



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

# Global Nutrient Cycle



# Global Nutrient Management Toolbox User Manual

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**Component C: Doc: C5-1**

Partners:



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## 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)





# GLOBAL NUTRIENT MANAGEMENT TOOLBOX USER'S MANUAL

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The Global Nutrient Management Toolbox is a suite of databases, information, and tools that support actions and policy decisions related to managing nutrients to minimize environmental degradation.

OCTOBER 2018

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## The Nutrient Challenge

Nutrients, nitrogen and phosphorus, are critical for growing crops and feeding the world. However, too many nutrients can harm the environment. Human activities generate around 120 million metric tons of reactive nitrogen each year, two-thirds of which goes unused and pollutes the world's waters and air, contributes to greenhouse gas potential, degrades ecosystems, and negatively impacts soil quality in many regions. Anthropogenic mined phosphorus is also added to the natural cycles. Although phosphorus is a finite resource, nearly half of what is produced goes unutilized and enters waterbodies as a pollutant. On the other hand, some regions, particularly in Africa and parts of Asia and Latin America, do not have enough nutrients to meet their agricultural needs. Soil may be mined, leaving more nutrients extracted than replaced.

Nitrogen and phosphorus fertilizer use has grown since the 1960s and is projected to increase by an additional 40-50 percent by 2050 as the world struggles to feed growing populations. We're facing a global nutrient challenge: we

must produce more food and energy, while at the same time decreasing our pollution and lifting more than 500 million smallholder farmers in developing countries out of poverty. How we handle this challenge has significant implications for our ability to feed the planet, protect our environment and meet the Sustainable Development Goals (SDGs).

The Global Partnership on Nutrient Management developed a Global Nutrient Management Toolbox to drive attention and action around this critical challenge. The Toolbox can be used to sustainably manage nutrients across various sectors—agriculture, urban, wastewater and energy. It does this by documenting promising practices, technologies and policies in use around the globe and by providing basin-scale models to assess current loads and simulate future scenarios. Decision-makers and practitioners alike who are considering nutrient management interventions can use the Toolbox to inform their decisions and maximize environmental, economic and social benefits.

## Using the Toolbox

The following section provides a detailed walkthrough of the website's features and functions. The Toolbox is accessible at [nutrientchallenge.org/gpnm-toolbox](http://nutrientchallenge.org/gpnm-toolbox).

The contents of the toolbox are listed below. Scroll to read on, or click a header to jump directly to a given section:

- [BMP DATABASE](#)
- [POLICY DATABASE](#)
- [CASE STUDIES](#)
- [SYNTHESIS REPORT](#)
- [NUTRIENT MANAGEMENT POLICY FRAMEWORK](#)
- [CALCULATOR TOOL](#)

The screenshot displays the GPNM Toolbox website. The header features the title 'GPNM Toolbox' and a search bar with the placeholder 'type to search...'. A navigation menu includes 'Home', 'Resources', and 'GPNM Toolbox'. The main content area is divided into two columns. The left column contains a paragraph about food, energy, and water security, followed by a paragraph about global areas of low oxygen or hypoxia, and a paragraph about the development of the global nutrient management toolbox. Below these paragraphs are seven buttons: 'BMP DATABASE+', 'POLICY DATABASE+', 'CASE STUDIES+', 'SYNTHESIS REPORT+', 'NUTRIENT MANAGEMENT POLICY FRAMEWORK+', and 'CALCULATOR TOOL+'. The right column features a 'Search Widget' with a search bar and a 'Log in' button. Below the search widget is a 'News Items' section with a header bar containing icons for a calendar, a star, and a speech bubble, and a list item titled 'Collaborative Approach'.

Food, energy and water security are inextricably linked, and implications for the more than 500 million small holder farmers in the developing world to get beyond subsistence and improve quality life require technical assistance and support. New integrated approaches to manage nutrients across various disciplines (i.e., agriculture, aquaculture, livestock and wastewater) are needed to ensure environmental, economic and social benefits for key stakeholders and coastal ecosystems.

Global areas of low oxygen or hypoxia in coastal waters are growing. Loss of ecosystem services from these coastal zones is equal to USD 200 billion annually. Nevertheless, management and policy improvements across many sectors are resulting in sixty recovery systems worldwide. Proper nutrient management best practices must be scaled-up to ensure the long-term stewardship, conservation and sustainable management of our soil health and water resources.

A global nutrient management toolbox was developed to demonstrate policy and technological options, which offer such potential solutions to decision makers and practitioners alike. Please click on buttons to search the key elements of the toolbox:

BMP DATABASE+

POLICY DATABASE+

CASE STUDIES+

SYNTHESIS REPORT+

NUTRIENT MANAGEMENT POLICY FRAMEWORK+

CALCULATOR TOOL+

**Search Widget**

type to search...

Username \*

Log in

Password \*

Request new password

**News Items**

Collaborative Approach

## I. Best Management Practices Database

[The Best Management Practices \(“BMP”\) Database](#) provides examples of practices that reduce nutrient losses across the agriculture and urban sectors. The database includes information about each practice such as a description, considerations for adoption, nutrient reduction effectiveness estimates and regional applicability. Extension agents, agriculture consultants, stormwater managers and others may use this database to identify and research options for possible nutrient-reducing practices that could be implemented on farms and in cities.

To search the BMP Database, first choose a sector: agriculture or urban. Then, limit your search within that sector to a particular BMP category or climate zone. The database includes more than a dozen BMP categories from which to choose. Agricultural practices have additional search criteria that may be used: agriculture types and scalability to small farms. You may choose more than one item from each drop-down menu. For example, here we show a search for nutrient recycling agriculture BMPs that are scalable to small farms.

# BMPs Search Template

Sector Type

Agricult... ▼

BMP Category

× Nutrient Recycling

Climatic Zone

Agriculture Types

Only show practices scalable to small farms?

☒

Text Search

Search

Reset



After clicking “Search,” relevant BMPs meeting the search criteria will be displayed. Here, we see two pages of results for nine nutrient recycling agriculture BMPs that are scalable to small farms, starting with Agricultural Waste Composting. The entry for each practice includes key information such as the land use type, applicable climatic zones and regions, pollutants treated, a description and references. The results can be viewed on the website as shown above, or the user can click to download “My Results” or “All BMPs” to an Excel spreadsheet.

← Previous 1 2 Next →

## Agricultural Waste Composting

**Category:** Nutrient Recycling

**Practice Type:** Management

**Landuse/Agriculture Type:** Row Crop, Fodder, Rice

**Climatic Zones:** Temperate, Tropical, Semiarid

**Regions:** North America, South Asia, Europe

**Pollutants Treated:** Nitrogen, Phosphorus, Sediment

**Description:** Agricultural waste products (unused portions of crops or waste products from processing) including have the potential to contribute nutrients and should be managed in a manner that prevents nutrient contamination to surface and ground waters. Consideration should be given to the amount of raw waste generated, the nutrient content of the waste product, and recognition that nutrient loading depends on the way in which the waste is handled after harvest. Most vegetable waste, such as sweet corn fodder, cull ears and husks can be used as a green manure by applying it to production fields.<sup>1</sup>

**Scalable to small farms?** Yes

<sup>1</sup> Selman, Mindy, and Suzie Greenhalgh. “Eutrophication: Policies, Actions, And Strategies to Address Nutrient Pollution.” WRI Policy Note, Water Quality: Eutrophication And Hypoxia. Sept. 2009. Web. Feb. 2014.  
[http://pdf.wri.org/eutrophication\\_policies\\_actions\\_and\\_strategies.pdf](http://pdf.wri.org/eutrophication_policies_actions_and_strategies.pdf).



A compost heap handles vegetable and other plant waste on an organic farm (Saucier, Miss.). Photographer: Stephen Kirkpatrick. Photo Courtesy of USDA NRCS.

## Conservation Cover Crops

**Category:** Conservation Cover, Nutrient Recycling

**Practice Type:** Management

**Landuse/Agriculture Type:** Row Crop

**Climatic Zones:** Temperate, Tropical, Semiarid

**Regions:** North America, Europe

**Pollutants Treated:** Nitrogen, Phosphorus, Sediment



## II. Policy Database

The [Policy Database](#) contains examples of policy instruments that have been implemented around the world to address nutrient pollution from agriculture, aquaculture, fisheries, transport, urban and wastewater sectors. Policies are organized into seven categories:

1. Ecosystem restoration and protection
2. Environmental outreach and education
3. Institutions and capacity
4. Market-based instruments
5. Price-based instruments
6. Regulatory approaches
7. Research, monitoring and evaluation

Entries are searchable by category, type, region and/or sector. Policy makers and others can use this database to explore what approaches are being taken in other parts of the world that may be applicable to their countries or regions.

When searching the Policy Database, you may choose one or more of the seven policy categories from the drop-down menu. Then, you can search for a specific policy type(s) within that category. You may also limit your search to policies in specific regions or sectors. After clicking on "Search," your results will be displayed below. You may also choose to download "My Results" or "All Policies" to see the policies of interest in an Excel-based format.

An example result is shown above for a regulatory approach using environmental bans and restrictions. The entry includes the regions and countries where this policy has been implemented, a brief description, information about realized or anticipated nutrient outcomes of the policy and references.

## Policies Search Template

Category

Regulatory Approaches

Policy Type

✕ Environmental Bans & Restrictions

Environmental Caps & Limits

Environmental Standards

Regulatory Frameworks

Region

Sector

Text Search

Search

Reset

Download: [My Results](#) | [All Policies](#)

### Detergent Phosphate Bans

**Category:** Regulatory Approaches

**Policy Type:** Environmental Bans & Restrictions

**Sector:** Mixed

**Region:** Europe; North America; South America; Asia

**Country:** EU member countries; United States; Paraguay; Brazil; China; Japan; South Korea

**Description:** In China, under the provisions on protecting drinking water sources of Water Pollution Prevention and Control Law (2008), the State Council and local governments can prohibit or restrict the use of phosphates in detergent in drinking water source protection areas. Major coastal provinces, including Guangdong, Liaoning, Shandong, have banned the sales and use of laundry and dishwashing detergent containing more than 1.1% phosphate. In the United States, phosphates have been banned in laundry detergent nationally since 1993. By 2012, 18 states have enacted phosphate restrictions to dishwashing detergent which do not allow stores to sell household use dishwashing detergent with more than 0.5% phosphorous. Since July 2013, 3 U.S. states - New York, Maryland, South Carolina - have expanded the prohibits to commercial dishwashing detergent. The European Union has banned the use of phosphates and limited the content of other phosphorous containing compounds in consumer laundry detergents since June 30, 2013. It requires that a standard dose of washing powder must not contain more than 0.5 grams of phosphorus. Similar restrictions will apply to consumer automatic dishwasher detergents as of January 1, 2017, which require that the total content of phosphorus is less than 0.3 grams of phosphorus per standard dosage. Japan and South Korean have banned the use of phosphate in Laundry detergents since 1980s. In Paraguay, the Government banned domestic production and imports of phosphate detergents. In Brazil, the government imposed a gradual reduction of cleaning ingredients in detergent formulations, from max levels of 15.5% of phosphate in year 2005 to 12.5% in year 2008.

**Outcome:** The detergent phosphaste bans could reduce the level of phosphorus in wastewater and prevent eutrophication.

**Reference:** [China Detergent Phosphate Bans](#)

[US Detergent Phosphate Bans](#)

[EU Detergent Phosphate Bans](#)

[Detergent Phosphate Bans in Japan, South Korea, Paraguay, Brazil](#)



### III. Case Studies

The Toolbox's [Case Studies](#) highlight interventions practitioners are trying around the world to achieve nutrient management objectives at a catchment or other local scale. Examples of interventions include voluntary programs for farmers to practice better management of their land and water resources, demonstrations of new methodologies for quantifying reductions in nutrients and models of inter-country cooperation around transboundary waters. The website provides some basic information for each case study and provides a link to an information sheet with more detail.

Each case study provides background on the issue of concern, the objectives, a description of the intervention and the outcomes. Many of these case studies represent successful pilot programs that others can learn from, adapt and replicate.

#### Case Studies

##### Detecting Effects of BMPs on Rain Events Generating Nonpoint Source Pollution



Name: Detecting Effects of Best Management Practices (BMPs) on Rain Events Generating Nonpoint Source Pollution (NPSP) in Agricultural Watersheds using a Physically-Based Stratagem  
Location/Terrain: Conesus Lake, NY, USA

Crop(s): Livestock, cover crops and others

Nutrient(s): Nonpoint source pollution (NPSP)

Rationale: This research documents a methodology for confirming reductions in NPSP resulting from implementation of agricultural BMPs. It employs that methodology to confirm the success of BMPs implemented.

[Zoltweghabcs.pdf](#)

##### Impacts of Manure Management Practices on Stream Microbial Loading



Name: Impacts of Manure Management Practices on Stream Microbial

#### Overview

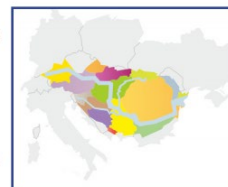
**Name:** Danube River Basin: Boosting Capacities for Nutrient Reduction and Transboundary Co-Operation

**Location/Terrain:** Danube River Basin (17 countries)

**Crop(s):** Various crops and livestock production

**Nutrient(s):** Nitrogen and phosphorus

**Rationale:** Nitrogen and phosphorus levels from agriculture, municipal and industrial sources have seriously degraded the Black Sea ecosystem.



#### Issue(s) of Concern/Challenges:

Nitrogen and phosphorus levels from agriculture, municipal and industrial sources have seriously degraded the Black Sea ecosystem, disrupted fisheries, reduced biodiversity, posed threats to humans and resulted in billions of dollars of losses to the economies of Black Sea littoral countries.

#### Practice Objectives:

The objective is to reduce nutrient loading into the Danube River and its tributaries and to improve water quality in the Danube and Black Sea.

#### Practice Description:

All farmers larger than 5 hectares and/or 5 animal units should calculate their resource economy every year by April 1 of the preceding year and covering at least the resource economy for nitrogen and phosphorus. Farmers should ensure soil sampling every five years. Crop rotation and fertilizing plans should be prepared every year for all larger farms.

Livestock numbers should be limited to ensure that nitrogen content in the manure is no more than 170 kg/ha. There should be storage capacity for at least six months of production of livestock manure at the farm. Spreading manure from October 15 to March 1 should not take place. Proper technology and technique should be used for spreading livestock manure.

#### Outcomes:

- Reduced nitrogen by 14 tonnes/year on eight demonstration farms
- Reduced phosphorus by 2 tonnes/year on eight demonstration farms

## IV. Synthesis Report

The [Synthesis Report](#) looks in detail at eight high-priority best environmental practices with an effort to examine the scalability of the practices for smallholder and limited resource farmers in key nutrient “hotspot” regions: Chilika Lake, India; Lake Victoria, Africa; and Manila Bay, Philippines. Project implementers and funders can reference this Synthesis Report to identify scalable practices that could be considered priorities to incentivize or otherwise promote through various approaches.

# Synthesis Report

An initial synthesis was developed 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. 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:

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

This report contains an expansion of each BEP, in the form of case studies, using information from both the inventory of projects provided by GETF 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 (4) “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.

Here you find the link to the GNC Toolbox **Synthesis Report**

## V. Nutrient Management Policy Framework

The Toolbox's Nutrient Management Policy Framework can inform nutrient management policies and present opportunities for scaling up the implementation of key best practices. It is designed to be a workable framework for a country or region looking to develop a nutrient management policy. The framework provides information on the key components of a nutrient management policy and includes examples of specific mechanisms within each element. The content of the framework is illustrated below.

In addition, the framework shares specific examples of promising strategies recently piloted in two developing countries, India and the Philippines.

### Framework Elements

#### Science-Based Holistic Approach

#### Legislative and Regulatory Components

#### Voluntary Programs for Agriculture

#### Economic Policy Instruments for Nonpoint Source Pollution Control

#### Public Education and Participation

#### Flexibility and Adaptation

### Example Mechanisms

Water Quality and Pollution Source Monitoring  
Predictive Models  
Determination and Allocation of Allowable Pollutant Loads

Environmental Standards  
Compliance and Enforcement Mechanisms

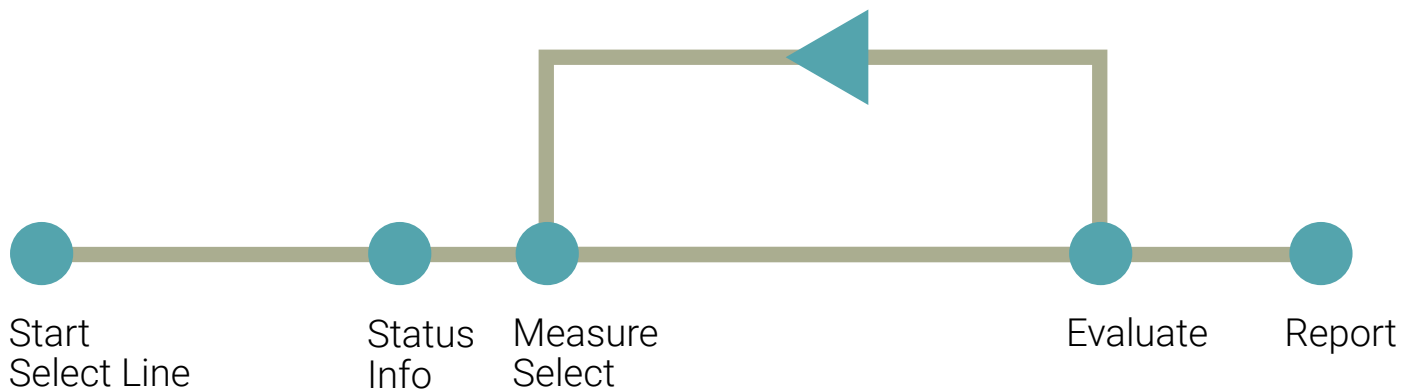
Voluntary Practice-Based Standards  
Education and Outreach to Farmers  
Technical Assistance Programs

Environmental Cross-Compliance Requirements  
Subsidies for Conservation Practices and Environmental Protection  
Payments for Ecosystem Services  
Water Quality Trading Programs



## VI. Calculator Tool

The Toolbox Calculator uses the Global Nitrogen Export from WaterSheds (NEWS) model to estimate the current status of total nitrogen and phosphorus loads (i.e., dissolved inorganic, dissolved organic, and particulate) in more than 5,000 major river basins around the world. Users can evaluate the nutrient loading implications of changes in management decisions by selecting measures such as implementing agricultural best management practices or increasing sewage treatment.



The report displays the results in terms of nutrient loadings and how they compare to the Index of Coastal Eutrophication Potential (ICEP). ICEP is an indicator for SDG 14.1 that assesses the risk of nutrient loadings from the river basin contributing to eutrophic conditions in coastal waters.

The following instructions are for version 5.9 of the Calculator Tool.

## GNC Calculator Tool

Here you can find the link to the current (draft) version of the GNC Calculator Tool.


calculator tool\_v2 is the original version which has been demonstrated on different occasions

calculator tool\_v5 is a new version (available since March 2017), which has some added functionality:

- selection of multiple management practices simultaneously
- using own data, instead of pre-filled data

Please note - this is a Microsoft Excel (macro enabled) file. Furthermore: right click the file name and then save the file.

### Attachment:

 calculator tool\_v2.xlsm

 [calculator tool\\_v5.9.xlsm](#)

When you open the Excel file, you will see the above image of the back end of the calculator. To view and interact with the user interface, you will need to click to “Enable Editing” at the top of the page, followed by “Enable Content.” Then, the user interface will open it.

calculator tool\_v5.9a [Protected View] - Excel

File Home Insert Page Layout Formulas Data Review View Tell me what you want to do

PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View. Enable Editing

basinname

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																		
2					<b>Choose your Basin</b>													
3																		
4																		
5					<b>Select Continent</b>													
6																		
7					<b>Select Ocean</b>													
8																		
9					<b>Select Sea</b>													
10																		
11					<b>Select Basin</b>													
12																		
13																		
14					<b>General Information</b>													
15																		
16					<b>Basin Name</b>		Bug (234)		<b>Continent</b>	Europe		<b>Input Data</b>		<b>N</b>	<b>P</b>			
17									<b>Ocean</b>	Mediterranean+Black Sea								
18									<b>Sea</b>	Black Sea		<b>Agri</b>	fertilizer application	641	50	kg/km2/yr		
19													manure application	1705	328	kg/km2/yr		
20					<b>Area</b>	area	69.14620313	1000 km2						removed from agri land via harvest and grazing	2015	363	kg/km2/yr	
21						percentage land	98.7	%						biological fixation by agri	525		kg/km2/yr	
22						percentage agri land	84.1	%						deposition on agri lands	890		kg/km2/yr	
23																		
24					<b>Population</b>	population	5693	1000 cap						biological fixation by non-agri (natural) systems	233		kg/km2/yr	
25						percentage urban pop	67.2	%						deposition on non-agri lands	163		kg/km2/yr	
26						GDP	880	US\$										
27												<b>Sewage</b>	fraction of total sewage export as DIN/DIP	0.56	-			
28													fraction of total sewage export as DON/DOP	0.14	0.01	-		
29													amount of sewage N/P entering surface waters	106.21	20.95	kg/km2/yr		
30													amount of sewage N/P entering surface waters (DON/DOP)	106.21	20.95	kg/km2/yr		
31													fraction of anthr. non-point sources of N/P entering as DIN/DIP	0.08	0.00	-		
32													fraction of anthr. non-point sources of N/P entering as DON/DOP	0.00	0.00	-		
33													fraction of non-anthr. non-point sources of N entering as DIN	0.08	-			
34																		
35													river DIN/DIP retention	0.37	1.00	-		
36													river DON/DOP retention	1.00	1.00	-		
37																		

Overview\_Basin OB\_c Overview\_calc Overview\_calc2 Calc sheet\_basin Combine Sliders Input Input (Scale) Intermediate Calculation Sewage Sewage (Calc)

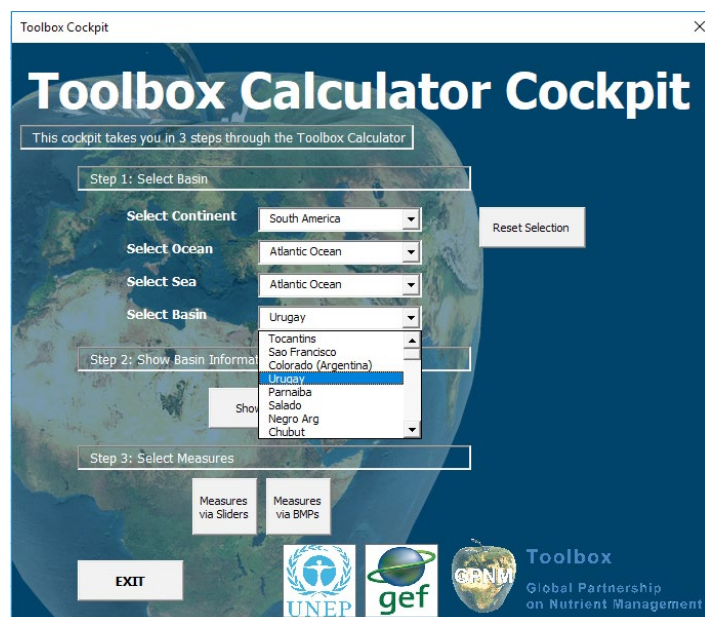


The Toolbox Calculator Cockpit is the user interface. Users make selections and view results here. The spreadsheets contain the back-end data and calculations and should not be altered.

First, click to "Reset Selection" to clear the pre-filled drop-down menus.

### Step 1: Select Basin

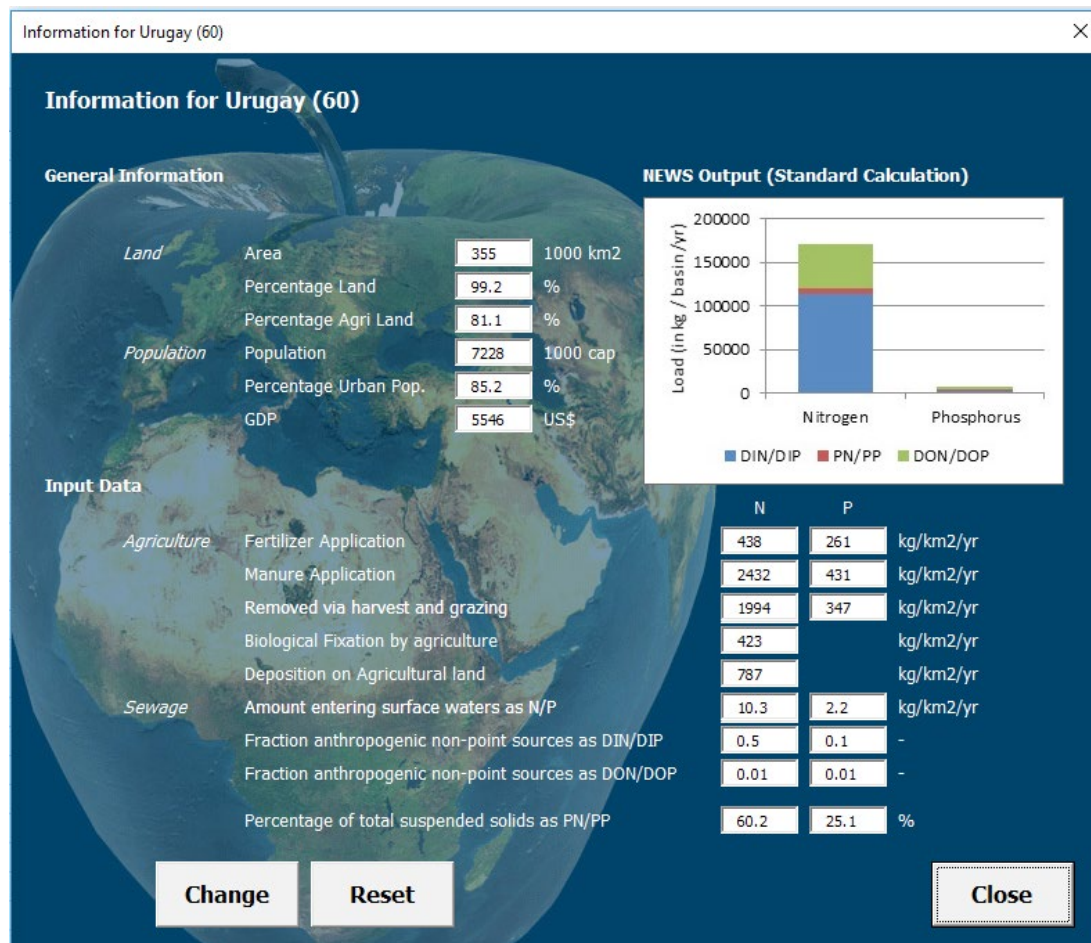
Starting at the top of Step 1, select the continent (or region), then ocean, sea and river basin of interest. The proceeding drop-down menus will change according to your prior selections.



### Step 2: Show Basin Information

Under Step 2, click to “Show Info” to see general information about your basin of interest, input data on agriculture and sewage, and total loadings of nitrogen and phosphorus in kilograms per basin per year. The input data displayed represent default values from the Global NEWS model's 2000 baseline.

The user may edit these fields in the white boxes if they have better data for the basin of interest. If at any time after editing the user needs to return to the default values, they can select the “Reset” button. Closing and re-opening the application will also reset the values. Finally, select “Close” to exit Step 2 and return to the Toolbox Calculator Cockpit.



### Step 3: Select Measures

Step 3 allows the user to create alternative future scenarios by selecting management measures that could adjust nutrient loadings in the basin of interest. Evaluation outcomes will be relative to the Global NEWS model's 2000 baseline scenario. There are two options for evaluating the outcomes of future scenarios:

- Measures via Sliders:** This option offers a selection of actions by relative percentage of implementation that can be taken to adjust nitrogen and phosphorus loads. These actions, in agriculture or wastewater sectors, include changes such as different fertilizer applications, varying biological nitrogen fixation and simulating the amount of sewage entering surface waters. Users can move the sliders left or right to decrease or increase the percentage of implementation or manually enter a percentage. The image below illustrates a scenario evaluation for changes in fertilizer and manure applications and agricultural area.

Change Sliders

×

Reset

Close

Nitrogen

Phosphorus

	-100	0	100	%
fertilizer N application	◀		▶	-30
manure N application	◀		▶	-10
N removed from agricultural lands via harvest and grazing	◀		▶	0
biological N fixation by agriculture	◀		▶	0
biological N fixation by non-agricultural (natural) systems	◀		▶	0
N deposition on agricultural lands	◀		▶	0
percent of basin area used as agricultural land	◀		▶	-10
N deposition on non-agricultural lands	◀		▶	0
fraction of total sewage N exported as DIN	◀		▶	0
amount of sewage N entering surface waters	◀		▶	0
fraction of anthropogenic non-point sources of N entering surface waters as DIN	◀		▶	0
fraction of non-anthropogenic non-point sources of N entering surface waters as DIN	◀		▶	0
fraction of total sewage N exported as DON	◀		▶	0
fraction of anthropogenic non-point sources of N entering surface waters as DON	◀		▶	0
percentage of total suspended solids (TSS) occurring as PN	◀		▶	0
river DIN retention	◀		▶	0
river DON retention	◀		▶	0

	-100	0	100	%
fertilizer P application	◀		▶	-30
manure P application	◀		▶	-10
P removed from agricultural lands via harvest and grazing	◀		▶	0
amount of sewage P entering surface waters	◀		▶	0
fraction of total sewage P export as DIP	◀		▶	0
fraction of anthropogenic non-point sources of P entering surface waters as DIP	◀		▶	0
river DIP retention	◀		▶	0
river DOP retention	◀		▶	0
fraction of anthropogenic non-point sources of P entering surface waters as DOP	◀		▶	0
fraction of total sewage P exported as DOP	◀		▶	0
percentage of total suspended solids (TSS) occurring as PP	◀		▶	0
total suspended solid load	◀		▶	0
total suspended solid yield	◀		▶	0
Population	◀		▶	0
Percentage Urban Population	◀		▶	0
GDP	◀		▶	0

Show Graph

Hide Graph



- **Measures via BMPs:** This option allows the user to specify the level of implementation for up to eight agricultural best management practices (BMPs). It is best suited for the agricultural sector interested in increased implementation of best practices, as it does not include measures from the wastewater or other point sources. Any BMP implementation selected by the user will represent the percentage of implementation above and beyond the year 2000. Implementation is only applied to the arable land in the basin (as determined by the Global NEWS model). Users can use the sliders to adjust the percentage. Select "Info" for more information about the BMP including a description, considerations for implementation, the nutrient reduction effectiveness estimates and references.

Best Management Practices

×

Select one of the Practices below and then adjust the level of implementation (default = 0%, 100% means that everywhere in the basin the practice is applied on the relevant areas). The graph then shows how the nitrogen and phosphorus loads change.

		Implementation	
		0	100
1 Nutrient Management	Info	<input type="range"/>	35 %
2 Riparian Forest Buffers	Info	<input type="range"/>	12 %
3 Riparian Grass Buffers	Info	<input type="range"/>	0 %
4 Conservation Tillage	Info	<input type="range"/>	20 %
5 Conservation Cover Crops	Info	<input type="range"/>	20 %
6 Wetland Restoration	Info	<input type="range"/>	0 %
7 Grazing/Pasture Management	Info	<input type="range"/>	0 %
8 Animal Waste Management Systems	Info	<input type="range"/>	0 %

Reset Sliders

Reset Practices

Hide Graph

Show Sliders

Show Graph

Close

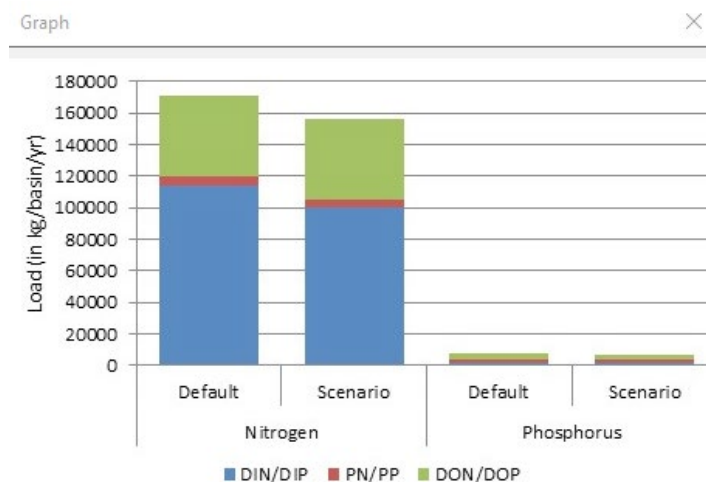
Using either option in Step 3, a “Graph” window will display which presents the nitrogen and phosphorus loading rates in kg/basin/yr for the “default,” or baseline conditions compared to the future “scenario.”

In the bar graph, each bar shows the total pollutant loading rate for nitrogen and for phosphorus under the default and future scenario. The bars are divided by the pollutant form, where the sum of DIN, PN and DON equates to total nitrogen, and the sum of DIP, PP and DOP equals total phosphorus. Below the bar chart, the results are presented in tabular form. The columns represent the pollutant form (e.g., DIN or DIP) with the results for nitrogen and phosphorus under the default and future scenarios listed across the rows. The percent difference between the two scenarios is also presented. At the bottom of the window, there is a row for ICEP results. ICEP values are provided for the river basin by the Global NEWS Model’s simulation of the effect of riverine nutrient and silica loads on the coastal zone. If nitrogen and phosphorus discharges are in excess over silicon with respect to diatom

requirements, harmful algal species may develop. Positive ICEP values indicate this potential for harmful algal blooms or eutrophication. Researchers have suggested the following categorization to gauge level of risk of eutrophication:

- > 5: Highest risk
- 1 to 5: High risk
- 1 to -1: Medium risk
- -1 to -5: Low risk
- < -5: Lowest risk

ICEP is an indicator for monitoring sustainable development goal (SDG) 14.1 which calls for countries to reduce marine pollution from land-based activities, including nutrient pollution by 2025. Therefore, these ICEP results make the Toolbox Calculator a valuable planning tool for evaluating options for meeting, and progress against achieving SDG 14.1 and other water quality goals.



		DIN/DIP	PN/PP	DON/DOP	Total	
Nitrogen	Default	113985	5474	51356	170816	kg/basin/y
	Scenario	99656	5474	50788	155918	kg/basin/y
	Difference	-12	0	-1	-8	%
Phosphorus	Default	1749	2279	3257	7286	kg/basin/y
	Scenario	1560	2279	3169	7009	kg/basin/y
	Difference	-10	0	-2	-3	%
ICEP	Default	-1.341				
	Scenario				-1.429	

## Acronym Guide

- **DIN** dissolved inorganic nitrogen
- **DIP** dissolved inorganic phosphorus
- **PN** particulate nitrogen
- **PP** particulate phosphorus
- **DON** dissolved organic nitrogen
- **DOP** dissolved organic phosphorus
- **ICEP** Index of Coastal Eutrophication Potential

## About the Global Partnership on Nutrient Management

The accelerated use of nitrogen and phosphorus is at the center of a complex web of development benefits and environmental problems. The Global Partnership on Nutrient Management (GPNM) is a response to this “nutrient challenge”—how to reduce the amount of excess nutrients in the global environment consistent with global development. The GPNM reflects a need for strategic, global advocacy to trigger governments and stakeholders to move towards lower nitrogen and phosphorous inputs to human activities. It provides a platform for governments, UN agencies, scientists and the private sector to forge a common agenda, mainstreaming best practices and integrated assessments, so that policymaking and investments are effectively “nutrient-proofed.” The GPNM also provides a space where countries and other stakeholders can forge more cooperative work across the variety of international and regional fora and agencies dealing with nutrients, including the importance of assessment work.

## Get Started

To learn more or to use the Global Nutrient Management Toolbox, visit:

**[nutrientchallenge.org/gpnm-toolbox](http://nutrientchallenge.org/gpnm-toolbox).**

## Contact

For more information on GPNM and the toolbox, please contact:

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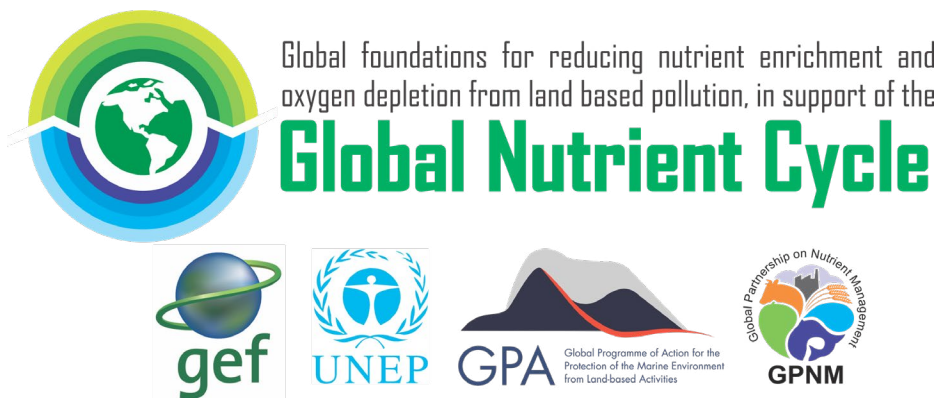
Nairobi, Kenya



## Partners

The Global Nutrient Management Toolbox was developed by Global Partnership on Nutrient Management partners—the World Resources Institute, the Energy Research Centre of the Netherlands, and the Global Environment and Technology Foundation—to demonstrate effective practices and policies for nutrient management.

The Toolbox was developed with funding support from the Global Environment Facility through the Global Foundations for Reducing Nutrient Enrichment and Oxygen Depletion from Land-Based Pollution, in Support of the Global Nutrient Cycle (GEF-GNC) Project.



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