United Nations Environment Programme

Terminal Evaluation of the UNEP/GEF project GF/1100-99-07 The Role of the Coastal Ocean in the Disturbed and Undisturbed Nutrient and Carbon Cycles

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Contents:

Abbreviations

C	Carbon
CEO	LOICZ-IPO Chief Executive Officer
DEWA	UNEP Division of Early Warning and Assessment
EC	European Commission
EU	European Union
GEF	Global Environment Facility
GEFSEC	GEF Secretariat
GPA	UNEP Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities
Ias	GEF Implementing Agencies
IGBP	International Geosphere-Biosphere Programme
IHDP	International Human Dimensions Programme on Global Environmental Change
IW	GEF International Waters
LME	Large Marine Ecosystems
LOICZ	Land-Ocean Interactions in the Coastal Zone
LOICZ-IPO	LOICZ International Project Office
M&E	Monitoring and Evaluation
MSP	Medium Sized Project
PIR	Project Implementation Report
ProDoc	Project Document
TDA	Transboundary Diagnostic Analysis
ToR	Terms of Reference
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank

Executive Summary

1. This report represents the Terminal Evaluation of the UNEP/GEF Medium Sized Project: The Role of the Coastal Ocean in the Disturbed and Undisturbed Nutrient and Carbon Cycle.

2. The overall goals of the project were:
   - To estimate the impacts of nutrient enrichment on coastal waters;
   - To estimate the changes on regional and global biochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere;
   - To assist governments in assessing the role of their coastal waters as sinks/sources of carbon;
   - To resolve scientific uncertainties concerning the Global Carbon Cycle.

3. The project has given a first global appreciation of disturbed estuarine and coastal systems, including the regional differences in intensity of disturbance and an array of system performance under differential loading. This has implications for the status of natural resources and the probable trends in system function; information that will have impact on thinking for sustainability options and carbon-nitrogen cycling. The final report provides policy recommendations and reflects the implications of changing nutrient fluxes for management. The report also provides an assessment of project outcomes and implications in the context of the GEF Operational Programmes. This Targeted Research Project is still very relevant under GEF-4 Strategic Programme 2: '*Reducing nutrient over-enrichment and oxygen depletion from land-based pollution of coastal waters in LMEs consistent with the GPA'*.

4. The Executing Agency was the LOICZ-IPO (Land Ocean Interactions in the Coastal Zone - International Project Office). The project duration was initially 30 months starting in July 1999. This was revised and extended to be completed in December 2006, making a total duration of 87 months.

5. The main sources of information for this evaluation have been the UNEP Task Manager, the LOICZ-IPO CEO, and literature from the project and the wider LOICZ initiative. A short email questionnaire was distributed to specialists within UNEP and the project to seek wider information.

6. **The project has:**
   - Enabled estimates of nutrient enrichment in coastal waters to be made;
   - Estimated changes in biogeochemical cycling in coastal waters;
   - Using a typology approach (comparing coastal regions of similar types) enabled a relatively small number of coastal budget estimates for nutrients and carbon to be extrapolated to provide regional and global estimations of fluxes;
   - Provided training and tools to enable countries to assess the role of coastal waters as sinks/sources of carbon and contributed to the on-going research to reduce the scientific uncertainties in the global carbon cycle.
   - The sustainability of the UNEP/GEF project has been assured by
     - The LOICZ programme continuing;
     - The results from this UNEP/GEF project (and those of the on-going LOICZ) will continue to be an important resource for GEF IW projects;
     - The work of LOICZ will continue to be applied in the activities of UNEP-DEWA.

7. A possible short-coming of the ProDoc was the failure to include the need for management recommendations to enable mitigation steps to be adopted by governments. At the end of the project the Task Manager and the LOICZ-IPO agreed to hold a final workshop to identify options that led to the production of a final report providing UNEP and the GEF (and their International Waters projects) with recommendations on how to utilise the work of LOICZ.

8. Although this project contained a limited M&E system (as considered by current best practice) the project did self-assess performance against the project objectives with indicators defined in the ProDoc.

9. It is not clear how much use of this project (or the overall LOICZ programme) is being used by governments in reporting carbon information to UNFCCC etc., although there are indications that countries surrounding the North Sea, South Africa and the USA are beginning to adopt the approaches of LOICZ. This is likely to expand further as the work of LOICZ is continued.

Conclusion and Rating

10. The overall rating of this project was **satisfactory.** The following important issues were rated as being **highly successful** with regards to meeting the planned objectives:
    - The project has considerably added to the pool of budget models (170 added) for nutrients and carbon in coastal waters. The project had a focus on sub-tropical and tropical sites where data was previously limited enabling more comprehensive global assessments to be made.
    - The information collected under the UNEP/GEF project is still being utilised by the scientific community involved in the on-going work of LOICZ ensuring that the input of UNEP/GEF is sustained.
    - The project has reached a wide number of scientific experts from government and academic institutes around the world, and presented an agreed methodology for undertaking coastal assessments of nutrients and carbon.
    - The project initiated a role of a 'mentor' to provide regional assistance to the work undertaken by the project and this is still continuing.

Recommendations

11. The following recommendations for GEF and UNEP are made:
    i. The GEF, in co-operation with the IAs, should develop a strategy to ensure that future targeted research projects have a clear vision from the outset on how the GEF and IAs will utilise the work to assist countries or to facilitate the work of other projects on similar issues.

    ii. UNEP and the GEF need to have a mechanism for absorbing key recommendations that arise from projects (this probably applies to all projects not just Target Research Projects).At the end of the project, UNEP requested a final workshop to develop policy and management recommendations. This was a useful addition to the original project design and provided detailed analysis of how GEF policy could utilise the work with improved linkages between policy and science. However whilst this report was completed in 2006 it does not seem to have been integrated in to the development of IW nutrient or carbon programmes within UNEP or the GEF.

    iii. Future projects should explicitly develop a strategy (for subsequent use by GEF / IAs) for how the products of the research can best migrate from the scientific community through to policy change and management actions that can result in mitigation measures. This project did not directly address the use of the scientific understanding in terms of management planning, yet the techniques developed lend themselves to 'what if' scenarios for evaluating pollution reduction actions. (It should be noted that the final report – 'A management perspective' prepared by the project did provide some preliminary suggestions of the next steps to utilise the LOICZ approach for management).

    iv. As a first step to raising awareness on the topic, UNEP should include a detailed summary of the main outputs (in graphical or map format) of the LOICZ work that clearly shows the distribution of global budget model sites, trend information, sinks/sources of carbon and nutrients, etc. This can be largely based on the Final Report of the project and other key publications made by LOICZ.

v. UNEP should develop a mechanism to further propagate the valuable work undertaken by LOICZ for both on-going and future IW projects involved with nutrients and / or carbon budgets in coastal waters. This should be a more comprehensive programme than just publishing a simple brochure and making references to the LOICZ web site. A plan should be developed to assist IW projects utilise the very technical work of LOICZ and to assist the projects with an appreciation of how this science based information can best aid management decision making. It is important that UNEP continue a close relationship with LOICZ to ensure that the on-going work of this global programme can be assimilated and transferred to IW projects, where appropriate utilising the extensive network of experts familiar with the topic within LOICZ. It could be beneficial in this 'awareness' raising to consider a side-event at the next GEF IW Conference focusing on LOICZ. This could be an opportunity to showcase the work undertaken and to explain how the budget models, results of LOICZ in terms of trends, retrospective baseline conditions etc. and the network of experts in LOICZ could assist IW projects addressing coastal issues of for example, nutrients. However prior to this it would essential for UNEP to have in place a mechanism to continue support the requests for information and assistance from IW projects on this issue.

vi. UNEP and GEF should identify means to ensure the results of targeted research projects, and their networks of experts, are integrated into future IW projects addressing similar problems. The current project offers an excellent set of data and assessments that could assist river and coastal projects with, for example TDA baseline evaluations and scenarios resulting in potential future management actions. For example, an important publication by the LOICZ programme, utilising information obtained by the UNEP/GEF project indicates a three-fold increase in coastal nutrients between the 1970s and 1990s. Whilst acknowledging that these estimates were derived in different ways, the paper states there are clear evidence that the increases are 'real' as a result of human activity.

vii. UNEP and GEF require a better mechanism for engaging scientists and policy makers in discussions to ensure that relevant tools are developed to assist management decisions and that tools that are available are understood and applied. Such a mechanism would be valuable in assessing the design of projects and programmes to ensure their relevance to global environment issues.

viii. UNEP should ensure that the recently approved GEF MSP '*Global: Enhancing the use of Science in International Waters Projects to Improve Project Results'* integrates the findings of this evaluation within the project's work programme.

1 Introduction and Background

12. This report represents the Terminal Evaluation of the UNEP/GEF Medium Sized Project (MSP): *The Role of the Coastal Ocean in the Disturbed and Undisturbed Nutrient and Carbon Cycle.*

13. **(i) Project rationale**
The status of coastal aquatic systems is changed by enhanced anthropogenic nutrient inputs. The global extent, and the wider regional and global impacts of these changes is unclear due to the absence of empirical estimates from a sufficiently large and representative set of coastal sites world-wide. Nutrient enrichment of coastal waters has profound effects on biological productivity and the health of the coastal ocean. Algal blooms, anoxia, fish kills, red tides, and pollution are increasingly widespread problems in developing country regions of the world. Changes in the biological systems alter the rates of carbon fixation and respiration in coastal waters resulting in changes to the sink/source status of coastal areas with respect to carbon.

14. The overall goals of the project were:
    - To estimate the impacts of nutrient enrichment on coastal waters;
    - To estimate the changes on regional and global biochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere;
    - To assist governments in assessing the role of their coastal waters as sinks/sources of carbon;
    - To resolve scientific uncertainties concerning the Global Carbon Cycle.

15. The outcomes from this project included:
    - The development of several hundred empirical models of carbon and nutrients in undisturbed and disturbed (polluted) coastal systems that will be of value at the local and national level in assessing the state of eutrophication and carbon source/sink status of the coastal ocean;
    - By using a typological approach information on local budgets were extrapolated to model regional and global estimates of carbon flux required for balancing the global carbon budget and assessing the role of the coastal ocean in the global carbon cycle.

16. This project has given a first global appreciation of disturbed estuarine and coastal systems, including the regional differences in intensity of disturbance and an array of system performance under differential loading. This has implications for the status of natural resources and the probable trends in system function; information that will have impact on thinking for sustainability options and carbon-nitrogen cycling. Importantly a robust model was developed that relates readily measured variables (runoff, land use and population) to coastal loads of dissolved inorganic phosphorus and nitrogen, allowing description and scenario development of the potential impacts of increasing human population on disturbance to coastal ecosystems. The final report provides policy recommendations and reflects the implications of changing nutrient fluxes for management. The report also provides an assessment of project outcomes and implications in the context of the GEF Operational Programmes.

17. **(ii) Relevance to GEF Programmes**
In the GEF Contaminant-Based Operation Programme 10, targeted *'global projects useful in setting priorities for possible GEF interventions*' and '*meeting the technical needs of projects in this focal area*' are among the priority components that characterise the range of projects within this Operational Programme. The Regional/Global Technical Support Component of this GEF Operational Programme states that '*targeted regional or global capacity building projects may be necessary to help increase awareness on how to jointly address these contaminant problems. Global projects in this component can help individual groups of countries to share experience with other areas around the globe and lessons can be derived from the experience.*'

18. This Targeted Research Project is still very relevant under GEF-4 Strategic Programme 2: 'Reducing nutrient over-enrichment and oxygen depletion from land-based pollution of coastal waters in LMEs consistent with the GPA'.

19. The project was one of the first targeted research projects for GEF and to-date only 3 projects of this type have been implemented in International Waters.

20. **(iii) Executing Arrangements**
The Executing Agency is the LOICZ-IPO (Land Ocean Interactions in the Coastal Zone - International Project Office). The LOICZ-IPO, operating through the established biochemical modelling centres of LOICZ located in the University of Stockholm, Sweden and the University of Hawaii, were responsible for coordinating the day-to-day management of the project.

21. The project duration was initially 30 months starting in July 1999, which was revised to be completed in December 2006, making a total duration of 87 months.

22. **(iv) Project Activities**
The project had five components:
    - Continuation of individual and institutional inputs to the LOICZ budgeting website;
    - A first tier of 8 preliminary regional workshops held over a period of 20 months (Central America, Southwest Atlantic, East Africa, West Africa, Northwest Pacific, East Asia, South Asia, Southeast Pacific);
    - Training of regional resource persons in the application of the modelling guidelines;
    - Second tier of more synthetic workshops – by ecosystem and climate type that cross-cut geographic regions and involved the regional leaders;
    - A terminal global workshop would bring together the results of the thematic workshops. Publication and wide dissemination of results via electronic and hard media.

23. Within the activities listed above the project developed 170 budget models for nutrients and carbon in coastal sites around the world.

24. The LOICZ budget models represent the aggregated effect of all the living components of the coastal ecosystem on nutrient fluxes and transformations as net ecosystem metabolism. It is possible to develop more complicated budget models which divide the food web into primary producers, consumers etc. and which represent exchanges and transfers among these components, or in turn divides each of these trophic levels into different functional groups. It is further possible to represent the exchanges and transformations within and between components as dynamic processes, whose magnitude is controlled by the component properties and external environmental variables. The choice among model types and levels of aggregation depends on the intended use. Typically as model complexity increases, the model looks more realistic, but it becomes more difficult to rigorously validate model predictions.

25. The LOICZ Biogeochemical budget modelling methodology provides a relatively simple assessment technique that can be rapidly applied to coastal ecosystems and is based on the

fundamental concept in ecology and geochemistry, the conservation of mass. The budget describes the net outcome of the rate of material delivery into a system (gross inputs) and the rate material leaves a system (outputs). At any given time some of these materials also may be "stored" within the system. However, provided there are not chemical transformations (e.g., denitrification) that effectively remove from the system (sink) or produce them within the system (source), the change in the amount of material stored should always match the difference between the amount arriving into the system (input) and the amount leaving the system (output). LOICZ budgets focus primarily on the inputs, outputs and sources and sinks of dissolved inorganic nutrients, because these are widely measured and can be used to infer information about other important fluxes.

26. Major outcomes elucidated included:
    - The combined controls on nutrient loads and it was shown that both population density and run-off are major anthropogenic drivers of change.
    - That coastal classifications – most notably dissolved inorganic phosphorus and dissolved inorganic nitrogen loads – can be used as flux predictors, and identified the additional data and tools required to fully implement up-scaling approaches.

27. **(v) Budget**
    The final audited accounts indicated that the total budget used by the Executing Agency (LOICZ-IPO) was US$ 1,151,936 with US$ 693,936 funded by the GEF Trust Fund and in-kind co-funding from; University of Stockholm US$175,000, University of Hawaii US$ 75,000, LOICZ-IPO US$ 198,000 and European Union US$ 10,000. The original budget allocated to UNEP for supervision was US$ 40,000. In 2002 approximately USD14,000 that remained in UNEP's budget was allocated to the project's final workshop and the final report for GEF ('A management perspective').

28. **(vi) LOICZ Programme**
    The Land-Ocean Interactions in the Coastal Zone (LOICZ) is a core project of the International Geosphere-Biosphere Programme: A study of global change (IGBP) and the International Human Dimensions Programme on global environmental change (IHDP) of the International Council for Science (ICSU).

29. LOICZ is an international research project involving scientists from across the globe which has been investigating changes in the biology, chemistry and physics of the coastal zone since 1993. After 2003, LOICZ has expanded its areas of research to include social, political and economic sciences in order to address the human dimensions of the coastal zone.

30. The goal of LOICZ is to provide knowledge and understanding of the interactions between global change and local pressures and its implications for the coastal zone. The science of LOICZ has been focused on the measurement of biogeochemical fluxes into, and within, the coastal zone. LOICZ has established a biogeochemical budget modelling approach to provide a common methodology for delivering comparable data on coastal ecosystem loads and net metabolic performance of coastal systems.

31. LOICZ operates as an unbrella organisations for research projects that are affiliated addressing issues of land-ocean interactions in the coastal zone. Since 1993 over 400 projects (including this UNEP/GEF project) developing approaches for the following issues:
    - Methodologies or models that allow data assimilation, processing and synthesis, including up and/or down-scaling
    - Scenarios of change and/or response to change in socio-ecological systems
    - Scientific context for the evaluation of existing policies and structures
    - Globally applicable tools for scientific synthesis, decision support and structure development

- Dissemination interfaces to provide information and assist sustainable coastal development on appropriate scales.

2 Scope, objectives and methods

32. This terminal evaluation has been addressed in accordance with the Terms of Reference (ToR) for this assignment (Annex 1). This report constitutes the combined outcome of interviews / email discussions with key stakeholders including project participants and UNEP staff (Annex 2) and a review of available project literature and correspondences (Annex 3). A short email questionnaire (Annex 4) was distributed to specialists within UNEP and the project to seek wider information. The list of experts was developed in partnership with the UNEP Task Manager and the LOICZ-IPO CEO.

33. The main objectives of this evaluation were:
(i) To address key questions of the project, identified in the ToR as:
Has the project:
    - Assembled estimates of the impacts of nutrient enrichment on coastal waters?
    - Assembled estimates of the changes on regional and global biochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere?
    - Provided regional and global estimates of carbon flux required for balancing the global carbon budget and assessing the role of the coastal ocean in the global carbon cycle?
    - Helped resolve scientific uncertainties concerning the Global Carbon Cycle in the wider scientific community?
    - Helped individual groups of countries to share experience with other areas around the globe and learn lessons derived from the experience?
    - Assisted governments in assessing the role of their coastal waters as sinks/sources of carbon?

    (ii) To establish the impact of the GEF funds by reviewing the potential outcome without these resources;
    (iii) To make recommendations for future activities.

3 Project Performance and Impact

34. At the time the project was contracted the ProDoc formed the basis of the contract. This document, whilst clear in its objectives and programme did not foresee the need for a Project Steering Committee, clear Monitoring and Evaluation (M&E) plans, inception reports, etc. which are now considered to be highly beneficial to the implementation of projects. This does not mean that the project was poorly implemented or failed with regards to project supervision, but that the procedures adopted at the start of the project for these activities have evolved within UNEP and the GEF over the last decade.

3.1 (A) Attainment of objectives and planned results

3.1.1 Summary

35. It is clear from the LOICZ publications (see www.loicz.org) and a number of peer-reviewed scientific papers that the UNEP/GEF project had a considerable benefit to the work of the overall LOICZ programme and has substantively achieved the project objectives. The project also has provided a valuable information base (which the LOICZ programme continues to add to) on nutrients and carbon in coastal waters. This data resource is important to both future GEF projects, UNEP DEWA (for example) and to national efforts to minimise nutrient releases and providing guidance to understanding the important role of coastal waters as sources or sinks of carbon. It would be beneficial to the IW community to create higher awareness of the achievements of the LOICZ and this project through improved publicity of the approach and results on UNEP (plus DGEF and IWLEARN) web sites. In addition this evaluation identified that it would be beneficial to involve the LOICZ programme in the next IW Conference in 2009 to further increase the awareness in the approach and the potential benefits to other IW projects addressing nutrients and / or carbon impacts in coastal waters.

36. In the achievements of the original objectives the following points should be highlighted:

    The project has:

    - Enabled estimates of nutrient enrichment in coastal waters to be made;
    - Estimated changes in biogeochemical cycling in coastal waters;
    - Provided training and tools to enable countries to assess the role of coastal waters as sinks/sources of carbon and contributed to the on-going research to reduce the scientific uncertainties in the global carbon cycle.

37. This evaluation identifies the following points as being highly successful with regards to meeting the planned objectives:

    - The project has considerably added to the pool of budget models (170 added) for nutrients and carbon in coastal waters. The project had a focus on sub-tropical and tropical sites where data was previously limited enabling more comprehensive global assessments to be made.
    - The information collected under the UNEP/GEF project is still being utilised by the scientific community involved in the on-going work of LOICZ ensuring that the input of UNEP/GEF is sustained.
    - The project has reached a wide number of scientific experts from government and academic institutes around the world, and presented an agreed methodology for undertaking coastal assessments of nutrients and carbon.
    - The project initiated a role of a 'mentor' to provide regional assistance to the work undertaken by the project and this is still continuing.

38. However it is not clear how the results of this project (or the overall LOICZ programme) are utilised by national authorities in reporting carbon information to UNFCCC etc., although there

are indications that countries surrounding the North Sea, South Africa and the USA[1] are beginning to adopt the approaches of LOICZ. This is likely to expand further as the work of LOICZ is continued.

39. A possible short-coming of the ProDoc was the failure to include the need for management recommendations to enable mitigation steps to be adopted by governments. At the end of the project the Task Manager and the LOICZ-IPO agreed to hold a final workshop to identify options that led to the production of a final report2 providing UNEP and the GEF (and their IW projects) with some recommendations on how to utilise the work of LOICZ.

3.1.2 Effectiveness

40. The project has met the main objectives and outcomes identified in the ProDoc. The following table indicates the main indicators used in the ProDoc against the achievements reported by the project in interim and final reports.

Indicators (ProDoc logframe)	**Actual Results reported in Project Terminal Report (September 2007)**
Integration of CO_2 source-sink data into countries national reports to the UNFCCC	Too early to assess integration into national reporting but it is happening on the level of global carbon assessments and policy advice deriving from the activities of the Earth System Science Partnership[3]. This work can be assessed as ongoing within the overall LOICZ programme. LOICZ-IPO reported that the tools and methods developed under LOICZ are being utilised in the North Sea, South Africa and the USA.
Use of project outputs in national planning and nutrient reduction	This is occurring in, for example the discussions of the relevance of nutrient fluxes to coastal oceans in UNEP-GPA (following the IGR II Oct. 2006). This reflects the institutional dimensions such as Water Framework Directives (EU) and regional seas planning which draws on methodology and findings of this project (and the wider LOICZ initiatives).
Reduced scientific uncertainty concerning the role carbon cycling in global coastal ocean	An assessment of relative carbon sinks/sources of near coastal seas was completed and peer-review publications released.
Publication of regional and global assessments of the nutrient/carbon status and impacts of enhanced nutrients to coastal waters	9 regional reports and a global assessment completed; additional publications in progress. Nutrient load model developed and applied to regional differentiation of disturbance to coastal systems.
Public availability of at least 100 sub-regional and local carbon and nutrient budgets	Dedicated website maintained including more than 200 main budget site[4] information; hardcopy and CD publications distributed.
Publicly available analyses of impacts of enhanced nutrients on coastal carbon flux	Hardcopy reports/CDs distributed; uploading to LOICZ related websites completed. Peer reviewed literature published and continuously in preparation. In addition a policy and management related synthesis is published and globally distributed.

[1] See LOICZ web site for related activities and extensive publications of applications www.loicz.org
[2] The role of the coastal ocean in the disturbed and undisturbed nutrient and carbon cycles: A management perspective.
www.loicz.org/imperia/md/content/loicz/science/gef-booklet.pdf
[3] www.essp.org parent body of IGBP, IHDP etc.
[4] www.loicz.org

Indicators (ProDoc logframe)	Actual Results reported in Project Terminal Report (September 2007)
Publication of regional/global eutrophication status	9 regional reports and a global assessment completed; additional publications in progress.
Published reports of **8** regional workshops in developing country sub-regions	**9** budget workshops and 4 regional/global assessment workshops plus one policy / management implication workshop held; 8 budget and 2 assessment reports plus one policy / management recommendations report published. LOICZ continues to assist in assessment and analyses in multiple regions.
Training of 6-8 developing country scientists as regional advisors on methods and analyses. .	Advanced training for 10 scientists; 4 acted as regional mentors, 5 acted as national focal points; 1 acted as project analyst. All involved in network building, resource people for training workshops and two extended into postgraduate training (1 PhD and 1 MSc candidature).
Establish a network of trained modelling advisors in developing region	About 180 scientists trained and continue in the network. Additional scientists being trained through adoption of methodologies in University curricula (e.g., South Africa, Philippines, Mexico, Brazil, Russia, Black Sea area). Networks continue to grow through the on-going LOICZ programme
Additional nutrient and data models to website	About 170 models developed in workshops. Additional sites continue to be contributed – in 2006. More than 400 budget models have now been developed by the on-going work of LOICZ.
Publish reports on 3 regional and 1 global assessment	A combined 3-region report and a global report published with supplementary CDs plus a global synthesis volume as part of the LOICZ Synthesis Book[5].

3.1.3 Relevance

41. At the start of the project the work plan was clearly in-line with the GEF OP10 programme (Contaminant programme). The GEF IW has moved to four Strategic Programmes within GEF-4. The project undertaken is still highly relevant and applicable to Strategic Programme 2: Reducing nutrient over-enrichment and oxygen depletion from land-based pollution of coastal waters in LMEs consistent with the GPA. As a targeted research project the outputs (tools, budget models etc.) should be fully integrated into all GEF IW projects involving nutrients and / or coastal carbon budget assessments. However it is disappointing that the outputs and outcomes of this project are not more integrated into the work of the GEF and UNEP (plus other IAs) IW programmes. This is possibly due to an inadequate dissemination programme within UNEP. It would be highly beneficial if UNEP DGEF (or IWLEARN) identify means to bring this important research to the attention of other IW projects. This should be a more comprehensive programme than just publishing a simple brochure and making references to the LOICZ web site. A plan should be developed to assist IW projects utilise the very technical work of LOICZ and to assist the projects with an appreciation of how this science based information can best assist with management decision making.

3.1.4 Efficiency:

42. The use of LOICZ-IPO as the executing agency for this project enabled a very efficient programme to be undertaken by UNEP/GEF. The existing methods, networks of scientists and overall programme of the LOICZ greatly added to the resources provided by GEF. The project

[5] "Coastal Fluxes in the Anthropocene" (Summer 2005) www.loicz.org

attracted additional co-funding in the course of the execution of the project. LOICZ contributed additional resources to support the Polar and the Mediterranean / Black Sea regional workshops (from within LOICZ). In addition, 10 k USD was provided by the European Commission to support a workshop for the project on the Mediterranean / Black Sea to enable the attendance of non-GEF eligible scientists in training of the project tools and methods for estimating nutrient and carbon cycling in coastal waters. A summary of the co-financing provided is given in Annex 6. The provision of GEF resources for this project not only accelerated the production of nutrient budgets from sub-tropical and tropical regions but importantly enabled the participation of GEF eligible scientists at the regional and global workshops.

3.2 (B) Assessment of sustainability of project outcomes

3.2.1 Summary

43. A key advantage that this project has over many other GEF funded projects is the on-going nature of the LOICZ programme. LOICZ was operational prior to the GEF intervention and is continuing post-project. However the LOICZ-IPO and other partners in the programme recognise that the GEF project greatly assisted this global programme by providing the resources for regional budgets to be established, for providing regional training and a network of 'mentors'. These structures are reported by LOICZ-IPO to be continuing in their on-going work.

44. In summary the sustainability of the UNEP/GEF project has been assured by:
    - The LOICZ programme is continuing;
    - The results from this UNEP/GEF project (and those of the on-going LOICZ) will continue to be an important resource for GEF IW projects, **IF** an appropriate means is developed by UNEP to further disseminate the approach and results of LOICZ aimed at assisting with nutrient or carbon management projects;
    - UNEP-DEWA has reported that they currently use methodologies developed by LOICZ (and other programmes) in their assessments of transboundary waters. DEWA consider the LOICZ methods to be particularly useful for a better understanding of lands based sources that affect coastal environments.

45. UNEP should note the following observations that could assist with sustainability of the LOICZ project:
    - LOICZ-IPO initially had contact with UNEP-GPA to further use the developed methodology, but there has not been any contact from UNEP-GPA since 2006 with regards future co-operation
    - GEFSEC expected that more could have been done by UNEP to utilise the results and methods in other International Waters projects. GEFSEC consider that this targeted research is significant to the current discussions on nutrients within GEF-4 and could offer benefits to countries participating in future projects.

3.2.2 Financial resources

46. The project activities are clearly continuing through the on-going work of LOICZ. This can be seen in publications and other reports (e.g. newsletters) on the LOICZ website. The project did attract additional co-funding whilst in progress from the LOICZ partners and the European Commission for additional workshops in the Mediterranean / Black Sea region.

3.2.3 Socio-political

47. This MSP was a targeted research project with global benefits to the understanding of nutrients and carbon budgets in coastal waters. The main stakeholders of this work have been (and are likely to continue to be, due to the very technical nature of the work) scientists drawn from academic and government institutes. The LOICZ programme utilises a wide network of experts, frequent newsletters, and a dynamic website to ensure that the work and its benefits are widely disseminated.

3.2.4 Institutional framework and governance

48. The wide adoption of LOICZ methodology within the scientific community (academic and government institutes) is a technical resource enabling governments to better understand nutrient and carbon budgets within the coastal waters. Whilst the UNEP/GEF project had a relatively short timescale, the on-going LOICZ programme should be seen as offering a sustainable future (by updating tools and expanding the awareness of the approach within scientific communities, etc.). This on-going work will provide technical support to government scientists utilising the LOICZ methodology.

3.2.5 Ecological

49. There have been no identified risks as a result of the project's implementation. The environmental benefits will arise through the better scientific understanding of the coastal process involving nutrients and carbon that could lead to better local and regional management actions to mitigate the impacts.

50. The data sets and models that were developed under the UNEP/GEF project continue to be supplemented through the on-going activities of LOICZ. A strong recommendation to UNEP and to the GEF is that this data resource should be better publicised within the International Waters community and that UNEP should (through for example DEWA or the GPA) identify means to ensure that these assessment approaches are utilised in their routine work of reporting on the environment.

3.3 (C) Catalytic role

51. As a targeted research project the UNEP/GEF intervention has clear benefits to other IW programmes if the results (methods, budgets, etc.) are absorbed by new projects. It could have been reasonably expected that the ProDoc should have contained a concept of how the outputs/outcomes of this targeted research would be utilised within UNEP and the GEF IW community. The work of LOICZ is well documented but to-date there has been little focus on

translating this very technical work into a more comprehensible management directed approach that could aid with the implementation of, for example, mitigation measures for nutrients.

52. Examples of catalytic benefits include:
    - The project began when there were only about 40 models / sites available. The GEF project added 170 models/sites to this and the work has been continuing after the completion of the project adding more data sets and using the data collected by the project. Over 400 budget models now are available at LOICZ. An example of this can be seen in the peer-reviewed scientific publication[6] that clearly demonstrates the increasing desire to understand the processes of eutrophication and acknowledges the support the work received from UNEP/GEF. For example, the publication estimates that the total nutrient load of run-off to the world's coastlines from major rivers has increased three times since the 1970s.
    - Adoption by universities, and EU projects and world-wide research programmes of the tools and methodologies into curricula for fundamental and applied training of regional scholars and scientists. Other follow-on activities have been seen in New Zealand[7], Australia and the EU[8] are making use of the developed tools (biogeochemical assessment, typology approach) in management and scientific synthesis work. Scientists in most global regions are adopting the approach in project design and development, and as research tools. Links to extended catchment information and data includes the human dimensions community to a growing extent.
    - National use of the tools developed in science and coastal management information assessments is leading to additional supportive research and monitoring projects, supported by national and regional funders. UNIDO has engaged with LOICZ in using the approach for a major project proposal for potential implementation in West Africa examining nutrient reduction planning, monitoring and remediation interventions. The EU is interacting with LOICZ on the relevance and implications of fluxes in the implementation of the Water Framework Directive and the Marine Strategy and so is UNEP GPA before and during its Intergovernmental Review II (Oct 2006).

53. Recommendations for future UNEP and GEF programmes include:
    - Targeted research projects should have a clear concept of how the outputs/outcomes can be utilised by GEF, the IAs and the countries in the ProDoc. This should be more than just a 'dissemination plan' but be clear on what information will be provided, how it could be used by the different stakeholders and the benefits from using the results of the research.
    - The project identified a number of lessons of value to UNEP and the GEF applicable to other targeted research projects – specifically the use of regional 'mentors' to assist with training and regional awareness issues, re-engagement of regional participants in subsequent workshops to encourage continuing learning, etc.

3.4 (D) Achievements of outputs and activities

54. It is important to note that LOICZ is continuing to utilise the data collected under the UNEP/GEF project and provided more assessments/estimates of nutrients.

55. The following series of questions were highlighted in the ToR for this evaluation as being key issues to be addressed. The responses to these questions can be summarised as:

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[6] *Humans, Hydrology and he distribution of Inorganic Nutrient Loading to the Ocean*' Smith et. al. BioScience 53, 235, 2003

[7] Reported in LOICZ Newsletters 2007/1, 2008/1 and 2008/2. www.loicz.org

8 For example: EC project daNUbs www. danubs.tuwien.ac.at and EuroCAT www.cs.iia.cnr.it/EUROCAT/project.htm, www.dsa.unipr.it/lagunet, www.elme-eu.org/public/results.aspx and other projects / results on the LOICZ web site www.loicz.org

Has the LOICZ project*:*	Response
Assembled estimates of the impacts of nutrient enrichment on coastal waters?	**YES**: This is documented in a number of LOICZ issued reports, published work[9] and summarised in the Final Report prepared for UNEP.
Assembled estimates of the changes on regional and global biochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere?	**YES**: Models used allowed a baseline to be established and reported as above. During the execution of the UNEP/GEF project the focus was on data gathering. But assessment of change and the context of change is being undertaken by the on-going LOICZ activities (See references above).
Provided regional and global estimates of carbon flux required for balancing the global carbon budget and assessing the role of the coastal ocean in the global carbon cycle?	**YES**: Models and budgets developed covering >170 sites (plus 40 pre-project). The results have been widely published by LOICZ (on www[10] and peer reviewed papers). The work answered issues relating to coastal waters being sources or sinks for carbon.
Helped resolve scientific uncertainties concerning the Global Carbon Cycle in the wider scientific community?	**YES:** See references given above. This work is obviously not complete (as uncertainties still exist, but are being reduced) and is ongoing within the LOICZ community.
Helped individual groups of countries to share experience with other areas around the globe and learn lessons derived from the experience?	**YES:** The project has assisted through 9 regional workshops (8 originally planned) and the training of regional mentors. University teaching courses are including the LOICZ approach in their programmes. Nutrient and carbon budgets developed are included within the Erasmus Mundus[11] programme.
Assisted governments in assessing the role of their coastal waters as sinks/sources of carbon?	**YES**: Tools have been made available to enable assessments to be undertaken. This is again 'work in progress' and efforts within LOICZ to promote this are continuing – see LOICZ Newsletters. To date the approach has been applied in the North Sea, USA, South Africa and the Baltic[12]

[9] Coastal Fluxes in the Anthropocene, The Land-Ocean Interactions in the Coastal Zone Project of the International Geosphere-Biosphere Programme, Crossland C. et. al. 2005, ISBN: 978-3-540-25450-8. Humans, hydrology and the distribution of inorganic nutrient loading to the ocean. Smith, S. et. al. BioScience 53, 235-245

[10] See www.loicz.org report 24 and in LOICZ newsletters

[11] Erasmus Mundus is a co-operation and mobility programme in the field of higher education which promotes the European Union as a worldwide centre of excellence in learning

[12] Managing a sea: the ecological economics of the Baltic. Gren, M. et. al. 2000 ISBN 1853836087
H. Thomas, L.-S. Schiettecatte, K. Suykens, Y. J. M. Koné, E. H. Shadwick, A. E. F. Prowe, Y. Bozec, H. J. W. de Baar, and A. V. Borges Biogeosciences Discuss., 5, 3575-3591, 2008

Thomas, H., Bozec, Y. Elkalay, K., and de Baar, H. J. W.: Enhanced open ocean storage of CO2 from shelf sea pumping, Science, 304, 1005–1008, 2004.

Thomas, H., Bozec, Y., de Baar, H. J. W., Elkalay, K., Frankignoulle, M., Schiettecatte, L.-S.,Kattner, G., and Borges, A. V.: The Carbon budget of the North Sea, Biogeosciences, 2, 30 87–96, 2005a,

Thomas, H., Bozec, Y., Elkalay, K., de Baar, H. J. W., Borges, A. V., and Schiettecatte, L.-S.:Controls of the surface water partial pressure of CO2 in the North Sea, Biogeosciences, 2,323–334, 2005b,

3.5 (E) Assessment of Monitoring and Evaluation Systems

56. Although this project contained a limited M&E system (as considered by current best practice) the project did self-assess performance against the project objectives with indicators defined in the ProDoc. This self assessment performed by LOICZ-IPO was reported in the Terminal Report and the PIR in 2002. A summary of this self-assessment is included in Annex 5.

3.5.1 M&E design

57. The ProDoc presents a logframe which has been used in reporting (PIR 2002 and Terminal Report 2002 and revised in 2006). The ProDoc also identified the University of Hawaii having responsibility for internal quality assurance for project outputs.

3.5.2 M&E plan implementation

58. There was no formal implementation plan for M&E activities other than the use of the indicators in the logframe.

3.5.3 Budgeting and funding for M&E activities

59. There was no formal budget allocated within the Executing Agency (LOICZ-IPO) to M&E activities. UNEP had an initial budget of US$ 40,000 to supervise this project. Approximately US$ 14,000 of this resource was transferred to LOICZ-IPO to implement the final workshop and prepare the final report for GEF.

3.5.4 Long-term monitoring

60. The on-going activities of LOICZ will ensure that the key objectives of this UNEP/GEF intervention will continue to be reported in the LOICZ Newsletter. The use of LOICZ methodologies by DEWA will continue to demonstrate the benefits from this project, however better 'publicity' and awareness raising of the project by UNEP (for both internal and external users) is important.

3.6 (F) Assessment of processes that affected attainment of project results

3.6.1 Preparation and readiness

61. The ProDoc was well developed and the implementation of the project was consistent with the ProDoc. ToRs for activities and key roles under the project were included in the ProDoc. The organisations leading the project (LOICZ-IPO) and the partners contributing co-funding, all had appropriate expertise for implementing this Targeted Research Project.

62. The ProDoc did not foresee the need for a project steering committee and decisions appear to have been left to the executing agency (LOICZ-IPO) and their project partners. There is no evidence that this was a problem to the overall project with the objectives of this project having been met.

63. The management structure responded favourably to requests by the UNEP Task Manager to organise a final workshop and prepare the 'Final Report' (in 2006) in a more user-friendly presentation, when remaining resources were discovered by UNEP's Fund Manager after the formal end of the project in 2002. Although it should be noted that this important activity should have been anticipated by and included in, the ProDoc.

64. With hindsight more resources should have been directed towards identifying / recommending management measures that could address the problems that were highlighted by the project with

regards to nutrients in coastal waters. Towards the end of the project and with remaining budget, the project began a process to address management options and a final workshop held in 2006, supported by a 'Final Report' on the project – 'A Management Perspective' – provide a good start for future guidance. This document also provides valuable recommendations for the GEF on future nutrient and carbon related IW projects.

65. It is also clear with hindsight, that UNEP should have had a strategy of how this important targeted research project would be utilised by other GEF projects and for example, within UNEP (e.g. GPA and DEWA). It is appropriate that UNEP now develop a programme to utilise the knowledge and the network of experts within the planned GEF initiative on nutrients.

3.6.2 Country ownership/drivenness

66. This was a GEF Targeted Research Project, and as such was addressing technical issues of global significance. The outputs of the project (assessments of coastal nutrient and carbon budgets) are of potential benefit to all coastal states.

3.6.3 Stakeholder involvement

67. The project involved a large number of technical stakeholders (typically academic and government scientists) involved in coastal pollution studies. The work undertaken was at a very high technical level, but the information generated has been made available through the LOICZ website to interested stakeholders. The LOICZ programme has made extensive use of outreach such as periodic Newsletters and other publications available on their website – although this information is primarily aimed at a technical audience with a good understanding of the subject. In addition the models, nutrient and carbon budgets and other results of the UNEP/GEF project together with on-going activities under the LOICZ umbrella are also available.

68. The project has undertaken a number of regional and global workshops to assist with both the training of regional experts (mentors) and to wider technical audiences.

3.6.4 Financial planning

69. From the information available there are no questions over the financial management of the project's execution by LOICZ-IPO. In 2002 (the end of the planned project) LOICZ-IPO was subjected to an audit which summarised that:
    - The books of accounts and records have been maintained properly;
    - All project expenditures have been supported by vouchers and adequate documentation; and,
    - Expenditures have been incurred in accordance with the objectives outlined in the project document.

70. In 2002 the LOICZ-IPO reported a surplus of ca. US$ 18 k for return to UNEP. It appears that there were delays in internal financial reporting within UNEP and two years later it was recognised that the remaining funds identified by LOICZ-IPO together with additional resources unspent within UNEP could be utilised resulting in the request to LOICZ-IPO by the Task Manager to organise a final workshop and to prepare the final report. The final workshop and report were completed in 2006 and a summary of the end-of-project finances is presented in Annex 6 of this evaluation.

71. The project benefited from attracting additional co-funding than was originally envisaged. A summary of the co-funding is also presented in Annex 6.

3.6.5 UNEP supervision and backstopping

72. The original design of the project did not include a plan on how UNEP (or GEF) would utilise the completed project or the anticipated on-going activities of LOICZ.

73. The UNEP Task Manager changed in 2002, effectively at the end of the project. This provided an opportunity to review the programme and on identifying remaining resources to plan a final workshop to develop the final 'management perspective' report, that offered specific recommendations relevant to UNEP and the GEF's IW strategy.

74. UNEP's Fund Management Officer discovered remaining budget after the completion of the project in 2002 and the preparation of the terminal report by LOICZ-IPO. This led to an extension of the contract and a request by UNEP to LOICZ-IPO to hold a final workshop and to deliver a final report of greater benefit to the GEF IW community.

75. GEFSEC has commented during this assessment that the work undertaken should have enabled UNEP to take a more proactive role in defining future nutrient (and carbon) related IW programmes and projects. This comment could be avoided in future projects if there is a clear strategy on how the targeted research planned would be used by IAs and GEF projects. It is also important to note that the project prepared a final report (2006) directed at UNEP and GEF policy makers with specific recommendations relevant to the IW programme.

3.6.6 Co-financing and project outcomes & sustainability

76. The project received greater co-funding than was anticipated (US$ 198,000 against US$192,600 planned). This included resources from the LOICZ partners and the European Union. In addition the project outputs assisted with two EU projects (EuroCAT and daNUbs – the latter was of significant benefit to the UNDP/GEF Danube Regional Project).

77. The project execution benefited from the LOICZ being an existing programme when the project began and subsequently will benefit as the programme has continued long after completion. This has assisted with ensuring that the work of the UNEP/GEF intervention is sustained.

3.6.7 Delays and project outcomes & sustainability

78. The project underwent a number of variances regarding the conclusion date.

79. The project was originally planned to be completed in 30 months with an end-date of 31st December 2001 and evolved to be an 87 month project ending in September 2006.
    - **Revision 1**; 30 May 2001: An opportunity was taken for an additional Polar and Africa workshops in September 2002 and August 2002 Both initiatives were in response to increased scientific interest in the regions and expanded the project scope and outcomes.
    - **Revision 2**; 16 January 2002: Data analyses was extended reflecting greater number of budgets than expected. This led to a delay in the assembly and printing of final report.
    - **Revision 3**; June 2005: At the request of UNEP (following the identification of remaining budget within UNEP in 2002) a final workshop and final report with a focus more on policy and management were organised.

4 Conclusions and rating

4.1 Summary

80. This UNEP/GEF MSP Targeted Research Project *The Role of the Coastal Ocean in the Disturbed and Undisturbed Nutrient and Carbon Cycles* has been an important contribution to the understanding of coastal waters. The project has developed a large number of models (budgets) for nutrients and carbon around the world and provided training and other tools for national experts to utilise.

81. UNEP and the GEF have benefited significantly from working with LOICZ – a pre-existing and on-going international programme. This has assured the scientific quality of the process and enabled open discussion and agreement on the approaches adopted between the large number of experts involved in the project.

82. The project has improved the understanding of nutrients and carbon source/sinks in coastal waters by:
    - Developing 170 new models/budgets from global sites (particularly from previously less well studied sites in sub-tropical and tropical regions);
    - Providing training through regional and global workshops on the agreed methodology to over 180 governmental and academic scientists;
    - Developing a mentoring system where four regional experts can help in local developments;
    - Providing an updated web based resource with data, models, budgets and assessments of state.

83. The project did not (and was not designed to) provide usable management decision tools to enable mitigation measures to be readily assessed. This would be a worthy enhancement to the work but, understandably within a Medium Sized Project, this was not possible, especially as the work focussed heavily on the science supporting the environmental assessments. At the end of the project, and at the request of the UNEP Task Manager, LOICZ-IPO were requested to hold a final workshop and to develop a more 'management' focused final report with specific recommendations for UNEP and GEF policy makers. This was achieved through utilising unspent resources within LOICZ-IPO and from the initial US$ 40,000 UNEP management fee.

84. It is likely that much of the scientific data collection and evaluation within this project would have been undertaken by LOICZ without the support of UNEP/GEF. However, this support was seen as essential for involving scientists from GEF eligible countries in the many workshops and training programmes undertaken (and leading to strengthened country capacity) and for using sites for models and budget estimations from developing regions where globally relevant data was scarce.

85. The project outputs and outcomes are sustainable through the on-going work of LOICZ and the data contributed by the UNEP/GEF project is still being utilised resulting in further publications and reports.

86. UNEP-DEWA has reported that LOICZ methodologies are utilised for the assessment of transboundary international waters and improving the understanding of budgets in coastal zone management.

87. However, the project outcomes are at risk of being overlooked within the GEF IW community as this Targeted Research Project did not have a clear vision of how this work would be utilised in other international waters programmes. It is clear that the work undertaken by this project and the on-going work of LOICZ offers important tools and data to IW projects. At the request of the UNEP Task Manager a final workshop and final report were prepared to assist develop

management recommendations and suggestions for policies within the GEF regarding this work. It is disappointing that this relevant work is not 'mainstreamed' into GEF IW projects, for example the UNEP/WB GEF Strategic Partnership for the Mediterranean would be a good opportunity to utilise the LOICZ tools and to further develop them to provide a management support system.

4.2 Evaluation Ratings

	Criterion	Evaluator's Summary Comments	Evaluator's Rating
A	**Attainment of project objectives and results (overall rating) Sub criteria (below)**	The project met the objectives expressed in the ProDoc	**HS**
	Effectiveness	The Project achieved or exceeded the expected outputs	**HS**
	Relevance	This research is still of great relevance and importance to GEF IW projects	**HS**
	Efficiency	The UNEP/GEF project benefited from the existing and on-going activities of LOICZ	**S**
B	**Sustainability of Project outcomes (overall rating) Sub criteria (below)**	The work of the UNEP/GEF intervention is continuing through the LOICZ programme. The networks of experts are still involved and the information gathered still being utilised.	**S**
	Financial	The on-going nature of LOICZ assists with the financial sustainability of the work undertaken by this project	**S**
	Socio Political	As a target research MSP this project was aimed at academic/government scientists	**S**
	Institutional framework and governance	The work is continuing in academic institutes undertaking both research and teaching on nutrients and carbon budgets	**S**
	Ecological	The outputs of the project have a significant **potential** benefit to the understanding of nutrients in coastal waters. **HOWEVER** this benefit will only truly be realised **if** UNEP/GEF provide a mechanism for making the outputs of LOICZ more widely accessible to other IW projects. If **nothing** is done to further exploit this work within GEF IW community then a rating of MS is given. If, as expected, that this work is further enhanced through the new GEF MSP on 'Enhancing the use of science…etc.', then a rating of HS is provided.	**MS-HS**
C	**Catalytic Role**	This work is of potential benefit to a wide number of GEF IW projects but there has been limited attention to developing a strategy to use the methods or results by either UNEP or the GEF	**MS**
D	**Achievement of outputs and activities**	The LOICZ team, through this project, have achieved the expected outputs and undertaken the required activities.	**HS**
E	**Monitoring and Evaluation (overall rating) Sub criteria (below)**	The project M&E programme assessed the performance against the indicators identified in the ProDoc and these were presented in the PIR and the Terminal Report.	**MS**
	M&E Design	Logframe in the ProDoc	**MS**
	M&E Plan	Logframe in the ProDoc	**MS**

	Criterion	Evaluator's Summary Comments	Evaluator's Rating
	Implementation (use for adaptive management)		
	Budgeting and Funding for M&E activities	No information was available on budget for M&E activities within LOICZ-IPO	**MS**
F	**Assessment of processes that affected attainment of project results**	The project was well designed, managed and supervised and has resulted in the successful delivery of much useful information, and a wide network of experts capable of assisting governments develop strategies for mitigating impacts of nutrients and assisting with assessments of carbon sinks/sources in coastal waters.	**S**
	Preparation and readiness	The project was undertaken by an organisation already active in the subject. The ProDoc was well prepared and the project followed this document.	**S**
	Country ownership / driveness	The project is of potential benefit to all coastal countries	**S**
	Stakeholders involvement	High involvement from the targeted stakeholders (scientists form academic and government institutions)	**S**
	Financial planning	The project was undertaken with adequate financial controls	**S**
	UNEP Supervision and backstopping	There appears to have been adequate supervision by UNEP. The ProDoc did not anticipate the benefits of identifying a strategy for UNEP/GEF to utilise this work however the final final report (developed at the instigation of the UNEP Task Manager) did provide some recommendations. Unfortunately these have not yet been followed.	**S**
	Overall Rating		**S**

5 Lessons learned

88. The project identified a number of lessons that were considered to be beneficial to future projects, including:
    - The establishment of a Regional Mentoring structure was considered to be very successful greatly assisting the network development, training and regional growth/awareness of the LOICZ tools and outputs. This also benefited regional regular training modules as a component of academic training and capacity building reaching a growing number of young scientists especially from developing regions.
    - For training workshops the project ensured that the same experts continued to participate from within the network, building on previous experiences. This network approach rather than a "single regional visit of experts" led to a committed, enthusiastic and continually involved cadre of regional scientists. These links have had other successes in developing on-going research and collaborative research actions.
    - The project team recognised the benefit of the final extension that led to the final report providing a 'management perspective' on the work. This was seen as important to achieve a management and policy relevant digest of the project bridging into the human dimensions and decision support.

6 Recommendations

89. The following observations are made as an introduction to the main recommendations.

- Targeted research is an excellent instrument enabling the GEF to assist with improving the science base on globally important issues. In this case, on nutrients and carbon source/sinks in coastal waters providing access to scientists from GEF eligible countries to international expertise, thus strengthening national capacity, and providing a mechanism to collect / analyse data from regions where data is scarce leading to better global understanding of problems.

- This UNEP/GEF MSP developed, through the existing international structure of LOICZ, models, budgets of nutrients and carbon, assessments of loads and networks of experts, etc. information and methods that are of significant importance and relevance to the policy objectives of the current GEF-4 International Waters Strategic Programme 2.

90. The following recommendations are made as a result of this evaluation of the UNEP/GEF Targeted Research Project – 'The role of the coastal ocean in the disturbed and undisturbed nutrient and carbon cycles'.

i. The GEF, in co-operation with the IAs, should develop a strategy to ensure that future targeted research projects have a clear vision from the outset on how the GEF and IAs will utilise the work to assist countries or to facilitate the work of other projects on similar issues.

ii. UNEP and the GEF need to have a mechanism for absorbing key recommendations that arise from projects (this probably applies to all projects not just Target Research Projects).At the end of the project, UNEP requested a final workshop to develop policy and management recommendations. This was a useful addition to the original project design and provided detailed analysis of how GEF policy could utilise the work with improved linkages between policy and science. However whilst this report was completed in 2006 it does not seem to have been integrated in to the development of IW nutrient or carbon programmes within UNEP or the GEF.

iii. Future projects should explicitly develop a strategy (for subsequent use by GEF / IAs) for how the products of the research can best migrate from the scientific community through to policy change and management actions that can result in mitigation measures. This project did not directly address the use of the scientific understanding in terms of management planning, yet the techniques developed lend themselves to 'what if' scenarios for evaluating pollution reduction actions. (It should be noted that the final report – 'A management perspective' prepared by the project did provide some preliminary suggestions of the next steps to utilise the LOICZ approach for management).

iv. As a first step to raising awareness on the topic, UNEP should include a detailed summary of the main outputs (in graphical or map format) of the LOICZ work that clearly shows the distribution of global budget model sites, trend information, sinks/sources of carbon and nutrients, etc. This can be largely based on the Final Report of the project and other key publications made by LOICZ.

v. UNEP should develop a mechanism to further propagate the valuable work undertaken by LOICZ for both on-going and future IW projects involved with nutrients and / or carbon budgets in coastal waters. This should be a more comprehensive programme than just publishing a simple brochure and making references to the LOICZ web site. A plan should be developed to assist IW projects utilise the very technical work of LOICZ and to assist the

projects with an appreciation of how this science based information can best aid management decision making. It is important that UNEP continue a close relationship with LOICZ to ensure that the on-going work of this global programme can be assimilated and transferred to IW projects, where appropriate utilising the extensive network of experts familiar with the topic within LOICZ. It could be beneficial in this 'awareness' raising to consider a side-event at the next GEF IW Conference focusing on LOICZ. This could be an opportunity to showcase the work undertaken and to explain how the budget models, results of LOICZ in terms of trends, retrospective baseline conditions etc. and the network of experts in LOICZ could assist IW projects addressing coastal issues of for example, nutrients. However prior to this it would essential for UNEP to have in place a mechanism to continue support the requests for information and assistance from IW projects on this issue.

vi. UNEP and GEF should identify means to ensure the results of targeted research projects, and their networks of experts, are integrated into future IW projects addressing similar problems. The current project offers an excellent set of data and assessments that could assist river and coastal projects with, for example TDA baseline evaluations and scenarios resulting in potential future management actions. For example, an important publication by the LOICZ programme, utilising information obtained by the UNEP/GEF project indicates a three-fold increase in coastal nutrients between the 1970s and 1990s. Whilst acknowledging that these estimates were derived in different ways, the paper states there are clear evidence that the increases are 'real' as a result of human activity.

vii. UNEP and GEF require a better mechanism for engaging scientists and policy makers in discussions to ensure that relevant tools are developed to assist management decisions and that tools that are available are understood and applied. Such a mechanism would be valuable in assessing the design of projects and programmes to ensure their relevance to global environment issues.

viii. UNEP should ensure that the recently approved GEF MSP '*Global: Enhancing the use of Science in International Waters Projects to Improve Project Results'* integrates the findings of this evaluation within the project's work programme.

Annex 1 Terms of Reference for this evaluation

TERMS OF REFERENCE

Terminal Evaluation of the UNEP GEF project
"The Role of the Coastal Ocean in the Disturbed and Undisturbed Nutrient and Carbon Cycles"
GF/1100-99-07

1. PROJECT BACKGROUND AND OVERVIEW

Project rationale

The status of coastal aquatic systems is changed by enhanced anthropogenic nutrient inputs. The global extent, and the wider regional and global impacts of these changes is unclear, due to the absence of empirical estimates from a sufficiently large and representative set of coastal sites world-wide. Nutrient enrichment of coastal waters has profound effects on biological productivity and the health of the coastal ocean. Algal blooms, anoxia, fish kills, red tides, and pollution are increasingly widespread problems in developing country regions of the world. Changes in the biological systems alter the rates of carbon fixation and respiration in coastal waters resulting in changes to the sink/source status of coastal areas with respect to carbon.

The overall goal of the project was stated as *'to assemble: estimates of the impacts of nutrient enrichment on coastal waters; estimates of the changes on regional and global biochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere; to assist governments in assessing the role of their coastal waters as sinks/sources of carbon; and thus to resolve scientific uncertainties concerning the Global Carbon Cycle.*'

The expected outcomes from this project included:

1. Several hundred empirical models of carbon and nutrients in undisturbed and disturbed (polluted) coastal systems that will be of value at the local and national level in assessing the state of eutrophication and carbon source/sink status of the coastal ocean;
2. Upscaling, using model derived empirical data as surrogate information, will provide regional and global estimates of carbon flux required for balancing the global carbon budget and assessing the role of the coastal ocean in the global carbon cycle.

Relevance to GEF Programmes

In the GEF Contaminant-Based Operation Programme 10, targeted '*global projects useful in setting priorities for possible GEF interventions*' and '*meeting the technical needs of projects in this focal area*' are among the priority components that characterise the range of projects within this Operational Programme. The Regional/Global Technical Support Component of this GEF Operational Programme states that '*targeted regional or global capacity building projects may be necessary to help increase awareness on how to jointly address these contaminant problems. Global projects in this component can help individual groups of countries to share experience with other areas around the globe and lessons can be derived from the experience.*'

Executing Arrangements

The Executing Agency is the LOICZ-IPO (Land Ocean Interactions in the Coastal Zone - International Project Office). The LOICZ-IPO, operating through the established biochemical modelling centres of LOICZ located in the University of Stockholm, Sweden and the University of Hawaii, was responsible for coordinating the day-to-day management of the project. The project was expected to be completed within 30 months after its approval by UNEP.

Project Activities

The project duration was initially 30 months starting July 1999, which was later revised and extended to be completed in December 2006, making a total duration of 90 months.

The project had five components:

1) Continuation of individual and institutional inputs to the LOICZ budgeting website;
2) A first tier of 8 preliminary regional workshops held over a period of 20 months (Central America, Southwest Atlantic, East Africa, West Africa, Northwest Pacific, East Asia, South Asia, Southeast Pacific);
3) Training of regional resource persons in the application of the modelling guidelines;
4) Second tier of more synthetic workshops – by ecosystem and climate type that cross-cut geographic regions and involved the regional leaders;
5) A terminal global workshop would bring together the results of the thematic workshops. Publication and wide dissemination of results via electronic and hard media.

Budget

The total budget was US$ 1,162,600 with US$ 720,000 funded by the GEF Trust Fund and in-kind co-funding from; University of Stockholm US$175,000, University of Hawaii US$ 75,000, LOICZ-IPO US$ 192,600.

TERMS OF REFERENCE FOR THE EVALUATION

1. Objective and Scope of the Evaluation

The objective of this terminal evaluation is to determine the extent to which the project objectives were achieved, or are expected to be achieved, and assess if the project has led to any other positive or negative consequences. If possible the extent and magnitude of any project impacts to date will be documented and the likelihood of future impacts will be determined. The evaluation will also assess project performance and the implementation of planned project activities and planned outputs against actual results. The evaluation will focus on the following main questions:

Has the LOICZ project*:*

- *assembled estimates of the impacts of nutrient enrichment on coastal waters?*
- *assembled estimates of the changes on regional and global biochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere?*
- *provided regional and global estimates of carbon flux required for balancing the global carbon budget and assessing the role of the coastal ocean in the global carbon cycle?*
- *helped resolve scientific uncertainties concerning the Global Carbon Cycle in the wider scientific community?*
- *helped individual groups of countries to share experience with other areas around the globe and learn lessons derived from the experience?*
- *assisted governments in assessing the role of their coastal waters as sinks/sources of carbon?*

2. Methods

This terminal evaluation will be conducted as an in-depth evaluation using a participatory approach whereby the UNEP/DGEF Task Manager, key representatives of the executing agencies and other relevant staff are kept informed and regularly consulted throughout the evaluation. The consultant will liaise with the UNEP/EOU and the UNEP/DGEF Task Manager on any logistic and/or methodological issues to properly conduct the review in as independent a way as possible, given the circumstances and resources offered. The draft report will be circulated to UNEP/DGEF Task Manager, key representatives of the executing agencies and the UNEP/EOU. Any comments or responses to the draft report will be sent to UNEP / EOU for collation and the consultant will be advised of any necessary revisions.

The findings of the evaluation will be based on the following:

1. A desk review of project documents including, but not limited to:
   (a) The project documents, outputs, monitoring reports (such as progress and financial reports to UNEP and GEF annual Project Implementation Review reports) and relevant correspondence.
   (b) Notes from the Steering Group meetings.
   (c) Other LOICZ-related material produced by the project staff or partners.
   (d) Relevant material published on the project web-site: www.loicz.org.

2. Interviews with project management and technical support including the current LOICZ team based in Germany, the former Project Coordinator at the LOICZ (Chris Crossland, Brisbane Australia) and key actors involved in the regional workshops.

The list of possible interviewees includes: Robert W Buddemeier, Kansas Geological Survey, University of Kansas, USA; Laura T. David, Marine Science Institute, University of the Philippines, Philippines; John Parslow, Commonwealth Scientific and Industrial Research Organisation, Marine & Atmosphere Research, Australia; Stephen V Smith, Geology Department, Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, Mexico; Dennis Swaney, Department of Ecology & Evolutionary Biology, Cornell University, USA; Nalin Wikramanayake, Dept of Civil Engineering, Open University of Sri Lanka, Sri Lanka; Fredrik Wulff, Department of Systems Ecology, Stockholm University, Sweden.

3. Interviews and Telephone interviews with intended users for the project outputs and other stakeholders involved with this project, including in the participating countries and international bodies. The Consultant shall determine whether to seek additional information and opinions from representatives of donor agencies and other organisations. As appropriate, these interviews could be combined with an email questionnaire.

4. Interviews with the UNEP/DGEF project task manager and Fund Management Officer, and other relevant staff in UNEP dealing with International-Waters related activities as necessary. The Consultant shall also gain broader perspectives from discussions with relevant GEF Secretariat staff.

Key Evaluation principles.
In attempting to evaluate any outcomes and impacts that the project may have achieved, evaluators should remember that the project's performance should be assessed by considering the difference between the answers to two simple questions ***"what happened?***" and ***"what would have happened anyway?"***. These questions imply that there should be consideration of the baseline conditions and trends in relation to the intended project outcomes and impacts. In addition it implies that there should be plausible evidence to attribute such outcomes and impacts to the actions of the project.

Sometimes, adequate information on baseline conditions and trends is lacking. In such cases this should be clearly highlighted by the evaluator, along with any simplifying assumptions that were taken to enable the evaluator to make informed judgements about project performance.

3. Project Evaluation Parameters

A. Attainment of objectives and planned results:

The assessment of project results seeks to determine the extent to which the project objectives were achieved, or are expected to be achieved, and assess if the project has led to any other positive or negative consequences. While assessing a project's outcomes the evaluation will seek to determine the extent of achievement and shortcomings in reaching the project's objectives as stated in the project document and also indicate if there were any changes and whether those changes were approved. If the project did not establish a baseline (initial conditions), the evaluator should seek to estimate the baseline condition so that achievements and results can be properly established. Since most GEF projects can be expected to achieve the anticipated outcomes by project closing, assessment of project outcomes should be a priority.

Outcomes are the likely or achieved short-term and medium-term effects of an intervention's outputs. Examples of outcomes could include but are not restricted to stronger institutional capacities, higher public awareness (when leading to changes of behaviour), and transformed policy frameworks or markets. The evaluation should assess the extent to which the project's major relevant objectives were effectively and efficiently achieved or are expected to be achieved and their relevance.

- *Effectiveness:* Evaluate how, and to what extent, the stated project objectives have been met, taking into account the "achievement indicators" specified in the project document and logical framework[13]. In particular, the analysis of outcomes achieved should include, *inter alia*, an assessment of whether and to what extent the results of this project have informed national, regional or international processes such as greenhouse gas inventories, the IPCC or others.
- *Relevance:* In retrospect, were the project's outcomes consistent with the focal areas/operational program strategies and country priorities? The evaluation should also assess the whether outcomes specified in the project document and or logical framework are actually outcomes and not outputs or inputs. Ascertain the nature and significance of the contribution of the project outcomes to the wider portfolio of GEF Contaminant-Based Operation Programme 10.
- *Efficiency:* Cost-effectiveness assesses the achievement of the environmental and developmental objectives as well as the project's outputs in relation to the inputs, costs, and implementing time. Include an assessment of outcomes in relation to inputs, costs, and implementation times based on the following questions: Was the project cost-effective? Was the project the least cost option? Was the project implementation delayed and if it was then did that affect cost-effectiveness? The evaluation should assess the contribution of cash and in-kind co-financing to project implementation and to what extent the project leveraged additional resources. Wherever possible the evaluation should also compare the cost-time vs. outcomes relationship of the project with that of other similar projects.

Specifically the evaluation shall:

- Evaluate the outcomes of the project with regard to assisting governments to assess the role of their coastal waters as sinks/sources of carbon.

B. Assessment of Sustainability of project outcomes:

Sustainability is understood as the probability of continued long-term project-derived outcomes and impacts after the GEF project funding ends. The evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits after the project ends. Some of these factors might be outcomes of the project, e.g. stronger institutional capacities or better informed decision-making. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes. The evaluation

[13] In case in the original or modified expected outcomes are merely outputs/inputs then the evaluators should assess if there were any real outcomes of the project and if yes then whether these are commensurate with the realistic expectations from such projects.

should ascertain to what extent follow-up work has been initiated and how project outcomes will be sustained and enhanced over time. In this case, sustainability will be linked to the continued use and influence of scientific models and scientific findings, produced by the project.

Four aspects of sustainability should be addressed: financial, socio-political, institutional frameworks and governance, and ecological (if applicable) The following questions provide guidance on the assessment of these aspects:

- *Financial resources.* To what extent are the outcomes of the project dependent on continued financial support? What is the likelihood that any required financial resources will be available to sustain the project outcomes/benefits once the GEF assistance ends (resources can be from multiple sources, such as the public and private sectors, income generating activities, and market trends that support the project's objectives)? Was the project was successful in identifying and leveraging co-financing?
- *Socio-political:* To what extent are the outcomes of the project dependent on socio-political factors? What is the likelihood that the level of stakeholder ownership will allow for the project outcomes/benefits to be sustained? Is there sufficient public / stakeholder awareness in support of the long term objectives of the project?
- *Institutional framework and governance.* To what extent are the outcomes of the project dependent on issues relating to institutional frameworks and governance? What is the likelihood that institutional and technical achievements, legal frameworks, policies and governance structures and processes will allow for, the project outcomes/benefits to be sustained? While responding to these questions consider if the required systems for accountability and transparency and the required technical know-how are in place.
- *Ecological.* Are there any environmental risks that can undermine the future flow of project environmental benefits? The TE should assess whether certain activities in the project area will pose a threat to the sustainability of the project outcomes. For example, construction of dam in a protected area could inundate a sizable area and thereby neutralizing the biodiversity related gains made by the project.

As far as possible, also assess the potential longer-term impacts considering that the evaluation is taking place upon completion of the project and that longer term impact is expected to be seen in a few years time. Frame any recommendations to enhance future project impact in this context. Which will be the major 'channels' for longer term impact from the project at the national and international scales? The evaluation should formulate recommendations that outline possible approaches and necessary actions to facilitate an impact assessment study in a few years time.

C. Catalytic role

The terminal evaluation will also describe any catalytic or replication effect of the project. What examples are there of replication and catalytic outcomes that suggest increased likelihood of sustainability? Replication approach, in the context of GEF projects, is defined as lessons and experiences coming out of the project that are replicated or scaled up in the design and implementation of other projects. Replication can have two aspects, replication proper (lessons

and experiences are replicated in different geographic area) or scaling up (lessons and experiences are replicated within the same geographic area but funded by other sources). If no effects are identified, the evaluation will describe the catalytic or replication actions that the project carried out. No ratings are requested for the catalytic role.

D. Achievement of outputs and activities:

- Delivered outputs: Assessment of the project's success in producing each of the programmed outputs, both in quantity and quality as well as usefulness and timeliness.
- Assess the soundness and effectiveness of the methodologies used for developing regional and global estimates of nutrients and carbon flux required for balancing the global carbon budget and assessing the role of the coastal ocean in the global carbon cycle.
- Assess to what extent the project outputs produced have the weight of scientific authority / credibility, necessary to influence policy and decision-makers, particularly at the national or regional levels.

E. Assessment of Monitoring and Evaluation Systems:

- **M&E design.** Did the project have a sound M&E plan to monitor results and track progress towards achieving project objectives? The Terminal Evaluation will assess whether the project met the minimum requirements for project design of M&E and the application of the Project M&E plan (Minimum requirements are specified in Annex 4). The evaluation shall include an assessment of the quality, application and effectiveness of project monitoring and evaluation plans and tools, including an assessment of risk management based on the assumptions and risks identified in the project document. The M&E plan should include a baseline (including data, methodology, etc.), SMART (see Annex 4) indicators and data analysis systems, and evaluation studies at specific times to assess results. The time frame for various M&E activities and standards for outputs should have been specified.
- **M&E plan implementation.** Was an M&E system in place and did it facilitate tracking of results and progress towards projects objectives throughout the project implementation period. Were Annual project reports complete, accurate and with well justified ratings? Was the information provided by the M&E system used during the project to improve project performance and to adapt to changing needs? Did the Projects have an M&E system in place with proper training for parties responsible for M&E activities to ensure data will continue to be collected and used after project closure?
- **Budgeting and Funding for M&E activities.** Were adequate budget provisions made for M&E made and were such resources made available in a timely fashion during implementation? GEF projects must budget adequately for execution of the M&E plan, and provide adequate resources for during implementation of the M&E plan.
- **Long-term Monitoring.** M&E of long-term changes is often incorporated in GEF-supported projects as a separate component and it may include determination of environmental baselines, specification of indicators, provisioning of equipment and capacity building for data gathering, analysis and use. This section of the TE will describe the actions and

accomplishments of the project in the establishment of a long term monitoring system. The review will address the following questions: Did the project contribute to the establishment of a long term monitoring system? If it did not, should the project have included such a component? What were the accomplishments and short comings in establishment of the system? Is the system sustainable, i.e. is it imbedded in a proper institutional structure and has financing? Is the information being generated by this M&E system being used as originally intended?

F. Assessment of processes that affected attainment of project results.

The evaluation will consider, but need not be limited to, consideration of the following issues that may have affected project implementation and attainment of project results:

i. **Preparation and readiness.** Were the project's objectives and components clear, practicable and feasible within its timeframe? Were capacities of the executing institutions and counterparts properly considered when the project was designed? Were lessons from other relevant projects properly incorporated in design? Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to implementation? Was availability of counterpart resources (funding, staff, and facilities), passage of enabling legislation, and adequate project management arrangements in place at project entry?

- Ascertain to what extent the project implementation mechanisms outlined in the project document have been closely followed. In particular, assess the role of the various committees established and whether the project document was clear and realistic to enable effective and efficient implementation, whether the project was executed according to the plan and how well the management was able to adapt to changes during the life of the project to enable the implementation of the project.
- Evaluate the effectiveness and efficiency and adaptability of project management and the supervision of project activities / project execution arrangements at all levels (1) policy decisions: Steering Group; (2) day to day project management: LOICZ-IPO; (3) GEF guidance: UNEP DGEF

ii. **Country ownership/Drivenness.** This is the relevance of the project to national development and environmental agendas, recipient country commitment, and regional and international agreements. Examples of possible evaluative questions include: Was the project design in-line with the national sectoral and development priorities and plans? Are project outcomes contributing to national development priorities and plans? Were the relevant country representatives, from government and civil society, involved in the project? Did the recipient government maintain its financial commitment to the project? Have the government approved policies or regulatory frameworks been in-line with the project's objectives? Specifically the evaluation will:

- Assess the level of country ownership, and whether the project was effective in providing and communicating information and tools that assisted governments in assessing the role of their coastal waters as sinks/sources of carbon.
- Assess the level of country commitment to the use of estimates of the changes of regional and global biochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere for decision-

making during and after the project, including in regional and international fora.

iii. **Stakeholder involvement.** Did the project involve the relevant stakeholders through information sharing, consultation and by seeking their participation in project's design, implementation, and monitoring and evaluation? For example, did the project implement appropriate outreach and public awareness campaigns? Did the project consult and make use of the skills, experience and knowledge of the appropriate government entities, NGOs, community groups, private sector, local governments and academic institutions in the design, implementation and evaluation of project activities? Were perspectives of those that would be affected by decisions, those that could affect the outcomes and those that could contribute information or other resources to the process taken into account while taking decisions? Were the relevant vulnerable groups and the powerful, the supporters and the opponents, of the processes properly involved? Specifically the evaluation will:

- Assess the mechanisms put in place by the project for identification and engagement of stakeholders in each participating country and establish, in consultation with the stakeholders, whether this mechanism was successful, and identify its strengths and weaknesses.
- Assess the degree and effectiveness of collaboration/interactions between the various project partners and institutions during the course of implementation of the project.
- Assess the degree and effectiveness of any various public awareness activities that were undertaken during the course of implementation of the project.

iv. **Financial planning.** Did the project have the appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds. Specifically, the evaluation should:

- Assess the strength and utility of financial controls, including reporting, and planning to allow the project management to make informed decisions regarding the budget and allow for a proper and timely flow of funds for the payment of satisfactory project deliverables throughout the project's lifetime.
- Present the major findings from the financial audit if one has been conducted.
- Did promised co-financing materialize? Identify and verify the sources of co- financing as well as leveraged and associated financing (in co-operation with the IA and EA).
- Assess whether the project has applied appropriate standards of due diligence in the management of funds and financial audits.
- The evaluation should also include a breakdown of final actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co- financing. This information will be prepared by the relevant DGEF Fund Management Officer of the project for scrutiny by the evaluator (table attached in Annex 1 Co-financing and leveraged resources).

v. **UNEP Supervision and backstopping.** Did UNEP Agency staff identify problems in a timely fashion and accurately estimate its seriousness? Did

UNEP staff provide quality support and advice to the project, approved modifications in time and restructure the project when needed? Did UNEP and Executing Agencies provide the right staffing levels, continuity, skill mix, frequency of field visits?

vi. **Co-financing and Project Outcomes & Sustainability.** If there was a difference in the level of expected co-financing and actual co-financing, then what were the reasons for this? Did the extent of materialization of co-financing affect the project's outcomes and/or sustainability, and if it did affect outcomes and sustainability then in what ways and through what causal linkages?

vii. **Delays and Project Outcomes & Sustainability.** If there were delays in project implementation and completion, the evaluation will summarise the reasons for them. Did delays affect the project's outcomes and/or sustainability, and if so in what ways and through what causal linkages?

The ***ratings will be presented in the form of a table*** with each of the categories rated separately and with **brief justifications for the rating** based on the findings of the main analysis. An overall rating for the project should also be given. The rating system to be applied is specified in Annex 1:

4. Evaluation report format and review procedures

The report should be brief, to the point and easy to understand. It must explain; the purpose of the evaluation, exactly what was evaluated and the methods used. The report must highlight any methodological limitations, identify key concerns and present evidence-based findings, consequent conclusions, recommendations and lessons. The report should provide information on when the evaluation took place, the places visited, who was involved and be presented in a way that makes the information accessible and comprehensible. The report should include an executive summary that encapsulates the essence of the information contained in the report to facilitate dissemination and distillation of lessons.

Evidence, findings, conclusions and recommendations should be presented in a complete and balanced manner. The evaluation report shall be written in English, be of no more than 50 pages (excluding annexes), use numbered paragraphs and include:

i) An **executive summary** (no more than 3 pages) providing a brief overview of the main conclusions and recommendations of the evaluation;

ii) **Introduction and background** giving a brief overview of the evaluated project, for example, the objective and status of activities;

iii) **Scope, objective and methods** presenting the evaluation's purpose, the evaluation criteria used and questions to be addressed;

iv) **Project Performance and Impact** providing factual evidence relevant to the questions asked by the evaluator and interpretations of such evidence. This is the main substantive section of the report and should provide a commentary on all evaluation aspects (A − F above).

v) **Conclusions and rating** of project implementation success giving the evaluator's concluding assessments and ratings of the project against given evaluation criteria and standards of performance. The conclusions should provide answers to questions about whether the project is considered good or bad, and whether the results are considered positive or negative;

vi) **Lessons learned** presenting general conclusions from the standpoint of the design and implementation of the project, based on good practices and successes or problems and mistakes. Lessons should have the potential for wider application and use. All lessons should 'stand alone and should:
   - Specify the context from which they are derived
   - State or imply some prescriptive action;
   - Specify the contexts in which they may be applied (if possible who when and where)

vii) **Recommendations** suggesting *actionable* proposals regarding improvements of the current project. They may cover, for example, resource allocation, financing, planning, implementation, and monitoring and evaluation. Recommendations should always be specific in terms of who would do what, provide a timeframe, and a measurable performance target. In general, Terminal Evaluations are likely to have very few (only two or three) actionable recommendations;

viii) **Annexes** include Terms of Reference, list of interviewees, documents reviewed, brief summary of the expertise of the evaluator / evaluation team, a summary of co-finance information etc.. Dissident views or management responses to the evaluation findings may later be appended in an annex.

Examples of UNEP GEF Terminal Evaluation Reports are available at www.unep.org/eou

Review of the Draft Evaluation Report

Draft reports submitted to UNEP EOU are shared with the corresponding Programme or Project Officer and his or her supervisor for initial review and consultation. The DGEF staff and senior Executing Agency staff are allowed to comment on the draft evaluation report. They may provide feedback on any errors of fact and may highlight the significance of such errors in any conclusions. The consultation also seeks agreement on the findings and recommendations. UNEP EOU collates the review comments and provides them to the evaluators for their consideration in preparing the final version of the report.

All UNEP GEF Evaluation Reports are subject to quality assessments by UNEP EOU. These incorporate GEF Office of Evaluation quality assessment criteria and are used as a tool for providing structured feedback to the evaluator (see Annex 3).

5. Submission of Final Terminal Evaluation Reports.

The final report shall be submitted in electronic form in MS Word format and should be sent to the following persons:

Segbedzi Norgbey, Chief, Evaluation and Oversight Unit
UNEP, P.O. Box 30552-00100
Nairobi, Kenya
Tel.: (254-20) 7624181
Fax: (254-20) 7623158
Email: segbedzi.norgbey@unep.org

With a copy to:

Maryam Niamir-Fuller
Director

UNEP/Division of GEF Coordination
P.O. Box 30552-00100
Nairobi, Kenya
Tel: + 254-20-7624686
Fax: + 254-20-623158/4042
Email: maryam.niamir-fuller@unep.org

Isabelle Vanderbeck
Task Manager GEF Projects in Latin America and the Caribbean
1889 F Street, N.W.
Washington, D.C. 20006
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Tel: +1-202-458-3772
Fax: +1-202-458-3560
Email: isabelle.vanderbeck@unep.org or UNEPRep@oas.org

Takehiro Nakamura
UNEP/GEF SPO International Waters
United Nations Environment Programme (UNEP)
Division of GEF Coordination (DGEF)
PO Box 30552-00100
Nairobi, Kenya
Tel: 254 20 7623886
Fax: 254 20 7624041
Email: takehiro.nakamura@unep.org

The final evaluation report will be printed in hard copy and published on the Evaluation and Oversight Unit's web-site www.unep.org/eou. Subsequently, the report will be sent to the GEF Office of Evaluation for their review, appraisal and inclusion on the GEF website. In addition the final Evaluation report will disseminated to: The relevant GEF Focal points, Relevant Government representatives, UNEP DGEF Professional Staff, The project's Executing Agency and Technical Staff. The full list of intended recipients is attached in Annex 5.

6. Resources and schedule of the evaluation

This terminal evaluation will be undertaken by an international evaluator contracted by the Evaluation and Oversight Unit, UNEP. The contract for the evaluator will begin on 9th June 2008 and end on 24th August 2008 (27days) spread over 11 weeks (8 days of travel, to Washington, Germany). The evaluator will submit a draft report on 14th July 2008 to UNEP/EOU, the UNEP/DGEF Task Manager, and key representatives of the executing agencies. Any comments or responses to the draft report will be sent to UNEP / EOU for collation and the consultant will be advised of any necessary revisions. Comments to the final draft report will be sent to the consultant by 4th August 2008 after which, the consultant will submit the final report no later than 22nd August 2008.

The evaluator will have an initial telephone briefing with EOU and UNEP/GEF then travel to meet with project staff.
In accordance with UNEP/GEF policy, all GEF projects are evaluated by independent evaluators contracted as consultants by the EOU. The evaluators should have the following qualifications:

The evaluator should not have been associated with the design and implementation of the project. The evaluator will work under the overall supervision of the Chief, Evaluation and Oversight Unit, UNEP. The evaluator should be an international expert in marine science with a sound understanding of biogeochemistry. The consultant should have the following minimum qualifications: (i) experience in biogeochemical budgets in coastal seas modeling and assessments; (ii) experience with management and implementation of research projects and in particular with policy-related monitoring and assessments that generate knowledge and information relevant to decision-making; (iii) experience with project evaluation. Knowledge of UNEP programmes and GEF activities is desirable. Fluency in oral and written English is a must.

7. Schedule Of Payment

Lump-Sum Option
The evaluator will receive an initial payment of 30% of the total amount due upon signature of the contract. A further 30% will be paid upon submission of the draft report. A final payment of 40% will be made upon satisfactory completion of work. The fee is payable under the individual Special Service Agreement (SSA) of the evaluator and is **inclusive** of all expenses such as travel, accommodation and incidental expenses.

The consultant's choice of payment option will be specified in the signed contract with UNEP.

In case, the evaluator cannot provide the products in accordance with the TORs, the timeframe agreed, or his products are substandard, the payment to the evaluator could be withheld, until such a time the products are modified to meet UNEP's standard. In case the evaluator fails to submit a satisfactory final product to UNEP, the product prepared by the evaluator may not constitute the evaluation report.

Annex 1. OVERALL RATINGS TABLE

Criterion	Evaluator's Summary Comments	Evaluator's Rating
Attainment of project objectives and results (overall rating) **Sub criteria (below)**		
Effectiveness		
Relevance		
Efficiency		
Sustainability of Project outcomes (overall rating) **Sub criteria (below)**		
Financial		
Socio Political		
Institutional framework and governance		
Ecological		
Achievement of outputs and activities		
Monitoring and Evaluation (overall rating) **Sub criteria (below)**		
M&E Design		
M&E Plan Implementation (use for adaptive management)		
Budgeting and Funding for M&E activities		
Catalytic Role		
Preparation and readiness		
Country ownership / driveness		
Stakeholders involvement		
Financial planning		
UNEP Supervision and backstopping		
Overall Rating		

RATING OF PROJECT OBJECTIVES AND RESULTS

Highly Satisfactory (HS): The project had no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Satisfactory (S): The project had minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Moderately Satisfactory (MS): The project had moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Moderately Unsatisfactory (MU): The project had significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Unsatisfactory (U) The project had major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Highly Unsatisfactory (HU): The project had severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Please note: Relevance and effectiveness will be considered as critical criteria. The overall rating of the project for achievement of objectives and results **may not be higher** than the lowest rating on

either of these two criteria. Thus, to have an overall satisfactory rating for outcomes a project must have at least satisfactory ratings on both relevance and effectiveness.

RATINGS ON SUSTAINABILITY

A. Sustainability will be understood as the probability of continued long-term outcomes and impacts after the GEF project funding ends. The Terminal evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits after the project ends. Some of these factors might be outcomes of the project, i.e. stronger institutional capacities, legal frameworks, socio-economic incentives /or public awareness. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes..

Rating system for sustainability sub-criteria

On each of the dimensions of sustainability of the project outcomes will be rated as follows.

Likely (L): There are no risks affecting this dimension of sustainability.

Moderately Likely (ML). There are moderate risks that affect this dimension of sustainability.

Moderately Unlikely (MU): There are significant risks that affect this dimension of sustainability

Unlikely (U): There are severe risks that affect this dimension of sustainability.

All the risk dimensions of sustainability are critical. Therefore, overall rating for sustainability will not be higher than the rating of the dimension with lowest ratings. For example, if a project has an Unlikely rating in either of the dimensions then its overall rating cannot be higher than Unlikely, regardless of whether higher ratings in other dimensions of sustainability produce a higher average.

RATINGS OF PROJECT M&E

Monitoring is a continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing project with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds. Evaluation is the systematic and objective assessment of an on-going or completed project, its design, implementation and results. Project evaluation may involve the definition of appropriate standards, the examination of performance against those standards, and an assessment of actual and expected results.

The Project monitoring and evaluation system will be rated on 'M&E Design', 'M&E Plan Implementation' and 'Budgeting and Funding for M&E activities' as follows:

Highly Satisfactory (HS): There were no shortcomings in the project M&E system.

Satisfactory(S): There were minor shortcomings in the project M&E system.

Moderately Satisfactory (MS): There were moderate shortcomings in the project M&E system.

Moderately Unsatisfactory (MU): There were significant shortcomings in the project M&E system.

Unsatisfactory (U): There were major shortcomings in the project M&E system.

Highly Unsatisfactory (HU): The Project had no M&E system.

"M&E plan implementation" will be considered a critical parameter for the overall assessment of the M&E system. The overall rating for the M&E systems will not be higher than the rating on "M&E plan implementation."

All other ratings will be on a six point scale:

HS = Highly Satisfactory
S = Satisfactory
MS = Moderately Satisfactory
MU = Moderately Unsatisfactory
U = Unsatisfactory
HU = Highly Unsatisfactory

Annex 2. Co-financing and Leveraged Resources

Co-financing (basic data to be supplied to the consultant for verification)

Co financing (Type/Source)	IA own Financing (mill US$)		Government (mill US$)		Other* (mill US$)		Total (mill US$)		Total Disbursement (mill US$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
– Grants										
– Loans/Concessional (compared to market rate)										
– Credits										
– Equity investments										
– In-kind support										
– Other (*) - - - - -										
Totals										

* Other is referred to contributions mobilized for the project from other multilateral agencies, bilateral development cooperation agencies, NGOs, the private sector and beneficiaries.

Leveraged Resources

Leveraged resources are additional resources—beyond those committed to the project itself at the time of approval—that are mobilized later as a direct result of the project. Leveraged resources can be financial or in-kind and they may be from other donors, NGO's, foundations, governments, communities or the private sector. Please briefly describe the resources the project has leveraged since inception and indicate how these resources are contributing to the project's ultimate objective.

Table showing final actual project expenditure by activity to be supplied by the UNEP Fund management Officer. (insert here)

Annex 3

Review of the Draft Report

Draft reports submitted to UNEP EOU are shared with the corresponding Programme or Project Officer and his or her supervisor for initial review and consultation. The DGEF staff and senior Executing Agency staff provide comments on the draft evaluation report. They may provide feedback on any errors of fact and may highlight the significance of such errors in any conclusions. The consultation also seeks agreement on the findings and recommendations. UNEP EOU collates the review comments and provides them to the evaluators for their consideration in preparing the final version of the report. General comments on the draft report with respect to compliance with these TOR are shared with the reviewer.

Quality Assessment of the Evaluation Report

All UNEP GEF Mid Term Reports are subject to quality assessments by UNEP EOU. These apply GEF Office of Evaluation quality assessment and are used as a tool for providing structured feedback to the evaluator.

The quality of the draft evaluation report is assessed and rated against the following criteria:

GEF Report Quality Criteria	**UNEP EOU Assessment**	**Rating**
A. Did the report present an assessment of relevant outcomes and achievement of project objectives in the context of the focal area program indicators if applicable?		
B. Was the report consistent and the evidence complete and convincing and were the ratings substantiated when used?		
C. Did the report present a sound assessment of sustainability of outcomes?		
D. Were the lessons and recommendations supported by the evidence presented?		
E. Did the report include the actual project costs (total and per activity) and actual co-financing used?		
F. Did the report include an assessment of the quality of the project M&E system and its use for project management?		
UNEP EOU additional Report Quality Criteria	**UNEP EOU Assessment**	**Rating**
G. Quality of the lessons: Were lessons readily applicable in other contexts? Did they suggest prescriptive action?		
H. Quality of the recommendations: Did recommendations specify the actions necessary to correct existing conditions or improve operations ('who?' 'what?' 'where?' 'when?)'. Can they be implemented? Did the recommendations specify a goal and an associated performance indicator?		
I. Was the report well written? (clear English language and grammar)		
J. Did the report structure follow EOU guidelines, were all requested Annexes included?		
K. Were all evaluation aspects specified in the TORs adequately addressed?		
L. Was the report delivered in a timely manner		

GEF Quality of the MTE report = 0.3*(A + B) + 0.1*(C+D+E+F)
EOU assessment of MTE report = 0.3*(G + H) + 0.1*(I+J+K+L)
Combined quality Rating = (2* 'GEF EO' rating + EOU rating)/3
The Totals are rounded and converted to the scale of HS to HU

Rating system for quality of terminal evaluation reports

A number rating 1-6 is used for each criterion: Highly Satisfactory = 6, Satisfactory = 5, Moderately Satisfactory = 4, Moderately Unsatisfactory = 3, Unsatisfactory = 2, Highly Unsatisfactory = 1, and unable to assess = 0.

Annex 4 GEF Minimum requirements for M&E

Minimum Requirement 1: Project Design of M&E14

All projects must include a concrete and fully budgeted monitoring and evaluation plan by the time of Work Program entry (full-sized projects) or CEO approval (medium-sized projects). This plan must contain at a minimum:

- SMART (see below) indicators for project implementation, or, if no indicators are identified, an alternative plan for monitoring that will deliver reliable and valid information to management
- SMART indicators for results (outcomes and, if applicable, impacts), and, where appropriate, corporate-level indicators
- A project baseline, with:
  - a description of the problem to address
  - indicator data
  - or, if major baseline indicators are not identified, an alternative plan for addressing this within one year of implementation
- An M&E Plan with identification of reviews and evaluations which will be undertaken, such as mid-term reviews or evaluations of activities
- An organizational setup and budgets for monitoring and evaluation.

Minimum Requirement 2: Application of Project M&E

- Project monitoring and supervision will include implementation of the M&E plan, comprising:
- Use of SMART indicators for implementation (or provision of a reasonable explanation if not used)
- Use of SMART indicators for results (or provision of a reasonable explanation if not used)
- Fully established baseline for the project and data compiled to review progress
- Evaluations are undertaken as planned
- Operational organizational setup for M&E and budgets spent as planned.

SMART INDICATORS GEF projects and programs should monitor using relevant performance indicators. The monitoring system should be "SMART":

1. **Specific**: The system captures the essence of the desired result by clearly and directly relating to achieving an objective, and only that objective.

[14] http://gefweb.org/MonitoringandEvaluation/MEPoliciesProcedures/MEPTools/meptstandards.html

2. **Measurable:** The monitoring system and its indicators are unambiguously specified so that all parties agree on what the system covers and there are practical ways to measure the indicators and results.
3. **Achievable and Attributable:** The system identifies what changes are anticipated as a result of the intervention and whether the result(s) are realistic. Attribution requires that changes in the targeted developmental issue can be linked to the intervention.
4. **Relevant and Realistic:** The system establishes levels of performance that are likely to be achieved in a practical manner, and that reflect the expectations of stakeholders.
5. **Time-bound, Timely, Trackable, and Targeted:** The system allows progress to be tracked in a cost-effective manner at desired frequency for a set period, with clear identification of the particular stakeholder group to be impacted by the project or program.

Annex 5 List of intended additional recipients for the Terminal Evaluation

Name	Affiliation	Email
Mail list	UNEP DGEF Professional staff	
Aaron Zazuetta	GEF Evaluation Office	azazueta@thegef.org
Government Officials		
GEF Focal Point(s)		
Executing Agency		
Hartwig Kremer	Loicz office in Bonn Germany	loicz.ipo@loicz.org hartwig.kremer@loicz.org; hartwig.kremer@loicz.ipo

Annex 2 List of interviewees

	Organisation	**Role**	**Email**
Isabelle Vanderbeck	UNEP	Final Task Manager	UNEPRep@oas.org
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Gianmarco Giordani	LaguNet		giordani@nemo.unipr.it
Andrea Merla		Consultant to GEF WB/UNEP Mediterranean Partnership	
Laurence Mee	University of Plymouth, UK	Member of LOICZ scientific board	
Bill Parr	UK	Former Nutrient expert – UNDP/GEF BSERP	

Annex 3 Key Documents

Documents Available from UNEP

1.	ProDoc
2.	UNEP PIR report for FY02
3.	Terminal Report (July 02)
4.	'Self evaluation' (similar to Terminal Report)
5.	Note from LOICZ team in 2004 regarding project completion
6.	Audit report (KPMG) – August 2002
7.	Revised financial statement – September 2006
8.	Final Report from final workshop (2006)
9.	Revised terminal report
10.	Quarterly Operational Report July – September 2001
11.	Quarterly Operational Report October – December 2001
12.	6 month Project Report July – December 2001
13.	Inventory of Equipment List December 2001

Document Available from LOICZ

1.	UNEP/GEF-LOICZ Final Report – A management Perspective. www.loicz.org
2.	LOICZ Reports and Studies (No. 5, 9, 10, 12 – 19, 20, 22 -24 and 28). www.loicz.org
3.	Humans, hydrology and the distribution of inorganic nutrient loading to the ocean. Smith et.al. BioScience 53 235 – 245, 2003.
4.	Coastal Fluxes in the Anthropocene: The Land-Ocean Interactions in the Coastal Zone Project of the International Geosphere-Biosphere Programme. Crossland, C.J.; Kremer, H.H.; Lindeboom, H.J.; Marshall Crossland, J.I.; Le Tissier, M.D.A. (Eds.) 2005, ISBN: 978-3-540-25450-8

Annex 4 Questionnaire

Terminal Evaluation of the UNEP/GEF project:
The role of the coastal ocean in the disturbed and undisturbed nutrient and carbon cycles

Objective of the Terminal Evaluation.

The main objectives of this evaluation are to establish the extent to which the project's objectives have been met and to provide recommendations on how the work can be further exploited by current and future UNEP/GEF programmes. It is important that the assessment is clearly supported by examples that demonstrate the successes or impacts of the project - please identify any points that help to demonstrate the impacts, outcomes and sustainability of the UNEP/GEF project.

In addition to the questions below, the evaluation is an opportunity to provide feedback to UNEP/GEF on any issues that were encountered during the execution of the project that could lead to improvements in future projects and to identify how the data sets and tools developed under the project could be used in future UNEP/GEF programmes.

The questions should be briefly addressed **with examples that highlight the achievements**. Specifically the Terminal Evaluation will address the following points:

1. Has the UNEP/GEF project:
   - Assembled **estimates of the impacts** of nutrient enrichment on coastal waters?
   - Assembled **estimates of the changes** on regional and global biochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere? (*was a 'baseline' established against which changes were estimated?)*
   - Provided regional and global **estimates of carbon flux** required for balancing the global carbon budget and assessing the role of the coastal ocean in the global carbon cycle?
   - Helped **resolve scientific uncertainties** concerning the Global Carbon Cycle in the wider scientific community?
   - **Helped individual groups of countries** to share experience with other areas around the globe and learn lessons derived from the experience?
   - **Assisted governments** in assessing the role of their coastal waters as sinks/sources of carbon?
2. As a 'GEF targeted research' project – has the project helped to '*raise awareness on how to jointly address contaminant problems'* – i.e. has it prepared guidance on management actions that can be taken?
3. The Terminal Report showed that in 2002 (and updated in 2006) it was 'too early to assesses' (or in 2006 as 'ongoing') the impact of the UNDP/GEF project. Could this be updated on the basis of the continuing work of LOICZ? Specifically the two indicators that need to be assessed are:
   - Integration of CO_2 source-sink data into countries national reports to the UNFCCC
   - Use of project outputs in national planning and nutrient reduction
4. Please summarise how the work supported by UNEP/GEF has continued under the LOICZ programme.

Annex 5 Project self evaluation

The following tables were prepared by LOICZ-IPO and included in the PIR (2002) and the project Terminal Report (2006).

Project anticipated and achieved needs:

Anticipated	Achieved
Estimates of the impacts of nutrient enrichment on coastal waters	A global assessment of nutrient loads impinging on the coast ecosystems has provides an initial spatial picture of disturbed and undisturbed systems and system response.
Estimates of the changes in regional and global biogeochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere	Net carbon flux estimates and net denitrification estimates have been derived at local and region scales. Global tendencies for C, N and P fluxes were derived
Assist governments in assessing the role of their coastal waters as sinks and/or sources of carbon	Capacity building was achieved across all global regions and further application of tools and skills are being made in addition to the initial assessments of ecosystems locally and regionally.
Resolve scientific uncertainties concerning the Global Carbon Cycle	Important steps have been taken within the work of the project to assess coastal system performance in the global carbon cycle

Project anticipated and achieved results

Anticipated	Achieved
Develop several hundred empirical models of carbon and nutrients in undisturbed and disturbed (polluted) coastal systems that will be of value at local and national levels in assessing the state of eutrophication and carbon source/sink status of the coastal ocean	A suite of 400+ models was developed from existing data across all regions of the world except South Asia. The surprising gap in robust data for South Asia is being addressed by a current field program using the training skills given by the project. The Arctic region, wet tropical areas (e.g., Indonesia, West Africa) and arid coasts (e.g. Middle East) remain under-represented due mainly to limited or little existing data. However, the typological approach to regional and global assessment provided a useful proxy tool for this first global assessment. The base data and models, and assessments and derivative models used in synthesis for regions and at global scales are in electronic (web sites), hardcopy and CD formats and are being actively distributed to interested parties. The resultant network of scientists trained in the biogeochemical modelling and typological assessment approaches have enhanced skills and awareness that will be supportive to additional local and national coastal evaluation processes. The network of researchers and institutes actively involved in regional assessment is continuously increasing; methods are under continuous review and subject to updating; result dissemination has reflected in new research projects and policy making on national and regional scale.
Up-scaling, using model derived empirical data, to provide regional and global estimates of carbon flux required for balancing the global carbon budget and assessing the role of the coastal ocean in the	Up-scaling and integrating locally determined input and systems data from the extremely heterogeneous coastal zone remains a practical and intellectual challenge – one that extends beyond the boundaries of this project. In the Final Report of the project (LOICZ Reports and Series No. 24, 2002), *inter alia*, we describe the spatial and temporal scales of site variability and have derived a crucial model for assessment of coastal system loading of nutrients from land. Using the typology approach, the global spatial distribution of "disturbed and undisturbed" coastal ecosystems is described. This also provides a basis for

Anticipated	Achieved
global carbon cycle	projection and scenarios that can reflect the future trends of increased human density in the coastal land areas and potential for coastal system impacts. In addition we have a suite of observations about coastal system performance in response to elevated nutrient loads from land and the influence of local variables (water residency times, system area and coastal exchange) that indicates that the immediate estuarine/nearshore regions is the site of rapid transformation of dissolved N and P. There is a central tendency towards net denitrification and net carbon flux is less clear cut with a slight tendency towards autotrophy with rates clustering near zero. These and other interim findings are being further evaluated as part of the longer journey being taken within LOICZ and are being addressed by the collaborative actions of the network established by the project. The combined typology approach and the numeric budget data are proving vital tool in this process.

Project anticipated and achieved outputs:

Anticipated	Achieved
Capacity building in coastal zone nutrient modelling	Capacity building was achieved through 9 regional training workshops (biogeochemical budgets) and effective application of skills into budget products at local to regional scales, and 4 regional/global assessment (up-scaling and typology) workshops. Continued capacity building is based on extended regional work e.g. Mediterranean and Black Sea, Latin America and in form of concrete training and teaching modules build into the EU funded Erasmus Mundus Master Programme for coastal and water management. Information from budget assessment is growingly being used in policy recommendation and decision making discourse following in particular from the last project workshop in 2006 and the published results.
Network development for coastal biogeochemical scientists	Three regional mentors (Philippine, Mexico and South Africa) assisted the wider project team expand the network of scientists by at least 170 new participants. The network continues to interact on further training and scientific assessments (local to global scales) which give longer life to the purpose of the project and is expected to provide subsequent refinement and diminished uncertainty to the current findings of the project activities. Additional scientists are being trained through adoption of methodologies in University curricula (e.g., South Africa, Philippines, Mexico, Brazil, Russia). (see above for further info and www.loicz.org)
Inter-regional comparison and global assessment of N and P fluxes and effects on estuaries and coastal sinks-sources for carbon and nitrogen	Nine budget workshops and 4 regional/global assessment workshops were held, resulting in 8 budget and 2 assessment reports (with supplementary CD's) being published. Several peer literature articles have been published and more are in preparation. Advanced training was provided for 10 scientists; subsequently 4 acted as regional mentors, 5 acted as national focal points; 1 acted as project analyst. All were involved in network building, contributed as resource people in training workshops and two extended into postgraduate training within the purpose of the project (1 PhD and 1 MSc candidature) About 140 models were developed in workshops with a further 60+ additional budget contributions being made outside formal workshop activities. Additional site budgets continue to be contributed. Currently more than 400. The methodology now enters a stage in which it is furthering the implementation of the Global Earth Observation efforts under the IGOS Partners.
Development of new tools for scaling and modelling	A new typological approach based on cluster analyses (LOICZView electronic clustering and statistical tools) was developed and a

Anticipated	Achieved
system forcings and performance	companion electronic typology database (140+ variables geo-referenced in 50,000 pixels at half degree resolution for the world coastal zone) is continuing to expand. This is an exciting development that is attracting interest from the scientific and coastal management communities, and it is being actively used across a range of agencies for a multiplicity of spatial scale-dependent purposes in coastal and marine assessments. Importantly, it is accessible to and being used in less developed as well as developed countries, as it is public web-based and continually supported (by LOICZ) with CD access being provided to users with limited web access. This was neither a trivial task and nor outcome of the project. This is now subject to continued further development and a complementary clustering software is being tested (DISCO) for advanced and next generation application. This aims to visualize and analyse complex systems interactions on multiple scales – nutrient fluxes are one of the key variables here. Additional biogeochemical modelling tools were developed to allow estimation of run-off and other variables and processes essential for site modelling; these were planned actions and opportunistic through workshop interactions and need. An electronic budget calculation tool (CABARET) was developed early and beta-tested through the workshops. All tools are available electronically through the dedicated website and supported with hardcopy and discs. Method review and improvement is ongoing building on and extending the project derived networks of experts world-wide.

Self-assessment against ProDoc Indicators

Activities	Indicator(s) including target value and time frame	Actual Level Achieved	2001 Rating	2002 Rating
Activity 1 Develop 100 bio-geochemical budgets	100 budgets by January 2001 Additional budgets from network in 2001	140 budgets plus 60+ additional budgets in 2001 (and continuing)	HS	 HS
Activity 2 Development of tools for bgc assessments	Electronic toolkit by June 2000 Additional tools for input estimation by December 2000	CABARET tool completed March 2000 Opportunistic; 3 new tools by Dec 2000 & continuing	HS HS	
Activity 3 Training in use of biogeochemical tools and assessments	6 regional workshops (budgets) by March 2001 1-3 additional workshops subject to external funding 2001	Completed February 2001 3 completed by October 2001	HS	 HS
Activity 4 Develop scaling methods and databases (typology)	Subcontract development by Dec 2000	Completed November 2000 (evolution continuing)	HS	HS
Activity 5 Training in scaling methodologies and tools	3 regional workshops by August 2001	2 completed by 30 June 2001 3rd completed in July 2001	S	 S
Activity 6 Integration of site data to regional and global scales	1 global integration workshop in November 2001	Completed in November 2001; write-up delayed		S
Activity 7 Website and publications	Budgets website operational and updated from workshops Typology website established Dec 2001 Workshop and tools publications within 6 months of workshop	Achieved Established October 2000 Generally w/shops and tools publications achieved within time	HS HS	 S
Activity 8 Network building, mentoring and capacity extension	6 Scholarship training by April 2001 3 Regional mentorships established by Dec 2000 with local training over 3 workshops by Oct 2001	5 scholars completed 3 mentorships established October 2000 and 2 workshops held by June 2001. 2 workshops held September/October 2001	S HS	 S
		Overall Rating	**S**	**S**

Annex 6 Project Financing

Summary of co-financing

(a)

(b) Initial		US$	%
GEF Trust Fund 720,000	61.9		
Co-financing (in kind)			
Univ. of Stockholm	175,000	15.0	
Univ. Hawaii	75,000	6.5	
LOICZ	192,600	16.6	
Total Cost	1,162,600	100	

(c) Actual		
GEF Trust Fund (in kind)	693,936	60.2
Co-financing		
Univ. of Stockholm	175,000	15.2
Univ. Hawaii	75,000	6.5
LOICZ	198,000	17.2
European Union	10,000	0.9
Total Cost	1,151,936	100

Final Project Expenditure Accounts

Total project statement of allocation (budget), expenditure and balance (Expressed in US$) covering the period

July 1999 to May 2006

Project No. GF/1100-99-07 Rev 3 (2005/2006) **Agency name** LOICZ International Project Office
Project title: The Role of the Coastal Ocean in the Disturbed and Undisturbed Nutrient and Carbon Cycles
Project commencing: 1 July 1999..... **Project ending:** 30 September 2006.....

Object of expenditure by UNEP budget code	**Project budget allocation**		**Total expenditure**	**Total unliquidated obligations**	**Cumulative expenditure**	**Unspent balance of budget allocation**	
	m/m (1)	**Amount (2)**	**(3)**	**(4)**	**(5)**	**m/m (6)**	**Amount (2)-(5)**
1200 Consultants 1201 Technical supervision and coordination		**59625**	**59667**		**59667**		**(42)**
2200 Sub-contracts 2201 Marine Science Institute 2202 University of Kansas 2203 University of Stockholm		 8000 8480 9540	 8020 8494 9582		 8020 8494 9582		 (20) (14) (42)
1202 2299 sub-total: Sub-contracts		**26020**	**26096**		**26096**		**(76)**
3100 Fellowships 3101 Fellowship training		 **74041**	 **74607**		 **74607**		 **(566)**
3200 Group training 3201 Regional scholarships 3202 Regional mentorships		 32684 48000	 31779 46258		 31779 46258		 905 1742
3299 sub-total: Group Training		**80684**	**78037**		**78037**		**2647**
Meetings Regional workshops Thematic workshop Global workshop Rev 3 Policy/Management Workshop		 172580 147210 81600 26064	 170590 144364 80811 26417		 170590 144364 80811 26417		 1990 2846 789 -353.19*
3390 sub-total: Meetings		**401390**	**395765**		**395765**		**5625**

Object of expenditure by UNEP budget code	Project budget allocation		Total expenditure	Total unliquidated obligations	Cumulative expenditure	Unspent balance of budget allocation	
	m/m (1)	Amount (2)	(3)	(4)	(5)	m/m (6)	Amount (2)-(5)
4200 Non-expendable equipment		**2240**	**2240**		**2240**		**0**
5200 Reporting costs							
5201 Regional workshop report		16075	11811		11811		4264
5202 Thematic workshop reports		9000	2703		2703		6297
5203 Global workshop report		3000	3010		3010		(10)
Rev 3 Policy/Management Report		14150	14231.82		14231.82		-81.82*
5299 sub-total: Reporting		**28075**	**17524**		**17524**		**10551**
99 GRAND TOTAL		672075	653936		653936		18139
Incl. 2005/06 Rev 3 Extensions		40214	40648.82		40648.82		-435.01
		712289	694584.82		694584.82		17704.18