Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of the

Global Nutrient Cycle

COMPONENT C: Establishment of scientific, technological and policy options to improve coastal water quality policies in Large Marine Ecosystems (LMEs) and for national nutrient reduction strategy development

Prepared by: Global Environment Technology Foundation

Component C: Doc: Final Report

Partners:

December 2018

About the GEF-Global Nutrient Cycle Project

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

Core project outcomes and outputs:

- the development and application of quantitative modeling approaches: to estimate and map present day contributions of different watershed based nutrient sources to coastal nutrient loading and their effects; to indicate when nutrient over-enrichment problem areas are likely to occur; and to estimate the magnitude of expected effects of further nutrient loading on coastal systems under a range of scenarios
- the systematic analysis of available scientific, technological and policy options for managing nutrient over-enrichment impacts in the coastal zone from key nutrient source sectors such as agriculture, wastewater and aquaculture, and their bringing together an overall Policy Tool Box
- the application of the modeling analysis to assess the likely impact and overall cost effectiveness of the various policy options etc brought together in the Tool Box, so that resource managers have a means to determine which investments and decisions they can better make in addressing root causes of coastal over-enrichment through nutrient reduction strategies
- the application of this approach in the Manila Bay watershed with a view to helping deliver the key tangible outcome of the project – the development of stakeholder owned, cost-effective and policy relevant nutrient reduction strategies (containing relevant stress reduction and environmental quality indicators), which can be mainstreamed into broader planning
- a fully established global partnership on nutrient management to provide a necessary stimulus and framework for the effective development, replication, up-scaling and sharing of these key outcomes.

Project partners:

- Chilika Development Authority
- Energy Centre of the Netherlands
- Global Environment Technology Foundation
- Government of India - Lake Chilika Development Authority
- Government of the Netherlands
- Government of the Philippines
- Government of the United States
- Intergovernmental Oceanographic Commission of UNESCO
- International Nitrogen Initiative
- Laguna Lake Development Authority
- Partnerships in Environmental Management for the Seas of East Asia
- Scientific Committee on Problems of the Environment
- University of Maryland
- University of the Philippines
- University of Utrecht
- Washington State University
- World Resources Institute

Implementing Agency: United Nations Environment Programme
Executing Agency: UNEP- Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA)

COMPONENT C: Establishment of scientific, technological and policy options to improve coastal water quality policies in Large Marine Ecosystems (LMEs) and for national nutrient reduction strategy development

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

Final Report

Submitted by the Global Environment & Technology Foundation (GETF)
December 2018

1. **Project Background and Information**
   1.1. **Project Number:** SSFA/DEPI/2012/FMEB-GPA/ 2012-GFL-2328-2731-4B67
   1.2. **Project Component Title**: Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of Global Nutrient Cycle (Component C)
   1.3. **Responsible Division in UNEP**: Global Progamme of Action
   1.4. **Project Starting Date**: 21/12/2012
   1.5. **Project Completion Date**: 31/3/2018
   1.6. **Reporting Period**: Final report
   1.7. **Reference to UNEP Sub-Programme/GEF Strategic Priority and expected accomplishments**: The major outcomes included the practice and policy databases, case studies and capacity building, and integrated toolbox.
   1.8. **Overall objectives of the project**: The Global Environment & Technology Foundation – a small 501 (c)(3) not-for-profit organization dedicated to building the infrastructure for sustainable development – has been tasked in the GEF/UNEP project "Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution, in support of Global Nutrient Cycle" to develop a global nutrient management toolbox. The purpose of the toolbox is to **demonstrate policy and technological options (Component C), which offer such potential solutions to decision makers and practitioners alike.** All deliverables are complete and provided to the PCU. This is the final close out report.
   1.9. **Total Budget (US$): (specify contributions by donor/s**): The total budget for Component C was $399,653, including the David and Lucile Packard Foundation, who provided $50,155 in cash.
   1.10. **Partners and Leveraged Resources:** The following are key partners in implementation of this Component:
      - Colorado State University – provided peer review of the synthesis.
      - The Coventry Group, LLP – supported project management.
      - CTIC – provided access to practices.
      - ECN – developed the integration tool.
      - IPNI – developed case studies.
      - Millennium Challenge Corporation – developed a case study on innovative funding models
      - The Nature Conservancy – provided access to practices.
      - University of Delaware – provided peer review of the synthesis.
      - University of Georgia – provided peer review of the synthesis.
      - University of Rhode Island – provided peer review of the synthesis.
      - U.S. Department of Agriculture, National Resources Conservation Service – provided a list of practices and policies.
      - U.S. Environmental Protection Agency – provided a list of practices and policies.

- U.S. Water Partnership – provided access to experts.
- Water Stewardship, Inc. – developed the initial inventory of practices, synthesis document and training module.
- Winrock International – developed a case study on pay for success funding models.
- World Resources Institute – developed the policy and practice databases, the toolbox brochure, and the strategy deliverable.
- In-kind support by: 1) The Coventry Group, $34,412; 2) ECN, $29, 586; and, 3) IPNI, $45,000.

2. Project Status

2.1. Project Delivery Information

The Global Environment & Technology Foundation – a small 501 (c)(3) not-for-profit organization dedicated to building the infrastructure for sustainable development – has been tasked in the GEF/UNEP project "Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution, in support of Global Nutrient Cycle" to develop a global nutrient management toolbox. The purpose of the toolbox is to **demonstrate policy and technological options (Component C), which offer such potential solutions to decision makers and practitioners alike.** All deliverables are complete and provided to the PCU.

In the following sections, the overall context of the GNC toolbox will be given, followed by a description of the current work and solutions on the topic addressed here. The final section will give guidance on workable next steps related to the various toolbox products.

Challenges

Nitrogen and phosphorous are key nutrients that play an important role in the global and local sustainable development agendas. The use of these nutrients is key to growing crops and thus to the world's food security. However, in some parts of the world farmers do not have access to enough nutrients to grow crops and feed growing populations. But in many other parts of the world there is an 'excess' of nutrients in the environment as a result of industrial and agricultural activity and has profound impacts, from pollution of water supplies to the undermining of important ecosystems and the services and livelihoods they support.

The earlier mentioned nutrient challenge is set to intensify as the demand for food and bio-fuels increase, and growing urban populations produce more wastewater. These trends will be at a growing economic cost to countries in the undermining of ecosystems, notably in the coastal zone, and the services and jobs they provide.

When looking at some key facts related to the nutrient challenge, it becomes clear what key issues need to be addressed. Some of the facts are listed here:

- Human activities produce around 120 m tons of reactive nitrogen each year, much of which (nearly two thirds) ends up polluting air, water, soil marine and coastal areas and adding harmful gases to the atmosphere;
- Some 20 m tons of phosphorous are mined every year and some estimates suggest nearly half enters the world's oceans - 8 times the natural rate of input;
- Between 1960 and 1990 global use of synthetic nitrogen fertilizer increased more than sevenfold, while phosphorus use more than tripled;
- One half of the world's population is now thought to depend on nitrogen and phosphorous fertilizers for the production of their food – much of the fertilizer is not directly used by the crops; some escapes into the environment, some is retained in the soil and some is used to build soil organic matter, which can later release nutrients for crop growth;
- An estimated 90% of wastewater in developing countries is discharged untreated into waterways and coastal areas;
- Wastewater will pollute surface water resources and thus decrease the supply of useable water and increase the cost of cleaning it. Furthermore, it will contaminate aquatic resources, affect food supplies and biodiversity, ecosystem functioning, and the natural services of aquatic systems.
- Worldwide, the number of coastal areas impacted by eutrophication caused by excess nutrients stands at over 500;
- Dead zones in the world's oceans have increased from 10 cases in 1960 to 405 documented cases in 2008 (169 identified hypoxic areas, 233 areas of concern and 13 systems in recovery);
- Many of the world's freshwater lakes, streams and reservoirs suffer from eutrophication – millions of people depend on wells for their water where nitrate levels are well above recommended levels;
- More than 90% of the world's fisheries depend in one way or another on estuarine and near-shore habitats.

Agriculture, waste water and aquaculture are the sectors that can be found in this list of facts, having a direct influence on the nutrient load to the coastal waters. Excess loads will eventually result in a multitude of effects that will have a direct or indirect effect on the population's ability provide for sufficient food.

Current Work and Solutions on the Topic

The purpose of the Tool Box is to demonstrate policy and technological options, which offer potential solutions for managing nutrients to decision makers and practitioners alike. Various projects in different regions of the world have partially provided insight into these options. However, collecting them and making them available through a central global database has not been executed. This not only holds for the options, but also for the policies and case studies

and, thus, the work described here provides some unique datasets, brought together in one Tool Box, and made available for a wide audience.

The Tool Box brings different items together, ranging from insight in the relationship between the nutrient sources and their impacts in the coastal waters to scientific, technological and policy options to improve policies related to coastal water quality and waste discharge policies and land use/land management practices.

The first item of the Tool Box (the sources-impacts relationships) is within the domain of the modelling group within the GEF-GNC project. Based on global models and datasets, the tool can estimate the nutrient loads of the major global watersheds and the subsequent effect that has on the occurrence of harmful algal blooms and hypoxic zones. The second item (scientific, technological and policy options) is focused on compiling practices from countries across the globe, looking at best practices for nutrient reduction.

In the context of the GEF-GNC project this will then feed into the development of nutrient reduction strategies. For the Manila Bay watershed, dedicated decision-support tools will be available that are based on the activities described before. The information that is available through the different databases and tools provides important input in assessing the overall state of the environment for this watershed. Furthermore, this can also be extended to other regions of the world.

Tools available through the GEF-GNC project

The GPNM Tool Box, an important deliverable of the whole GEF-GNC project, is bringing together various aspects of both the modelling and inventory work (Appendix A). As mentioned before, the project deliverables for this particular part of the GEF-GNC project were:

- Inventory of nutrient reduction best practices compiled from countries across the globe
- Case studies on selected technology and policy options
- Syntheses of policy measures and regulations
- Nutrient budget calculator tool – allows for evaluation of impacts of management practices

The different parts of the GEF-GNC project Tool Box will be discussed below:

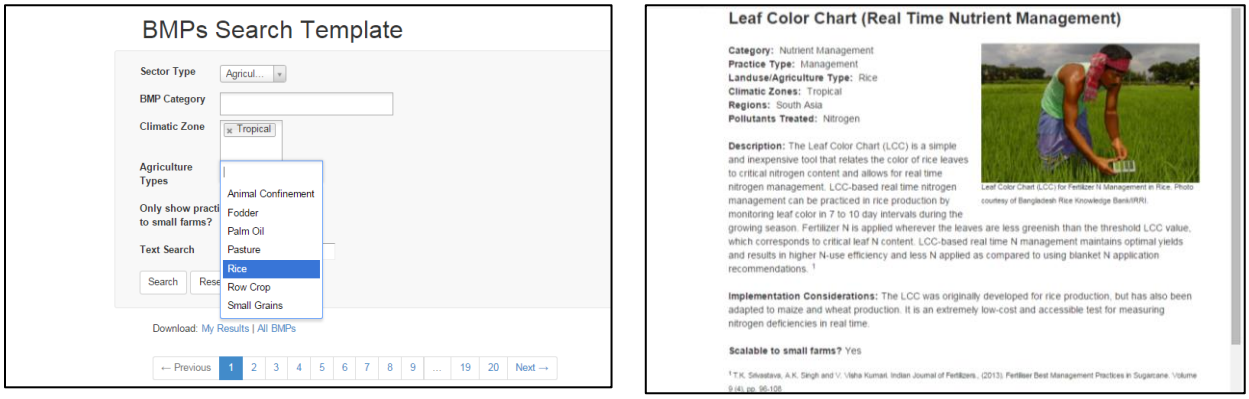
1) Best Management Practices (BMPs) database

Poor land management practices can have significant negative impacts on water quality, especially regarding excess nitrogen and phosphorus runoff into water systems. Excess nutrients can stimulate algal growth, which can consume the oxygen in a littoral or aquatic ecosystem and degrade natural habitats. Additionally, excess nutrients can contaminate ground water and lakes/reservoirs. Therefore, proper land and nutrient management practices are important topics to address when promoting water quality. The GPNM has compiled a database

of best management practices around the globe that can help mitigate nutrient pollution. The on-line database includes BMPs related to the agricultural and urban sectors. Each sector has several associated BMP categories; Urban and Agricultural BMPs are also categorized by climactic zones. Agricultural sector BMPs are further categorized by landuse/agriculture type as well as applicability to small farms with limited resources. The Best Management Practices database is a searchable collection of various practices. The database is available through the Nutrientchallenge.org website. Currently the database contains a list of around 100 practices and is searchable with respect to the following items (see also in screenshot below):

- Sector: agriculture/urban
- Category: conservation buffers/erosion control/drainage control/irrigation management /grazing management for agriculture and detention/filtration/infiltration/septic management/urban erosion control/urban stream restoration for urban practices
- Climatic zone: arid/semi-arid/tropical/temperate
- Land use/Agricultural type: animal confinement/fodder/palm oil/pasture/rice/row crop/small grains
- Scalability to farms: yes/no

Once the different options were selected, a list of relevant practices is presented. Next to some general information about the earlier mentioned options, a description of the practice and some implementation considerations are given. When available, the efficiency of the practice in terms of nitrogen and or phosphorus load reduction is also given.



Screenshots Best management practices database, available via www.nutrientchallenge.org

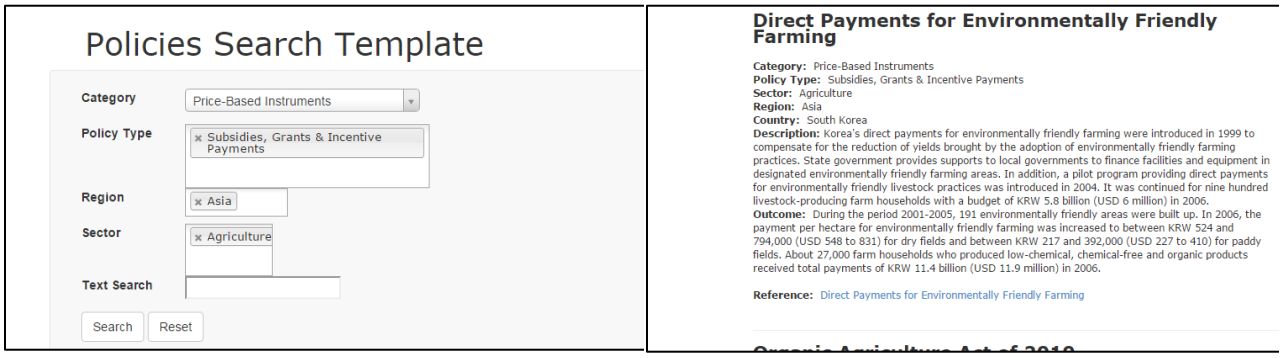
2) Policy database

The drivers of nutrient pollution are diverse and include complex and interrelated socioeconomic factors. The direct drivers of nutrient pollution include energy consumption and fertilizer use which result in increased nutrients lost to the environment, as well as land-use conversion which diminishes the capacity of ecosystems to capture and cycle nutrients. Indirect drivers of nutrient pollution include demographic shifts, expansion of intensive agriculture and economic growth (Howarth 2008; Selman and Greenhalgh 2009).

To address nutrient pollution, governments and institutions must consider a wide array of policy tools that can be applied to various sectors (including urban, agricultural, wastewater, fisheries, etc.) in order to mitigate nutrient pollution. The GPNM has compiled a database of policies around the globe that directly or indirectly mitigate nutrient pollution. We have placed policies into 7 broad categories and further categorized policies by type within each of these categories (policy taxonomy borrowed from Greenhalgh & Selman 2014).
Like with the Best Management Practices database, the policy database is an on-line, searchable, collection of various policies. The database is available through the Nutrientchallenge.org website and is searchable with respect to the following items (see also in screenshot below):

- Category: Environmental outreach & education/Regulatory approaches/Price-based instruments/Market-based instruments/Ecosystem restoration and protection/Institutions & capacity/Research, monitoring, & evaluation
- Type: environmental bans and restrictions/environmental standards/environmental caps & limits/regulatory frameworks for the Regulatory Approaches and environmental bans and restrictions/environmental standards/environmental caps & limits/regulatory frameworks for the Ecosystem restoration and protection category
- Region: Asia/Europe/Middle East/North America/Oceana/South America
- Sector: Agriculture/Aquaculture/Fisheries/Mixed/Transport/Urban/Wastewater

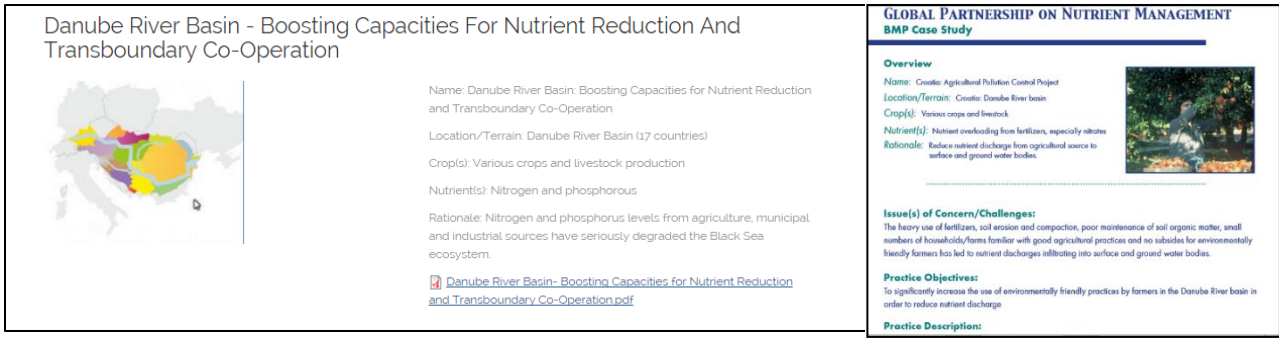
After selection, a list of relevant policies is presented. For the respective policies, some general information is shown, as well as a more detailed description and the outcome after implementation of the policy. An example for South Korea is shown below: 'Direct payments for environmentally friendly farming'.



Screenshots Policy database, available via www.nutrientchallenge.org

3) Case studies

The case studies section of the GNC Tool Box is not searchable, but is directly available through the Nutrientchallenge.org website. At present, there are 25 case studies available, giving information about the implementation of some of the practices at specific locations. Not only does it describe the practice objectives, but also its effects, costs and other relevant information.



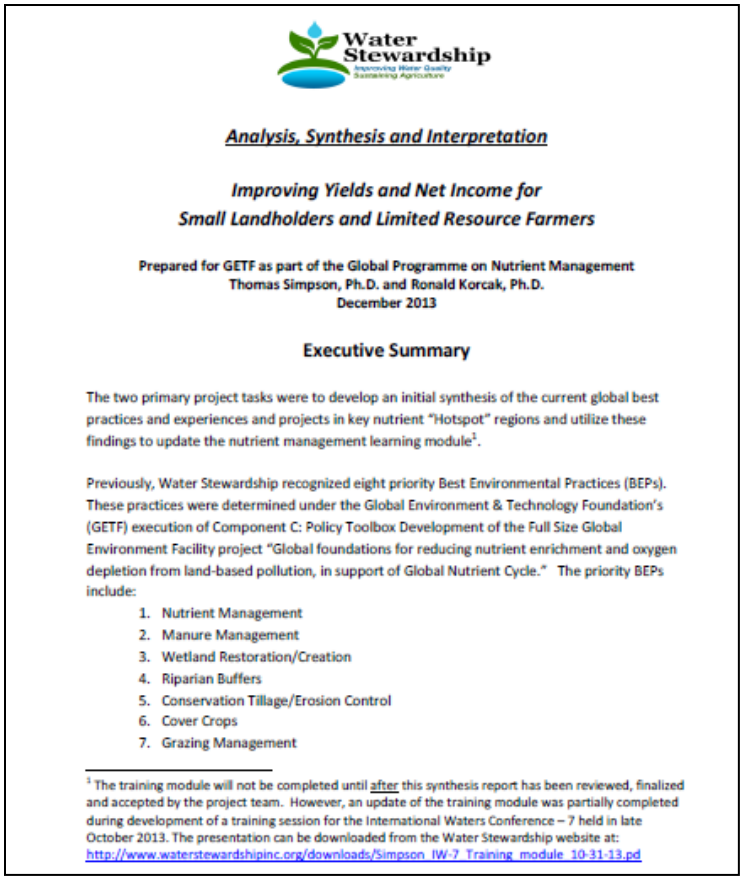
Screenshots Case studies, available via www.nutrientchallenge.org

4) Synthesis report

An initial synthesis was developed by GETF in collaboration with Water Stewardship, Inc. and peer reviewed by several key nutrient management experts. The report summarized the current global best practices and experiences and projects in key nutrient "hotspot" regions and used these findings to update the nutrient management learning module. The report recognized eight standard and priority Best Environmental Practices (BEPs), including:

- Nutrient Management
- Manure Management
- Wetland Restoration/Creation
- Riparian Buffers
- Conservation Tillage/Erosion Control
- Cover Crops
- Grazing Management
- Ecological/Organic Production Systems

The synthesis report contains an expansion of each BEP, in the form of case studies, using information from both an inventory of projects and a limited analysis of additional materials identified by Water Stewardship. Emphasis was placed upon scaling practices to fit the needs and criteria for small landholders and limited resource farmers. Scalability will require further analysis and understanding of the four "A's:" 1) Applicability; 2) Adaptability; 3) Affordability; and 4) Acceptability. These principles offer insight into the best way to modify BEPs developed for large-scale intensive agriculture, so they are compatible with and appropriate for small holder farmers.



Water Stewardship

Improving Water Quality
Sustaining Agriculture

Analysis, Synthesis and Interpretation

Improving Yields and Net Income for
Small Landholders and Limited Resource Farmers

Prepared for GETF as part of the Global Programme on Nutrient Management
Thomas Simpson, Ph.D. and Ronald Korcak, Ph.D.
December 2013

Executive Summary

The two primary project tasks were to develop an initial synthesis of the current global best practices and experiences and projects in key nutrient "Hotspot" regions and utilize these findings to update the nutrient management learning module[1].

Previously, Water Stewardship recognized eight priority Best Environmental Practices (BEPs). These practices were determined under the Global Environment & Technology Foundation's (GETF) execution of Component C: Policy Toolbox Development of the Full Size Global Environment Facility project "Global foundations for reducing nutrient enrichment and oxygen depletion from land-based pollution, in support of Global Nutrient Cycle." The priority BEPs include:

1. Nutrient Management
2. Manure Management
3. Wetland Restoration/Creation
4. Riparian Buffers
5. Conservation Tillage/Erosion Control
6. Cover Crops
7. Grazing Management

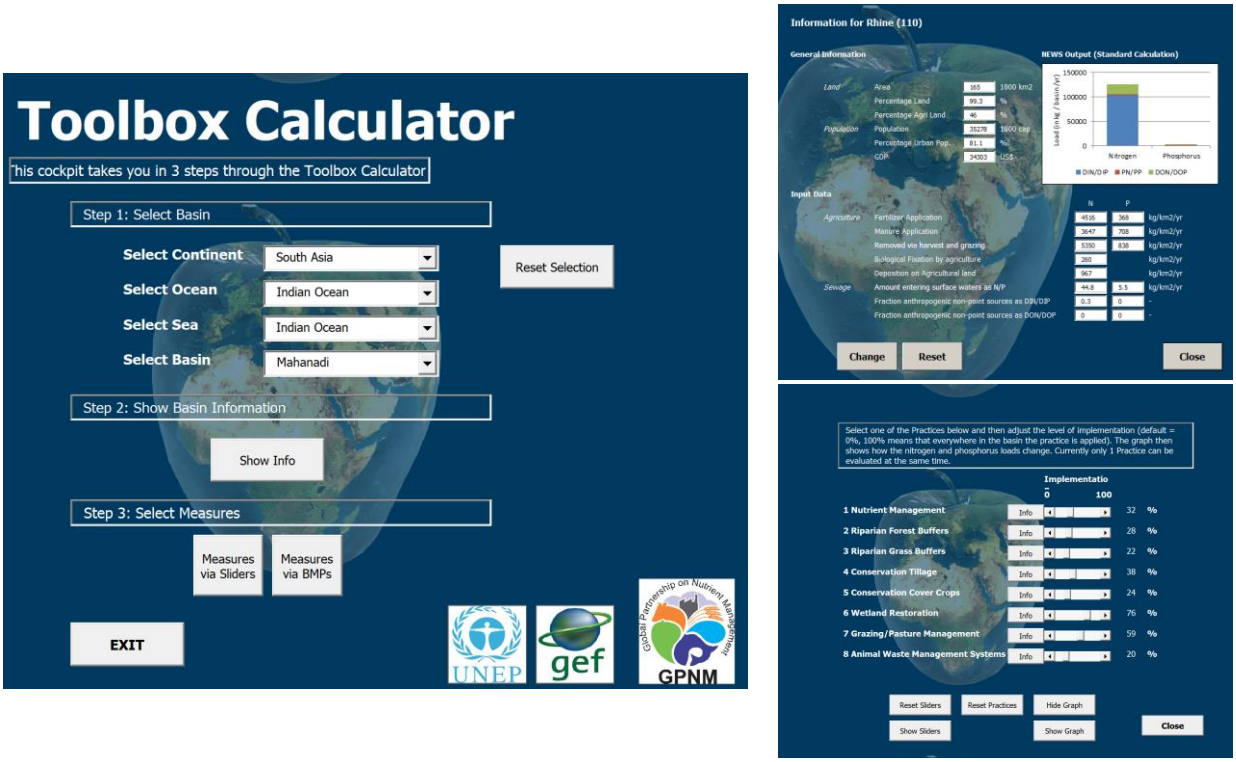
[1] The training module will not be completed until after this synthesis report has been reviewed, finalized and accepted by the project team. However, an update of the training module was partially completed during development of a training session for the International Waters Conference – 7 held in late October 2013. The presentation can be downloaded from the Water Stewardship website at: http://www.waterstewardshipinc.org/downloads/Simpson_IW-7_Training_module_10-31-13.pd

Screenshot Synthesis report www.nutrientchallenge.org

5) Nutrient Calculator

The Nutrient Calculator is a Microsoft Excel application and it uses the Global NEWS model (Kroeze et al. 2000). The Global NEWS (Nutrient Export from WaterSheds) model is developed by Global NEWS, which is an international, interdisciplinary scientific taskforce. This taskforce is focused on understanding the relationship between human activity and coastal nutrient enrichment. It was formed as a workgroup of UNESCO's Intergovernmental Oceanographic Commission (IOC) and it is a LOICZ affiliated project. As the primary aim of Global *NEWS,* the construction and application of next generation, spatially explicit global nutrient export models are mentioned, linking the resulting river loads to quantitative assessments of coastal ecosystem health. The first set of global river export models was published in late 2005 in a special collection of the journal *Global Biogeochemical Cycles*. The Global NEWS model is the result of this, which is a modelling system capable of calculating the nutrient loads to coastal waters that originate from activities in the various major watersheds. It is a global model, covering more than 6000 watersheds. With this model as a starting point, the Nutrient Calculator was developed, still functioning on a watershed level. The overall functionality of the calculator lies in calculating the nutrient load, based on the available activity data contained in the modelling database. Furthermore, the different modelling parameters can be changed interactively in two ways: for a total set of more than 25 parameters separately (but also in

combination) through sliders and through implementing the earlier mentioned set of 8 BEPs (individually or in combination). Once the values for the parameters or the BEPs are selected, the loads are calculated and shown through a graphical representation (see screenshots below). Following input from users, an important functionality was added to the tool: the use of own activity data, next to the pre-set data from the calculator database. In this way, future users can use specific data for the region (watershed scale).



Screenshots Nutrient calculator, available via www.nutrientchallenge.org

Other Deliverables

The following are several additional deliverables developed under Component C:

- Training module – Water Stewardship, in collaboration with several key nutrient management experts, developed a multi-disciplinary technical training module for project managers, policy makers and extension agents.
- ASA article published – GETF worked with the American Society of Agronomy to place an article in *CSA News* requesting expert assistance in gathering practices and cases.
- Nutrient management replication strategy template – The World Resources Institute (WRI) and GETF collaborated to develop a template approach to replicate nutrient management policies and practices.
- Toolbox brochure – WRI and GETF also developed a brochure to summarize outputs and impacts of the toolbox.

Technical trainings on use of the Toolbox were conducted near Lake Chilika in India and in Negombo, Sri Lanka as part of the 8th GEF International Waters Conference (IWC). At the Chilika Lake workshop, hosted by the Chilika Development Authority, agricultural extension officials, farmers, and…. Were oriented to the Toolbox and its potential adaptation to sustainably manage nutrients particularly in the agricultural sector. The agricultural community was interested in being better stewards of their land, but their formal training in nutrient management was limited. The experiences from the workshops confirmed the need for such a resource. The training also served as an opportunity for the project team to receive valuable feedback about the Toolbox's utility and recommendations for further enhancement.

At the IWC, the project team presented the Toolbox to participants—a mix of GEF International Waters project managers, technical consultants, and others from the IW community—and led a group exercise on its use for meeting relevant SDGs.

Similar feedback was received during the trainings: add ability to replace global data with local, show effects of nutrient loads on water quality, and develop guidance documents on how to use the Toolbox. The project team has addressed each of these priority requests. Additional requests for modifications are being tracked and will be implemented as future funding allows.

Deliverables Summary

Activity	**Description of work undertaken during reporting period**	**Status of Activity**	**Outcomes**
Activity 1 – Inventory of technological and policy options	SP-C1 Update and finalization of the comprehensive inventory of technological and policy options to reduce nutrient over-enrichment, with a synthesis of report of policies and practices including recommended priority actions based on the analyses of the best management inventory in final print layout.	Complete (March 2014)	Collected practices and policies from select countries.
Activity 2 – Case studies	SP-C2 Five in-depth case studies of selected technology and policy options for nutrient over-enrichment reduction from various regions of the world based on well-defined criteria ready for publication and dissemination.	Complete (March 2014)	Twenty-five case studies of developing world "hot spots" have been completed and can be viewed here. The cases focus on crop production improvements due to nutrient efficiencies, the importance of systems of

Activity	Description of work undertaken during reporting period	Status of Activity	Outcomes
			practices and the implications of codes of good practices on nutrient management approaches on the farm.
Activity 3 -- Synthesis	SP-C3 Production of a stand-alone synthesis report of best management practices (i.e. policy, technological options, measures and regulations) covering the various regions of the world ready for publication and dissemination.	Complete (December 2014)	The synthesis of the inventory is complete. It provides recommendations regarding adapting best management practices for small holder farmers.
Activity 4 -- Toolbox	SP-C4 Production of a fully operational 'policy toolbox' outlining the main messages and fully developed training module and curriculum with relevant reference materials, and defined core steps on the use the inventory and the global toolbox and delivery of the training.	Complete (June 2015)	The working database can be found on nutrient management best practices and policies. A two-page brochure was developed and delivered in November 2015, (followed by a Toolbox user guide in 2018).
Activity 5 – Replication work shops	SP-C5 Replication and up-scaling of best practice options, measures etc. through training workshops in project priority regions (to be selected in consultation with the PM).	Complete (May 2014, July 2015)	Chilika stakeholders provided guidance on potential modifications to the toolbox and integrated tool regarding the need to stack BMPs and include local data.
Activity 6 – Integrated tool with Component B	SP-C6 Integration of component Policy Tool Box with Component B source-impact modeling.	Complete (November 2016)	The Manila Bay integration effort was presented at the 8th GEF International Waters Conference in Sri Lanka, and feedback was provided by participants. Final updates on the Tool Box (based on feedback) are complete.

Activity	Description of work undertaken during reporting period	Status of Activity	Outcomes
Activity 7 – Replication strategy and final training on the integrated tool	SP-C7 A strategy document for replication and up-scaling of the best management practices i.e., knowledge sharing and training of at least 30 experts from key countries on the use/application of the policy toolbox and how it can be applied, including in relation to the source-impact analysis.	Complete (March 2017)	The strategy has been drafted and provided to the PCU. The final trainings during the GEF International Waters Conference and with scientists in Manila are complete.
Activity 8 – IWC training	SP-C8 Holding of 2-3 training session during the GEF International Waters Conference and other global meetings of nutrient relevance (to be decided in consultation with the PM) and production of training/workshop reports.	Complete (IWC 6,7,8)	Held workshops for GEF project managers, especially for Large Marine Ecosystems at IWCs 6 and 7. Held an interactive workshop at IWC8 to provide a simulation of "real-world" application of the toolbox and receive feedback.

2.2. **Lessons Learned**

The following are among the key recommendations and lessons from Component C implementation:

- Developing a new adaptation approach for scale – Large scale intensive farming has many practices that if implemented and adapted appropriately could be applied to small holder farm scale. Practices and systems of practices should be adapted and scaled based on: 1) Applicability; 2) Adaptability; 3) Affordability; and 4) Acceptability.
- Focusing on integration and collaboration across disciplines – Urban growth and lack of adequate wastewater and sanitation is leading to scenarios for which even if the maximum and most appropriate BMPs are implemented, nutrient loads will continue to increase. Integration of various kinds of practices from wastewater and agriculture are needed to eliminate potential discharges and develop nutrient reuse. One approach includes:
    1. Wastewater and nutrient management training – Providing integrated wastewater, environmental and nutrient management training for wastewater operators, farmers and food processors respectively to ensure sound, proactive management planning and implementation.

2. Nutrient management best practices – Helping farmers identify the most cost effective and efficient agricultural practices, leveraging best practices and approaches identified in the inventory.
3. Technology deployment – Accelerating the use of wastewater treatment and nutrient management technologies through partnerships with technology developers, including innovative, decentralized natural and packaged systems and constructed wetlands.
4. Financing and incentives – Concepts could include pay for performance to incentivize farmers to implement nutrient management best practices and utilize reused wastewater, commoditization of wastewater and financing schemes including water funds capitalized by users and promoting reuse and restoration.

2.3. **State how the project has nurtured sustainability. Is the project or project methodology replicable in other countries or regions? If yes, are there any concrete examples or requests?**

The GNC Component C has identified the following key need for technical information so that ongoing GEF and other efforts to replicate practices will be most effective and offer the most value for future investments:

- Costs – The cost of specific practices is only available on an ad hoc basis.
- Efficiencies – More geography-specific data on practice efficiencies would better indicate which practices and/or systems should be replicated.
- Reductions – Currently, nutrient reduction data is available on an ad hoc basis as well. Experts have suggested that nutrient load reductions specifically attributed to GEF investments would be very helpful and assist in "better telling the story" of the impact of GEF projects. The challenge has been that countries are often responsible for data collection after the GEF project has concluded.

The following are commitments/recommendations for further utilizing GNC Component C products, promoting replication of the Toolbox and integrated tool beyond the period of performance of the project and transferring actions to additional organizations:

- Ensure that the Toolbox provides an input to IMNS implementation;
- Continue to engage GEF Large Marine Ecosystem projects to build awareness and capacity of the Toolbox in key countries and regions;
- Build awareness of the Toolbox among U.S. embassies and associated ministries in key developing countries;
- Facilitate a dialogue among key donors including the U.S. Agency for International Development, DFID, the World Bank, other multilateral institutions, private foundations and others regarding potential next steps for the Toolbox

Although the current version of the Tool Box is available through the Nutrientchallenge.org website, a wider adoption of it is potentially hampered by the above-mentioned practical issues (e.g. online calculator, full integration with databases). Some recommendations to consider to have the Tool Box adopted by a wider audience include:

- Develop a dedicated communication plan to promote GPNM, including its goals and tools. Currently, outreach seems limited and thus a further adoption has been and will be hampered. A dedicated communication action that includes promoting the tools through related websites and networks can reach a broader audience of the various GPNM products;
- Modify the Nutrient Calculator tool for various scales. It has become clear that the Nutrient Calculator is a relevant tool for evaluating the nutrient situation on a larger scale but moving to a higher resolution/smaller scale is also important. This is especially true for local authorities who must evaluate a situation on a (large) city or provincial scale. The regional modelling system developed for the Manilla Bay has shown the relevance for that specific situation. Successful application of the system to other regions was shown during a dedicated workshop. Integration of this regional calculator into the Tool Box seems a valuable addition, enabling a wider adoption of the overall set of tools.

Overall the Tool Box is an important deliverable of the GEF-GNC project and as such, of the GPNM. With the upcoming finalization of the GEF-GNC project, the recommendations mentioned in this report need to be taken by (or through) the GPNM to be implemented. The GPNM website (www.nutrienchallenge.org) can play a central role in disseminating the knowledge and tools developed during the GEF-GNC project, with also the possibility of offering related material, e.g. distance training via MOOCs, etc. Taking up the toolbox into new and/or existing tools of GPNM partners is also a way for further distributing the GEF-GNC results and is thus highly recommended.

3. List of attached documents

1) BEPs summary
2) 25 case studies
3) The synthesis
4) Policy and practices databases
5) Two-page brochure
6) Toolbox user guide
7) Replication strategy
8) Training module
9) 4As summary
10) ASA article
11) Chilika work shop report draft

12) Pay for success presentation
13) Scalability presentation
14) Toolbox presentation

4. Effectiveness and Impact

The following summarizes the impact of Component C's activities:

1) Developed what was at the time "a first of its kind" inventory and database of nutrient management best practices and policies.
2) Assembled a global network of experts to engage decision makers to address nutrient challenges.
3) Offered access to global learning and experiences on nutrient management best practices to key decision makers.
4) Utilized test beds, such as Lake Chilika and Manila Bay for showcasing how the Toolbox and calculator might be implemented across various developing world geographies.

More must be done to engage governments in a policy discussion of how sound nutrient management is a critical component of food, water and energy security going forward.

5. Financial Overview

Project Co-financing Tables, 1 & 2

Table 1: Statement on co-financing for the period: December 12, 2012 to June 30, 2018

			Co-financing		
	Name of Partner	**Activity**	**Cash Contribution**	**Cost of travel (ticket, subsistence, etc)**	**In-Kind (Staff time in days and USD equivalent)**
1	David & Lucile Packard Fd.	3. Synthesis	$ 11,379		
2	David & Lucile Packard Fd.	6. Integrated tool with Component B	$ 38,776		
3	IPNI	2. Case studies			$ 45,000
4	ERCN	6. Integrated tool with Component B			$ 29,586
5	The Coventry Group	1. Inventory of technological and policy			$ 2,300

		options			
6	The Coventry Group	2. Case studies			$ 8,339
7	The Coventry Group	3. Synthesis			$ 1,725
8	The Coventry Group	4. Toolbox			$ 3,451
9	The Coventry Group	5. Replication workshops			$ 12,537
10	The Coventry Group	7. Replication strategy and final training on the integrated tool			$ 5,578
11	The Coventry Group	9. GNC SC WDC Meeting			$ 482
	SUBTOTALS		**$ 50,155**	**$ -**	**$ 108,998**

Table 2: Comparison of the Commitment and Actual in-cash and in-kind co-financing by Partners.

		Commitment		**Actuals as on June 30, 2018**	
	Partners	**Cash**	**Kind**	**Cash**	**Kind**
1	David & Lucile Packard Fd.	$ 62,000		$ 50,155	
2	IPNI		$ 25,000		$ 45,000
3	ERCN		$ 40,000		$ 29,586
4	The Coventry Group		$ 35,000		$ 34,412
5	Other (unconfirmed)		$ 135,000		
	SUBTOTALS	**$ 62,000**	**$ 235,000**	**$ 50,155**	**$ 108,998**