nutrient or feed inputs. A special case is the filter-feeding molluscs which consume algae and excrete particulate organic and dissolved inorganic nutrients. As has been noted before, ammonia and urea excreted by shellfish may be a cause of the development of HABs of specific species. The SCOR/LOICZ workgroup will analyze such relationships between aquaculture production and HABs. The NEWS2USE will take this further by (i) establishing the relationship between aquaculture and fisheries through feed requirements (fish, fish meal and fish oil); (ii) analyzing relationships between aquaculture and hypoxia; (iii) using the nutrient cycling in inland aquaculture production as an additional input to the Global NEWS models for predicting river nutrient export; (iv) improving the spatial allocation of the aquaculture production regions; (v) integrating marine aquaculture in the coastal typology and marine ecosystem models for modeling of the development of HABs, hypoxia and impacts on fisheries.

Chlorophyll :An understanding of the relationship between coastal nutrient loading, coastal chlorophyll concentration, and primary production is relevant to an understanding of coastal hypoxia, the occurrence of high biomass HABs, and fisheries. Hence, a subgroup of NEWS2USE will focus on developing relationships between coastal nutrient loading, coastal chlorophyll concentrations, and coastal primary production. Past analyses (e.g. Nixon 1992) and a preliminary analysis of large rivers (Harrison, unpublished) suggests that there is a fairly strong and positive relationship between river N loading and coastal chlorophyll concentrations. Models will be developed to predict chlorophyll concentrations are likely to be high and hence have the potential to support the onset of hypoxic events or HABs. In general, as chlorophyll is likely to be related in some fashion to the onset of hypoxia and potentially to the formation of high biomass HABs as well, this effort will support further investigations into relationships between nutrient loading and HAB formation and hypoxia.

Hypoxia: A subgroup of NEWS2USE will focus on developing relationships between coastal nutrient loading and hypoxic events. The first step in developing these relationships is to compile a global database that includes both systems with observed hypoxia and systems without observed hypoxia from a range of coastal typologies (e.g. fjords, coastal embayments, drowned river valley estuaries, and large rivers discharging directly to the coast) and geographic locations. The database will include the temporal dimensions (duration, frequency), spatial extent of hypoxia and the severity (dissolved oxygen concentrations). The database will include upwelling dominated systems and inland seas. The statistical approach used should account for possible spatial discontinuities and time lags between nutrient loading and seasonal hypoxia (nearly always hypoxia events are in summer/autumn). The approach will identify relationships between occurrence, temporal patterns and extent of hypoxia and how those relationships vary with system characteristics.

Harmful algal blooms: The HAB subgroup of Global NEWS2USE will initially use the concepts developed by Smayda and Reynolds (2001) for testing relationships between nutrient loading and HAB occurrence globally. This conceptual model (Smayda and Reynolds, 2001) describes 11 life forms of HABs (dinoflagellates) relative to physical and chemical habitat. Global distributions of many of the species and life forms in this conceptual model are available and will be compared with global distributions of coastal types, N loading, P loading, N/P ratio, and N and P retention, Indicator for Coastal Eutrophication Potential (ICEP) maps from Global NEWS, and other indices of nutrient loading and retention.. For at least 2 HAB species, hindcasts (1970 conditions) will be developed. Deterministic models will also be developed. These models will use a "functional group" approach to determine/predict if and when different functional groups develop in relation to nutrient quantity and quality. These models will use loads of different nutrients (N, P, and Si), different nutrient forms (dissolved/particulate, inorganic/organic), and other parameters as inputs.

Fish and Fisheries: The fifth sub-group of NEWS2USE will focus on the effects of land-based nutrient additions on fisheries and the species upon which they depend. The overall goals of the proposed Fish/Fisheries element are to improve the understanding and ability to predict effects of nutrient enrichment and hypoxia, and the interaction of nutrient enrichment, hypoxia and fisheries removals (including aquaculture and fisheries dependent on wild populations) on the abundance and composition of (1) fisheries landings, (2) abundances of finfish and mobile macro-invertebrates that are targets of fisheries (referred to collectively as fish or fishes below), and (3) benthic invertebrates that are important prey for fishes and are an ecologically important component of coastal ecosystems. The Fish/Fisheries element thus provides an examination of ecologically and economically important effects of nutrient enrichment (including enhancement of production by nutrient enrichment), and considers both food web and habitat consequences of nutrient enrichment.

The Fish/Fisheries element will also concentrate on the establishment of relationships between N, fish, fisheries and hypoxia using the nutrient loading data from rivers and other sources (e.g. aquaculture, atmospheric deposition, or groundwater) where needed. Factors such as of nutrient sources, system type, climate, population density and local economic condition will be also considered as drivers. In addition, activity will consider nutrient effects on fish abundances and fisheries landings at a variety of spatial scales.

Conclusion: the development of the tool, use and dissemination

The sixth sub-group of NEWS2USE focuses on the development of a tool that integrates results of the above studies on nutrient impacts on harmful algal blooms, hypoxia and effects on fisheries. This model-based tool uses a combination of empirical and deterministic approaches to estimate the magnitude of current and anticipated effects of anthropogenic alteration of coastal nutrient loading as a function of watershed characteristics (e.g. climate, lithology), human activities within watersheds (e.g. agriculture, urbanization), human activities within coastal waters (e.g. aquaculture, fishing), and coastal ecosystem characteristics (e.g. geomorphology, hydrodynamics). The tool will incorporate all global data and models brought together and developed in NEWS2USE, and will include the capability to visualize any selection of regions, seas, LMEs, country or river basin with the area of influence.

The tool indicates where and when problem areas are likely to occur and will provide estimates of the relative importance of different nutrient sources within watersheds. The tool will, in a user-friendly environment, include geographic information at the global scale and all the relationships, models and scenarios developed in the NEWS2USE programme. It will allow stakeholders to use this information to generate maps for visualization of coastal effects in selected regions of interest. It will also allow users to assess the likely impact of various policy options in agriculture, wastewater, aquaculture, water engineering on the basis of retrospective analysis and future conditions for the Millennium Assessment scenarios. As such this tool will enhance the capacity of resources managers and policy makers to anticipate and avoid, social, economic, and environmental strife associated with degradation of coastal resources.

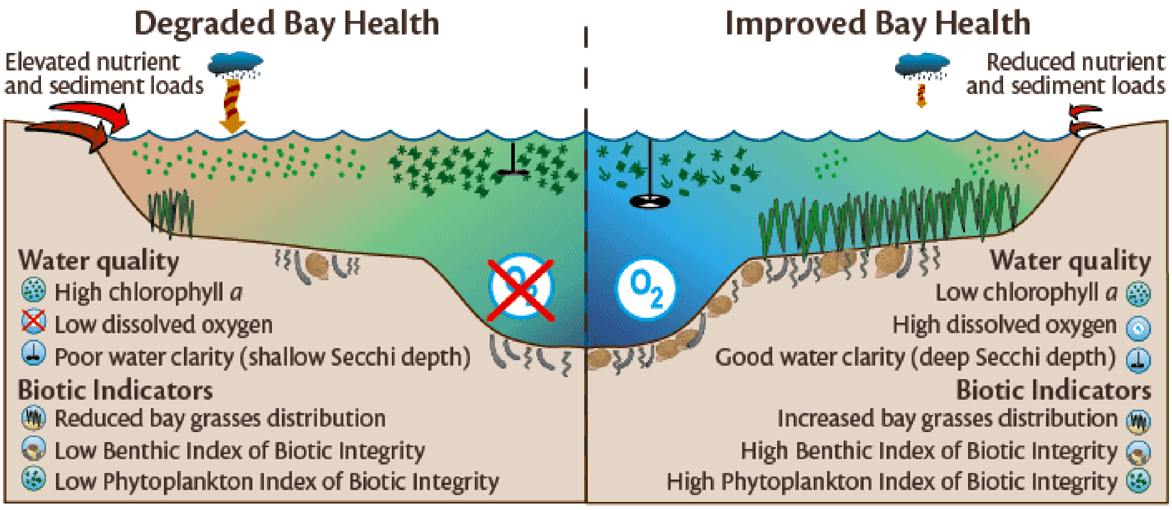
The intention is that this tool will be applied by scientists in close collaboration and with feedback from environmental managers and policy makers to assess the effects of management and policy alternatives on coastal marine ecosystems. The tool will integrate land-based diffuse and point sources of nutrients, and will also include impact modules for assessing the effects on primary production, hypoxia, harmful algal blooms and fisheries. This will allow scientists, managers, policy makers, and the general public to visualize the potential impacts of alternative development and mitigation strategies, a process that has proven effective in promoting conservation of resources in a number of cases worldwide.

To be an effective aid to management, this model must be as useful and accessible as possible. Efforts to enhance the model’s utility and accessibility will include: 1) the incorporation of stakeholders and potential model users (primarily policy-literate scientists) in model development, 2) easy distribution of the model via the internet, 3) the use, where possible, of non-proprietary software in running the model, and 4) the explicit development of model-related training and supporting materials and infrastructure.

APPENDIX 16: TECHNICAL BACKGROUND PAPER ON REPORT CARD FOR ASSESSING AND FORECASTING ECOSYSTEM HEALTH STATUS – LOICZ MODEL

Ecosystem health report cards are effective means of tracking and reporting the health of a waterway at both local and regional scales. Often, health of rivers/ estuaries/ bays can be affected by elevated nutrient and sediment loads, resulting in the overall degradation of water quality and biotic (biological) resources. For the report card, River/ estuary/ bay health is defined as the improvement of six indicators towards established ecological thresholds.

The three water quality indicators are: chlorophyll a; dissolved oxygen; and water clarity; and the three biotic indicators are: aquatic grasses (submerged aquatic vegetation); Benthic Index of Biotic Integrity (BIBI - soft bottom only); and Phytoplankton Index of Biotic Integrity (PIBI).



The goal of improved Bay health through nutrient and sediment reductions should result in these indicators meeting the established ecological thresholds. Threshold values were established for each indicator based on published scientific literature and technical reports Measuring progress towards thresholds allows for both combining diverse indicators into indices and comparison between Bay regions. Monitoring data are to be assessed against the threshold values by determining the percentage of samples passing the thresholds over the period of interest. Aquatic grasses are assessed as the proportion of the restoration goal present.

Water Clarity:

It is the most visible indicator of water quality. Suspended material such as sediment or algae in the water can make it appear murky or cloudy. Murky water blocks sunlight from penetrating through the water and reaching underwater grasses, which need light to grow. Sediment enters the river and estuaries with each significant rainfall, as storm water runoff. Sediments can also come from eroding river banks, poorly managed construction sites, and agricultural runoff. Algae and other biological material in the water column also decrease water clarity. Algae both blocks and absorbs sunlight, further decreasing the light available for underwater grasses.

Water clarity is measured with a Secchi disk, which is lowered into the water until it can no longer be seen. Threshold: ≥ 1.0 meter Secchi depth

Dissolved Oxygen:

Low dissolved oxygen levels are symptoms of an ecosystem out of balance. The existence of "dead zones" means there is fewer habitats for aquatic life to thrive. To improve oxygen levels we must address the sources of nutrient pollution. Upgrading our local wastewater treatment plants and septic systems will help, as well improving storm water management. We must also reduce the nutrient pollution coming from agricultural runoff in other parts of the Bay, which can ultimately influence the water quality.

Dissolved oxygen concentration fluctuates during daylight, as algae and other plants produce oxygen through photosynthesis. Levels are lowest at night, when photosynthesis stops and fish, crabs, and other aquatic animals consume existing oxygen. Areas with insufficient oxygen are known as "dead zones." If levels are too low, animals become stressed and may die if they cannot escape, even if it doesn't result in fish kills. This creates a habitat squeeze which stresses aquatic life, even if it doesn't result in fish kills. Oxygen data was measured against a threshold of 5 mg/l.

Nutrient Pollution:

Nutrient pollution, in the form of excess nitrogen and phosphorus, is the major driver of the river/estuaries poor water quality. The natural cycles of nitrogen and phosphorus have been drastically altered by human activities. Nutrients act as fertilizer and spur unchecked algae growth. Nutrients enter our rivers/estuaries from many sources. Another source of nitrogen is atmospheric deposition (from air pollution).

Threshold: Total Nitrogen ≤ 0.65 mg/l; Total Phosphorus ≤ 0.037 mg/l

Chlorophyll a:

Chlorophyll a the green pigment found in most plant life, including algae or phytoplankton is the best way to determine how much algae is in the water. Through photosynthesis, phytoplankton produces oxygen using sunlight. Phytoplanktons are also the primary food source for many species, including oysters, clams, mussels, and many fish. It is, therefore, a critical part of the food web. However, nitrogen and phosphorus pollution acts as fertilizer, and phytoplankton communities grow out of control, creating algae blooms.

Algae blooms block light from reaching underwater grasses and consume oxygen at night, when they switch from photosynthesis to respiration. When blooms die off, their decomposition also uses up oxygen. Algae blooms are often the cause of fish kills, since they may use up all the available dissolved oxygen in the water, leaving none for other aquatic life. Some algae species can be toxic to humans.

Threshold: ≤ 6.2 ug/l (spring); ≤ 7.7 ug/l (summer)

Underwater Vegetation

The monitoring sites can be rated on an Index of Biological Integrity (IBI). The IBI is a scientific tool used to identify and classify waterway health. Healthy rivers/estuaries support a diverse community of aquatic life, including fish, shellfish, and benthic organisms .The IBI measures ecological complexity by analyzing such factors as species diversity in a sample.
IBI Scale
1.00-1.99 Very Poor
2.00-2.99 Poor
3.00-3.99 Fair
4.00-5.00 Good

The IOC/IPHAB's programme

In the IOC-UNEP-IUCN-NOAA Program, nitrogen flux models were made using Ecopath with Ecosim (EwE), which is an ecological/ ecosystem modelling program. EwE has three main components:

- Ecopath - a static, mass-balanced snapshot of the system
- Ecosim - a time dynamic simulation module for policy exploration; and
- Ecospace - a spatial and temporal dynamic module primarily designed for exploring impact and placement of protected areas.

The Ecopath software package can be used to ;address ecological questions; evaluate ecosystem effects of fishing; explore management policy options; analyze impact and placement of marine protected areas; redict movement and accumulation of contaminants and tracers (Ecotracer); model effect of environmental changes.
This relationship can be expressed as;
Production = Catch + Biomass accumulation + predation mortality + net migration + other mortality (Christensen et al. 2000).

The primary difference between IOC's ECOPATH Model and the proposed "Report Card" approach is that the latter provides a simple yet detailed comparison of the ecosystem health on a seasonal, inter-annual and a long term trend analysis. The various enhancements in water quality from the past are easily determined using the report card and to develop indices of ecosystem health.

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Christensen, V., Walters, C.J. and Pauly, D. 2000.Ecopath with Ecosim: A user's guide. October 2000 Edition.Fisheries Center, University of British Columbia, Vancouver, Canada and ICLARM, Penang, Malaysia.

APPENDIX 17: TECHNICAL BACKGROUND PAPER ON APPLICATION OF LOICZ NUTRIENT HEALTH REPORT MODEL IN LAKE CHILIKA, ORISSA STATE

Specific objectives of testing

- understand the role of river-catchment and freshwater nutrient input to the Chilika Lake
- determine the transport of nitrogen from the major/ minor rivers into the Lake
- assess the biogeochemical coupling of nutrient inputs with other physical components of the Chilika Lake system
- compute fluxes of nutrients from the lake to the Bay of Bengal, from the lake to the atmosphere and determine the air-sea boundary exchange process
- understand the biogeochemical process and fluxes of nutrients (DIN, DIP, DIC, DOC) in the Chilika Lake using the LOICZ Biogeochemical Model
- estimate the overall water quality status of the Chilika Lake and the coastal water quality in the adjacent Bay of Bengal

in order to develop an overall ecosystem health report card on nutrient status in estuaries and deltas.

Context

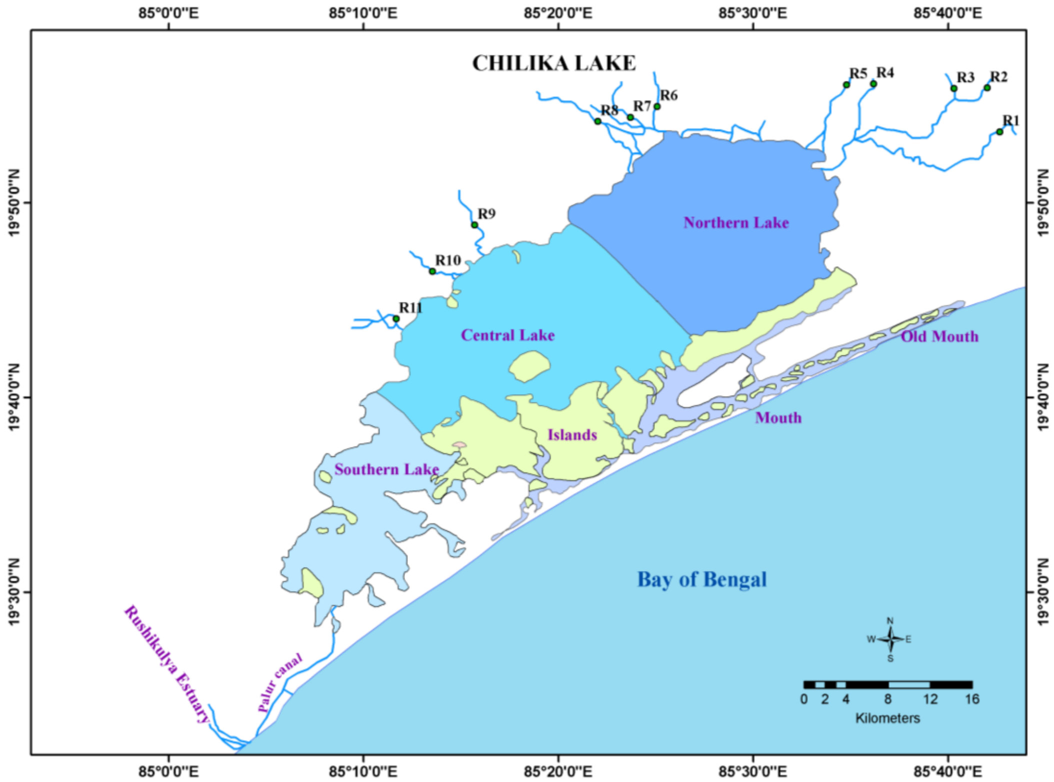
Chilika Lake, a semi-enclosed coastal lagoon on east coast of India, is the largest brackish water lake in tropical Asia . It is a shallow coastal water body separated from the Bay of Bengal by a long sand bar extending about 180-275 m wide. The Lake is a unique assemblage of marine, brackish and fresh water ecosystem with estuarine characters. The pear shaped lake is about 64.5 km long and varies in width from 18 km in north to 5 km in south. The average water spread area of the lake is 906 km^2 in dry season (December-June) and 1165 km^2 in the rainy season (July-October) (Ghosh and Pattnaik, 2005). The water depth in the Lake varies from 0.9 to 2.6 m in dry season and from 1.8 to 3.7 m in the rainy season.

The Chilika Lake was earlier connected to the Bay of Bengal via a long outer channel with several shoals restricting the water movement bi-directionally to and from the Bay. To regulate the water flow and maintain salinity gradient in the lake, a new mouth was opened on 23rd September 2000 at the northeastern end of the lake, which is 14 km from the main lake and has reduced the outflow from the lake by 18km. The Lake also connected at the southern end through a canal from Rambha Bay to the mouth of the Rushikulya estuary to a distance of 18 km, which is separated from the lake by lowlands, some of which are salt pans.

The Chilika drainage basin, including the lake itself, covers an area of almost 4300 km^2 (Das and Samal, 1988). The watershed boundaries lie between water flowing into the Mahanadi and Chilika in the north, while areas draining into the Bhargavi River make up the northeast watershed; in the west and southwest, the watershed boundary lies between streams flowing into the Rushikulya River and those flowing into Chilika (Ram et al 1994). In addition to 1100 km^2 area of the lake itself, the drainage basin of the lake includes 2325 km^2 of agricultural land, 525 km^2 of forests, 190 km^2 of permanent vegetation used for plantations, 70 km^2 of swamps and wetlands and 90 km^2 of grassy mud flats (Kadekodi et al 2005).

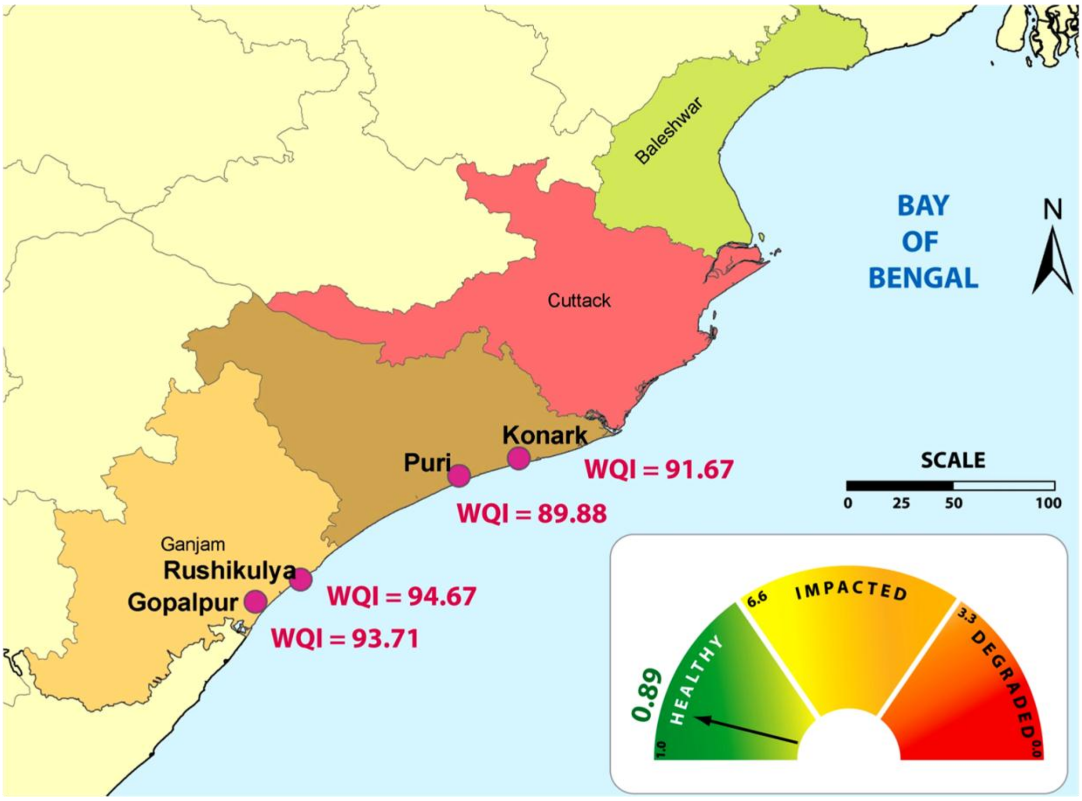
About 52 small rivers and streams are draining to Chilika Lake and the large Mahanadi River enters the lake in its north-eastern end. The flow pattern coincides with high discharge during peak flood seasons of the SW monsoons and low during rest of the year. The main tributaries of Mahanadi (such as Bhargavi, Daya and Makara) accounts for almost 61% (850 $m^3 s^{-1}$) of the total fresh water flow into the lake and 39% (536 $m^3 s^{-1}$) is from non-perennial rivers from the western catchments. The major silt load to the lake is carried by the Daya, Bhargavi and Nuna, the tributaries of Mahanadi River system.

Map of the testing area showing different lake sectors



Approximately 1.5 million tons per year of sediment enters the lake in the north from the distributaries of the Mahanadi River and 0.3 million tons per year enters the lake from the western catchment (Pattnaik 2002). The lake and the rivers experience heavy flooding during monsoon months. In association with strong wind, the sea level is elevated and affects the drainage of flood water to the sea. Therefore, the lake that receives large amount of silt load and fresh water obviously has no out flow to sea and act as a sink of terrestrial material slowly increasing its shallowness, creating a chaotic environmental condition. The reason behind this sedimentation process also includes automatic closing of the inlet mouth due to littoral drift.

Salinity gradation in the lake ranges from seawater strength to freshwater, due to the influence of both semi-diurnal tides and perennial freshwater inflow from one of the largest rivers in India, the Mahanadi. Salinity is one of the most dominant factors which determine the ecosystem of the lake. However the sediment buildup at the mouth of Chilika and the Palur canal connecting the lake with the ocean had reduced the saline water influx over a time period. Ghosh and Pattanaik, 2005, observed a sharp decline in average salinity in the Lake from ~22.0 to ~2.00 in between 1957-58 to 1995 and according to them, this reduced salinity is due to the reduced inflow of saline water caused by narrowing of the lagoon mouth.



Water Quality Index along the Orrisa coast

The Chilika Development Authority (CDA) has opened a new mouth, by which the salinity gradient in the lake improved to restore the ecosystem. Siltation, declining salinity and nutrient inflows led to extensive macrophyte growth. The lake is characterized by dense macrophyte vegetation in the northern and western bank of the Lake. Macrophytes belonging to Algae, pteridophytes and angiosperms are identified and are further divided into submerged, emergent and floating but also rooted vegetation type. Later improved salinity conditions in the lake resulted in a significant decrease in the coverage of invasive fresh water weeds, with the infested area declining from 523 km2 from October, 2000 to 352 km2 by May 2001 (Ghosh and Pattanaik, 2005).

Topographically Chilika Lake is divided into four natural ecological sectors depending on salinity and depth, as the Northern, Central, Southern sectors and the Outer channel (www.chilika.com). On account of its rich biodiversity, Chilika Lake was designated as a “Ramsar Site” i.e. a wetland of international importance. It is one of the largest wintering grounds for the migratory waterfowl.

Studies on biogeochemical cycling and fluxes of carbon and nitrogen in Chilika Lake revealed for the first time, a strong seasonal and spatial variability associated with the salinity. The lake was studied during both monsoon (July, 2005 and July-August, 2006) and pre-monsoon (May, 2006 and March-April, 2007), in 35 selected locations, including the 11 major rivers and two tidal locations. The lake exchange water with the sea (Bay of Bengal) and several rivers open into it.

The dominance of nitrification is evident during pre-monsoon due to the prevalence of oxygenated conditions in the lake. N_2O concentration was higher by 68 % and NO_3^- by 33%

during pre-monsoon than in monsoon due to coupled nitrification-de-nitrification. Air-water flux of N_2O varied considerably from sink to being an atmospheric source both in time and space. The significant diel variation of nutrients along with O_2, exhibited an apparent coupled nitrification-denitrification phenomenon mostly in presence of macrophytes in the lake. The present study indicates that the Chilka Lake is a N-dominated ecosystem in terms of biological transformation of N species and finally the N_2O fluxes from the lake surface.
Therefore, in order to better predict the future N_2O emissions in the lake, it is crucial to develop a long-term assessment of the biological mechanisms that produce the N_2O and the environmental factors that influences these mechanisms.

Appendix 18: Checklist for Environmental and Social issues

Please note that as part of the GEFs evolving Fiduciary Standards that Implementing Agencies have to meet is the need to address 'Environmental and Social Safeguards'.

To address this requirement UNEP-DGEF has developed this checklist with the following guidance:

1. Initially filled in during concept development to help guide in the identification of possible risks and activities that will need to be included in the project design.
2. A completed checklist should accompany the PIF
3. Check list reviewed during PPG phase and updated as required
4. Final check list submitted with Project Package clearly showing what activities are being undertaken to address issues identified

<table>
<tr><td>Project Title:</td><td colspan="3">Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of Global Nutrient Cycle.</td></tr>
<tr><td>GEF project ID and UNEP ID/IMIS Number</td><td>ADDIS #00593 (GEF ID#4212)</td><td>Version of checklist</td><td>At CEO Endorsement</td></tr>
<tr><td>Project status (preparation, implementation, MTE/MTR, TE)</td><td></td><td>Date of this version:</td><td>24 April 2011</td></tr>
<tr><td>Checklist prepared by (Name, Title, and Institution)</td><td colspan="3">Christopher Tompkins – DEPI – GPA consultant</td></tr>
</table>

In completing the checklist both short- and long-term impact shall be considered.

It is not anticipated that the project outcomes and activities will lead to harmful environmental and social impacts. On the contrary, the project aims to provide tools, measures and mechanisms to governments and other stakeholders, the application of which will lead to an improvement of the environment in which coastal communities in particular live. These improvements are in relation to water quality and strengthening of ecosystems and the services and livelihoods they provide, including fisheries.

The need for the project to address multiple nutrient over-enrichment sources and impacts and promote cost-effective integrated management, including through frameworks such as integrated watershed and coastal management, means that the project embraces the potential for trade-offs (albeit also the potential synergies) to arise between longer term ecosystem well being and perceived more immediate economic and social needs. For example, farmers may be reluctant to change fertilizer practices in up-stream locations, which impact adversely on coastal communities many miles away. Not least when perceived benefits in terms of addressing euthrophication can be 5-10 years in development. Accordingly, there is a strong stakeholder engagement in project design and activities.

Section A: Project location:

If negative impact is identified or anticipated the Comment/Explanation field needs to include: Project stage for addressing the issue; Responsibility for addressing the issue; Budget implications, and other comments.

As the overall project is global in scope, the comments below in this section relate to the main project application area – Manila bay watershed – and to a lesser extent the supplementary application area of Lake Chilika.

	Yes/No/N.A.	*Comment/explanation*
- Is the project area in or close to -		
- densely populated area	Yes	Manila Bay metropolitan area
- cultural heritage site	Yes	As above
- protected area	Yes	In the overall context of the Manila Bay watershed and Lake Chilika basin
- wetland	Yes	As above
- mangrove	Yes	As above
- estuarine	Yes	As above
- buffer zone of protected area	Yes	As above
- special area for protection of biodiversity	Yes	As above
- Will project require temporary or permanent support facilities?	N/A	Regarding the above, the project is designed to assist efforts in conserving wetlands, mangroves, biodiversity etc as part of broader improved water quality improvements. Accordingly, no special arrangements are necessary. Environmental assessments are built into the planning and investment regimes by national and local agencies into which the project application is inserted
If the project is anticipated to impact any of the above areas an Environmental Survey will be needed to determine if the project is in conflict with the protection of the area or if it will cause significant disturbance to the area.		

Section B: Environnemental impacts, i.e.

If negative impact is identified or anticipated the Comment/Explanation field needs to include: Project stage for addressing the issue; Responsibility for addressing the issue; Budget implications, and other comments.

	Yes/No/N.A.	*Comment/explanation*
- Are ecosystems related to project fragile or degraded?	Yes	The project is designed to assist efforts to rehabilitate currently degraded systems in the project application areas described above
- Will project cause any loss of precious ecology, ecological, and economic functions due to construction of infrastructure?	No	
- Will project cause impairment of ecological	No	

opportunities?		
- Will project cause increase in peak and flood flows? (including from temporary or permanent waste waters)	No	
- Will project cause air, soil or water pollution?	No	
- Will project cause soil erosion and siltation?	No	
- Will project cause increased waste production?	No	
- Will project cause Hazardous Waste production?	No	
- Will project cause threat to local ecosystems due to invasive species?	No	
- Will project cause Greenhouse Gas Emissions?	No	
- Other environmental issues, e.g. noise and traffic	No	
Only if it can be carefully justified that any negative impact from the project can be avoided or mitigated satisfactorily both in the short and long-term, can the project go ahead.		

Section C: Social impacts

If negative impact is identified or anticipated the Comment/Explanation field needs to include: Project stage for addressing the issue; Responsibility for addressing the issue; Budget implications, and other comments.

	Yes/No/N.A.	*Comment/explanation*
- Does the project respect internationally proclaimed human rights including dignity, cultural property and uniqueness and rights of indigenous people?	N/A	Regarding Manila Bay and Lake Chilika local people's and indigenous people rights will be secured through national and local arrangements
- Are property rights on resources such as land tenure recognized by the existing laws in affected countries?	Yes	Project works with national and local agencies
- Will the project cause social problems and conflicts related to land tenure and access to resources?	No	The project will aim to assist overall resource management and stakeholder dialogue about resource accessibility.
- Does the project incorporate measures to allow affected stakeholders' information and consultation?	Yes	Both in Manila Bay watershed and Lake Chilika stakeholder consultation and participation are an essential part of the project design and process
- Will the project affect the state of the targeted country's (-ies') institutional context?	Yes	In the sense that the project will strengthen the institutional ability of the project application areas to address pollution and water quality issues as part of overall improved environmental resource management
- Will the project cause change to beneficial uses of land or resources? (incl. loss of downstream beneficial uses (water supply or fisheries)?	No	The project aims to improve downstream use
- Will the project cause technology or land use modification that may change present social and	Yes	Not in terms of land tenure and planned use, but in terms of better application of technologies and

economic activities?		land use practices, e.g. in fertilizer application and recycling of waste
- Will the project cause dislocation or involuntary resettlement of people?	No	
- Will the project cause uncontrolled in-migration (short- and long-term) with opening of roads to areas and possible overloading of social infrastructure?	No	
- Will the project cause increased local or regional unemployment?	No	
- Does the project include measures to avoid forced or child labour?	N/A	
- Does the project include measures to ensure a safe and healthy working environment for workers employed as part of the project?	N/A	
- Will the project cause impairment of recreational opportunities?	No	Project aims to help improve them
- Will the project cause impairment of indigenous people's livelihoods or belief systems?	No	
- Will the project cause disproportionate impact to women or other disadvantaged or vulnerable groups?	No	
- Will the project involve and or be complicit in the alteration, damage or removal of any critical cultural heritage?	No	
- Does the project include measures to avoid corruption?	No	Improved environmental resource management should result
Only if it can be carefully justified that any negative impact from the project can be avoided or mitigated satisfactorily both in the short and long-term, can the project go ahead.		

Section D: Other considerations

If negative impact is identified or anticipated the Comment/Explanation field needs to include: Project stage for addressing the issue; Responsibility for addressing the issue; Budget implications, and other comments.

	Yes/No/N.A.	*Comment/explanation*
- Does national regulation in affected country (-ies) require EIA and/or ESIA for this type of activity?	Yes	In the context of planning and investment in water quality improvements and watershed management to which the project contributes.
- Is there national capacity to ensure a sound implementation of EIA and/or SIA requirements present in affected country (-ies)?	Yes	Project will help strengthen.
- Is the project addressing issues, which are already addressed by other alternative approaches and projects?	No	This said, project will contribute to integrated water and coastal zone management.

- Will the project components generate or contribute to cumulative or long-term environmental or social impacts?	Yes	Essential part of project design linked to IWRM and ICM and improved coastal water quality.
- Is it possible to isolate the impact from this project to monitor E&S impact?	N/A	Part of broader integrated management approaches as outlined above, though costs of tackling nutrient over-enrichment will be clarified.