

The Global Nutrient Management Toolbox Moving 'Nutrients Science' to Policy, to ACTION

LBSA Workshop for the Nairobi Convention GEF-WIOSAP Project

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Moving 'Nutrients Science' to Policy, to ACTION

- **Package of tools** to technical and policy enablers
- Strengthening of a **Global Partnership on Nutrient Management (GPNM)**
 - Conduit for delivery of tools to global interests



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



The University of the Philippines
Marine Science Institute



International
Nitrogen Initiative



Centre for
Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL



University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE



WORLD
RESOURCES
INSTITUTE

Knowledge on Nutrients to the World!

Global Nutrient Management Toolbox



<http://www.nutrientchallenge.org/gpnm-toolbox>

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THE NUTRIENT CHALLENGE

The challenge to produce more food and energy with less pollution

Global Partnership on Nutrient Management
GPNM

Welcome to the on-line platform of the Global Partnership on Nutrient Management (GPNM)

Learn about the challenges associated with the global use of nitrogen and phosphorus-based compounds and other nutrients in food production, their generation as by-products and their impacts on our natural environment, and learn of ways to improve efficiency of nutrient use and reduce pollution, while protecting the environment.

Search Widget

Text to search:

Username * Log in

Password *



Introduction to the GPNM Toolbox

- Purpose of the toolbox is to...
- **demonstrate policy and technological options, which offer potential solutions for managing nutrients to decision makers and practitioners alike**
- Core knowledge delivery for the Global Partnership on Nutrient Management (GPNM)
- Dynamic resource to be built by partnership contributors
- **...including YOU!!!**



Global Nutrient Management Toolbox

Features:

- Best management practice database
- Policy database
- Case studies
- Synthesis report
- Nutrient management policy framework
- Nutrient flux calculator tool

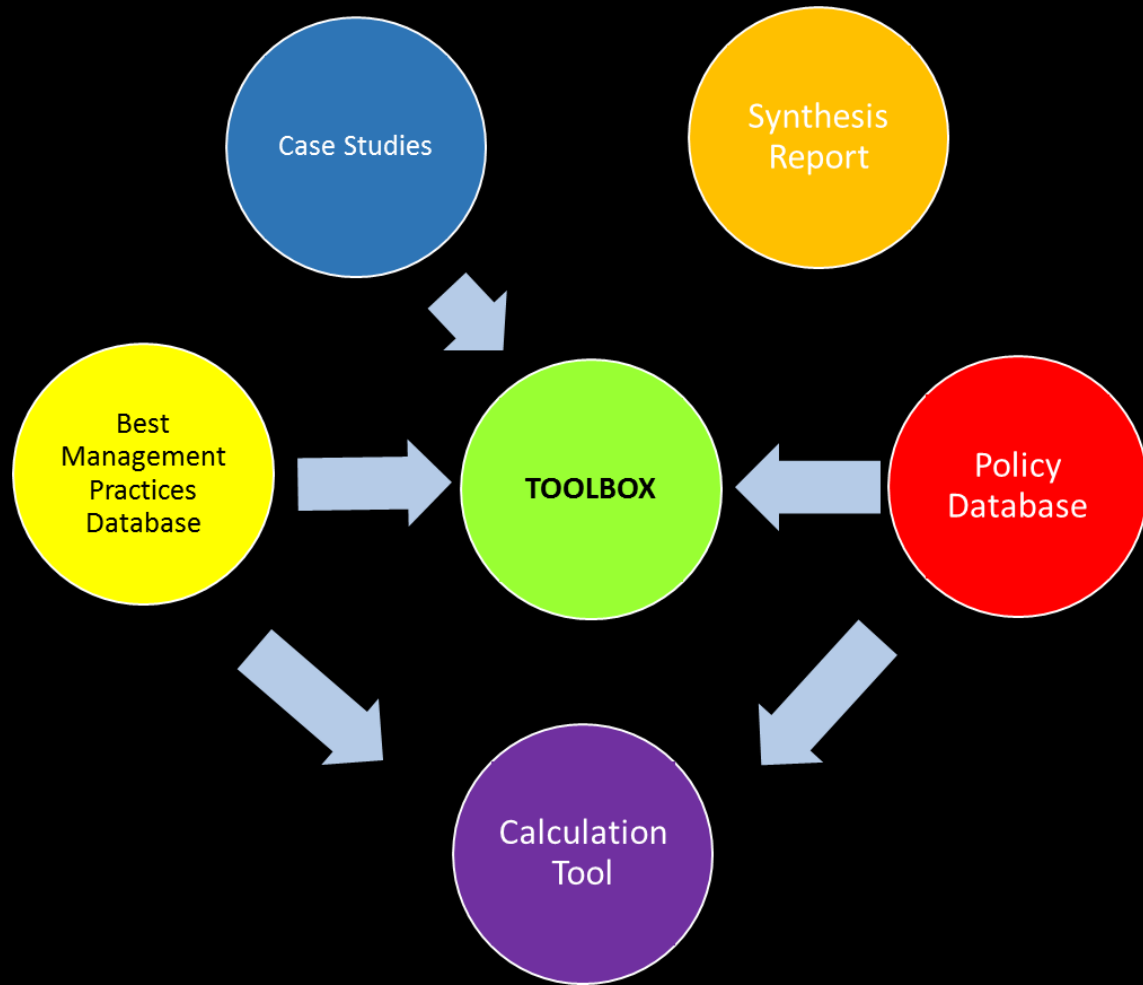


GLOBAL NUTRIENT MANAGEMENT TOOLBOX USER'S MANUAL

.....
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.



Elements of the toolbox



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GPNM Toolbox

type to search...

Home > Resources > GPNM Toolbox

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+

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News Items

Collaborative Approach Proposed for Reducing



Part A

Best management practice database

Policy database

Case studies

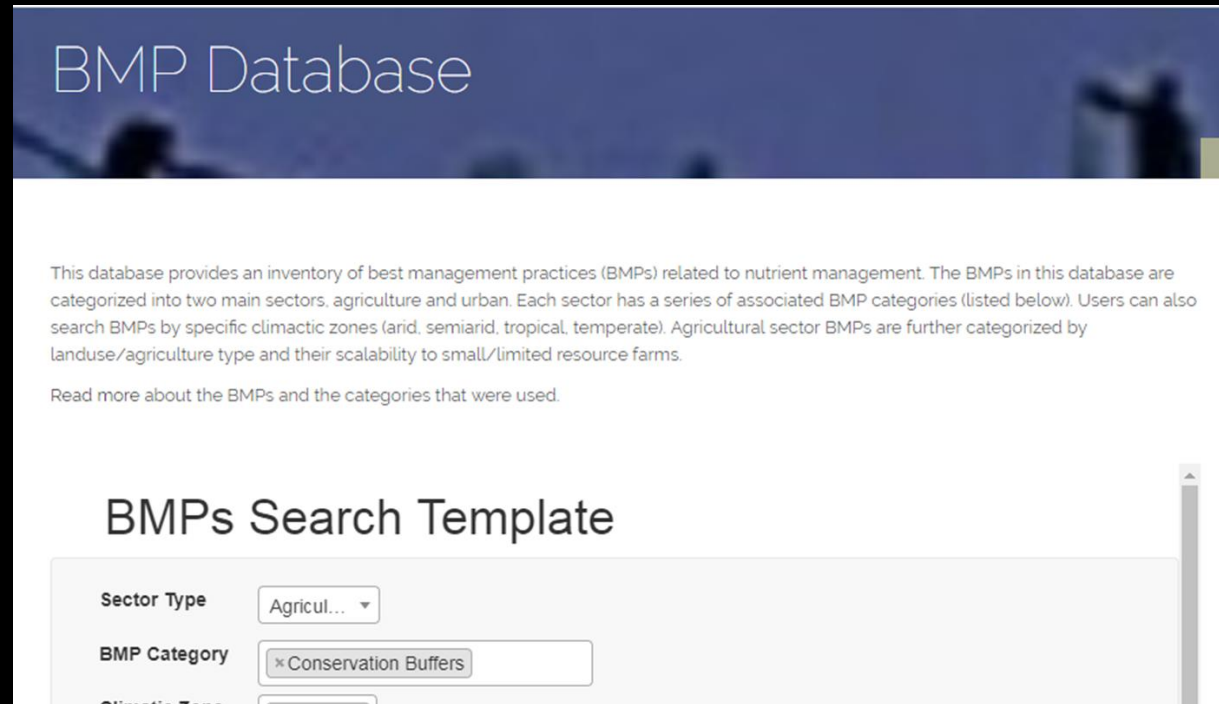
Synthesis report

Nutrient management policy framework

Best management practice (BMP) database

<http://www.nutrientchallenge.org/bmp-database>

- Examples of practices that reduce nutrient losses across agriculture and urban sectors
- Information about each practice such as a description, considerations for adoption, nutrient reduction effectiveness estimates and regional applicability.
- Use database to identify and research options for possible nutrient-reducing practices that could be implemented on farms and in cities.



The screenshot shows the homepage of the BMP Database. At the top, there is a blue header with the text "BMP Database". Below the header, there is a white section with a blue background image of people. The text in this section reads: "This database provides an inventory of best management practices (BMPs) related to nutrient management. The BMPs in this database are categorized into two main sectors, agriculture and urban. Each sector has a series of associated BMP categories (listed below). Users can also search BMPs by specific climactic zones (arid, semiarid, tropical, temperate). Agricultural sector BMPs are further categorized by landuse/agriculture type and their scalability to small/limited resource farms." Below this text, there is a link that says "Read more about the BMPs and the categories that were used." At the bottom of the screenshot, there is a section titled "BMPs Search Template" which contains a search form. The form has three fields: "Sector Type" with a dropdown menu showing "Agricul...", "BMP Category" with a text input field containing "x Conservation Buffers", and "Climatic Zone" with a text input field.

BMP Database

This database provides an inventory of best management practices (BMPs) related to nutrient management. The BMPs in this database are categorized into two main sectors, agriculture and urban. Each sector has a series of associated BMP categories (listed below). Users can also search BMPs by specific climactic zones (arid, semiarid, tropical, temperate). Agricultural sector BMPs are further categorized by landuse/agriculture type and their scalability to small/limited resource farms.

[Read more about the BMPs and the categories that were used.](#)

BMPs Search Template

Sector Type:

BMP Category:

Climatic Zone:

Best management practice (BMP) database

Practices searchable by: sector

Agriculture

Practices searchable by: category

- Conservation buffers
- Erosion control
- Drainage control
- Irrigation management
- Grazing management
- Wetland creation
- Etc.

Urban

- Detention
- Filtration
- Infiltration
- Septic management
- Urban erosion control
- Urban stream restoration
- Etc.

Best management practice (BMP) database

Practices searchable by: climatic zone

- Arid
- Semiarid
- Tropical
- Temperate



Practices searchable by: land use/agriculture type

- Animal confinement
- Fodder
- Palm oil
- Pasture
- Rice
- Row crop
- Small grains

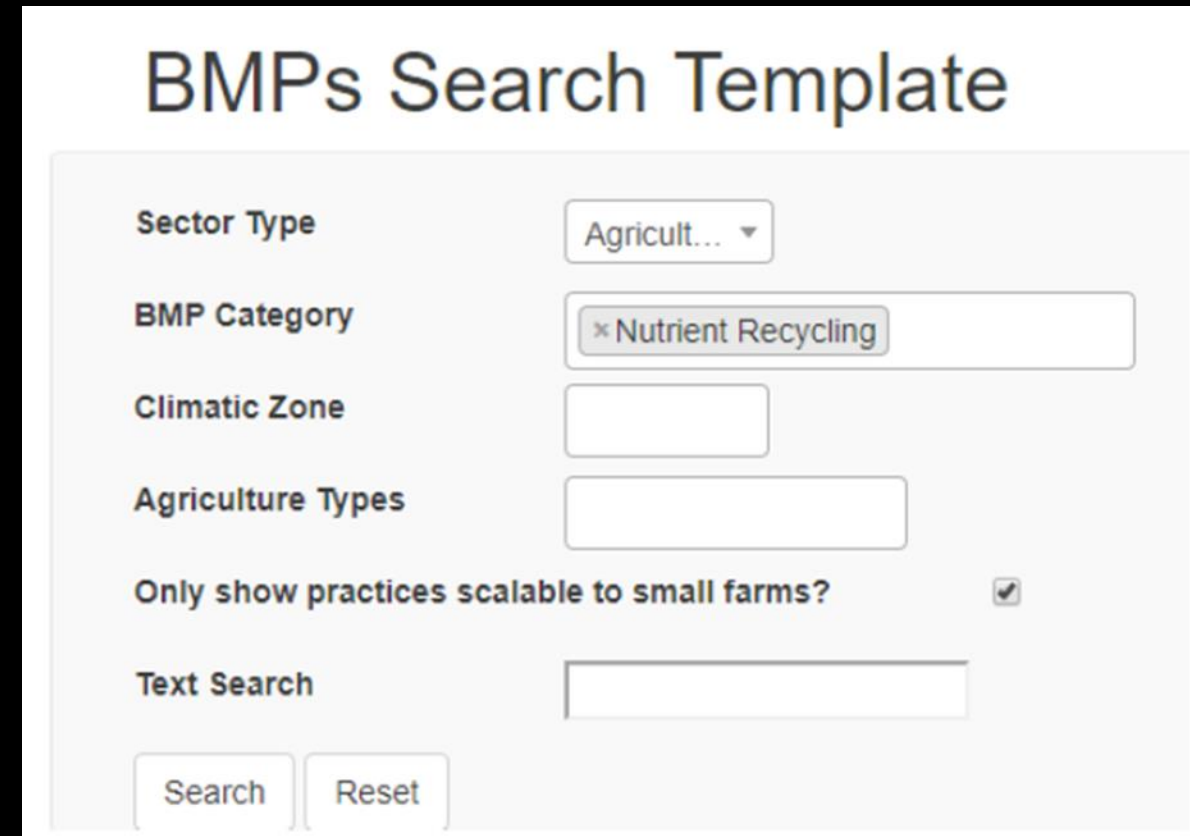


Practices searchable by: scalability to small farms

Only show practices scalable to small farms?

Searching the BMP Database

- Choose a sector: agriculture or urban.
- 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.
- 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



The image shows a web form titled "BMPs Search Template". It contains several input fields and a checkbox. The "Sector Type" field is a dropdown menu with "Agricult..." selected. The "BMP Category" field is a text input with "× Nutrient Recycling" entered. The "Climatic Zone" and "Agriculture Types" fields are empty text inputs. The "Only show practices scalable to small farms?" checkbox is checked. The "Text Search" field is an empty text input. At the bottom, there are "Search" and "Reset" buttons.

BMPs Search Template

Sector Type: Agricult... ▾

BMP Category: × Nutrient Recycling

Climatic Zone: [Empty]

Agriculture Types: [Empty]

Only show practices scalable to small farms?

Text Search: [Empty]

Search Reset

Searching the BMP Database

- After clicking “Search,” relevant BMPs meeting the search criteria will be displayed.
- 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
- Results can be viewed on the website; user can click to download “My Results” or “All BMPs” to an Excel spreadsheet

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. ¹

Scalable to small farms? Yes

¹ Selman, Mindy, and Suzie Greenhaigh. "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.



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

Policy database

<http://www.nutrientchallenge.org/policy-database>

- Examples of policy instruments implemented to address nutrient pollution from agriculture, aquaculture, fisheries, transport, urban and wastewater sectors.
- Policies 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

Policy Database

This policy database provides an overview of various policy instruments around the globe that have been implemented to address nutrient pollution. The database includes a wide range of policies that decision-makers can reference when considering options and approaches to reduce nutrient losses and can be searched by policy category, policy type, region, country and/or sector. Policies are categorized as follows (policy taxonomy borrowed from Greenhalgh & Selman 2014):

- Environmental outreach & education—including environmental education; public awareness; and technical assistance.
- Regulatory approaches—including environmental bans & restrictions; environmental standards; environmental caps & limits; and regulatory frameworks.
- Priced-based instruments – including taxes, fees and levies; tax credits & rebates; subsidies, grants & incentive payments; low-interest loans; and income support.
- Market-based instruments—including environmental markets (regulated and voluntary); auctions & tenders; and ecolabeling.
- Ecosystem preservation and restoration—including ecosystem restoration; protected areas; land purchases; covenants and easements; and stewardship agreements.
- Institution and capacity—including institutional capacity; transparency & accountability; bridging institutions; partnerships; and frameworks & guidance.
- Research, monitoring, and evaluation—including research; monitoring; evaluation; and biophysical models.

[Read more about the Policy Database and the different categories.](#)

Policy database

Practices searchable by: region

- Asia
- Europe
- Middle East
- North America
- Oceania
- South America

Practices searchable by: sector

- Agriculture
- Aquaculture
- Fisheries
- Mixed
- Transport
- Urban
- Wastewater



Searching the Policy database

- Entries searchable by category, type, region and/or sector
- Explore approaches in other parts of the world that may be applicable to your country/region
- Choose one or more of the seven policy categories from the drop-down menu.
- Search for a specific policy type(s) within that category
 - May limit search to policies in specific regions or sectors
- After clicking on “Search,” results will be displayed
- Also choose to download “My Results” or “All Policies” to see the policies of interest in an Excel-based format.
- 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

Region: Environmental Caps & Limits

Sector: Environmental Standards

Text Search: Regulatory Frameworks

Search Reset

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](#)


Case Studies

<http://www.nutrientchallenge.org/case-studies>

- **Highlight interventions** practitioners to achieve nutrient management objectives at a catchment or other local scale.
- **Examples:** voluntary programs for farmers to practice better management of land and water resources, demonstrations of new methodologies for quantifying reductions in nutrients and models of inter-country cooperation around transboundary waters
- Each case study provides **background on the issue, objectives, description** of the intervention and the **outcomes**
- Many 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 Strategem

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.

[Zoltveghabcs.pdf](#)

Impacts of Manure Management Practices on Stream Microbial Loading

Name: Impacts of Manure Management Practices on Stream Microbial Loading

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

Synthesis Report

<http://www.nutrientchallenge.org/synthesis-report>

- Considers 8 high-priority best environmental practices
 - **examine scalability of practices** for smallholder and limited resource farmers in key **nutrient “hotspot” regions**: Chilika Lake, India; Lake Victoria, Africa; and Manila Bay, Philippines
- Identify scalable practices that could be considered priorities to incentivize or otherwise promote through various approaches



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 module¹.

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.pdf

Nutrient Management Policy Framework

<http://www.nutrientchallenge.org/nutrient-management-policy-framework>

- Inform nutrient management policies and present **opportunities for scaling up the implementation** of key best practices
- Designed to be a workable framework for a country or region looking to develop a nutrient management policy.
- Provides **information on key components of a nutrient management policy**
 - includes examples of specific mechanisms within each element
- Framework shares **specific examples of promising strategies** recently piloted in two developing countries, India and the Philippines

Framework Elements	Example Mechanisms
Science-Based Holistic Approach	Water Quality and Pollution Source Monitoring Predictive Models Determination and Allocation of Allowable Pollutant Loads
Legislative and Regulatory Components	Environmental Standards Compliance and Enforcement Mechanisms
Voluntary Programs for Agriculture	Voluntary Practice-Based Standards Education and Outreach to Farmers Technical Assistance Programs
Economic Policy Instruments for Nonpoint Source Pollution Control	Environmental Cross-Compliance Requirements Subsidies for Conservation Practices and Environmental Protection Payments for Ecosystem Services Water Quality Trading Programs
Public Education and Participation	
Flexibility and Adaptation	

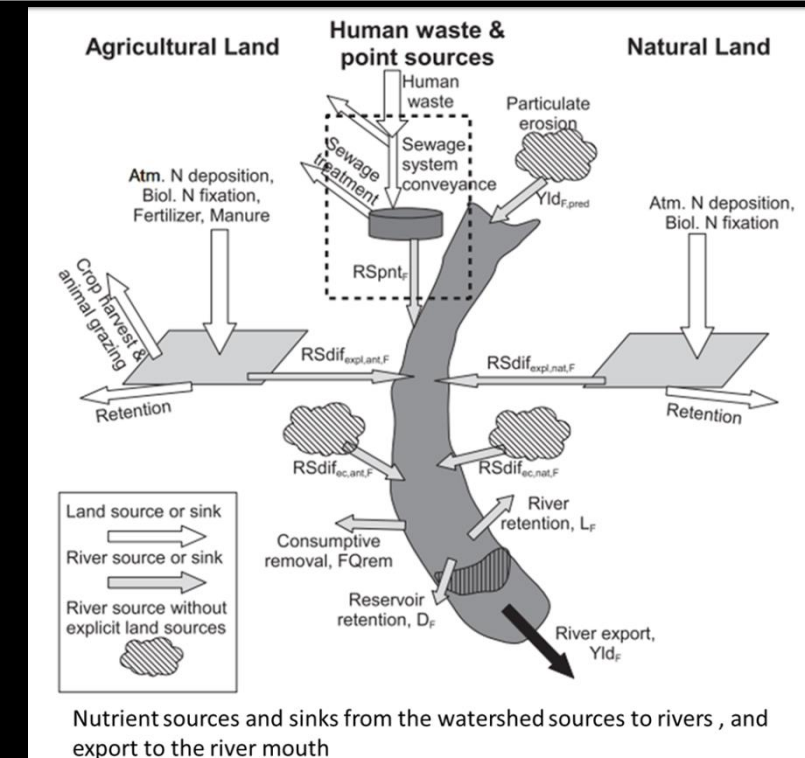
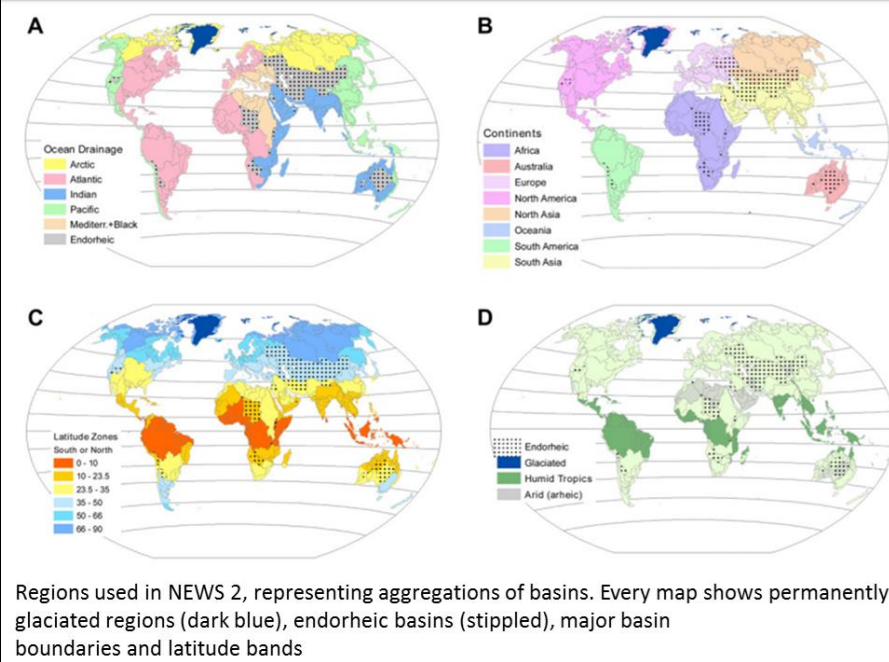


Part B

Nutrient flux calculator

Nutrient calculator - predicting nutrient loads from river basins

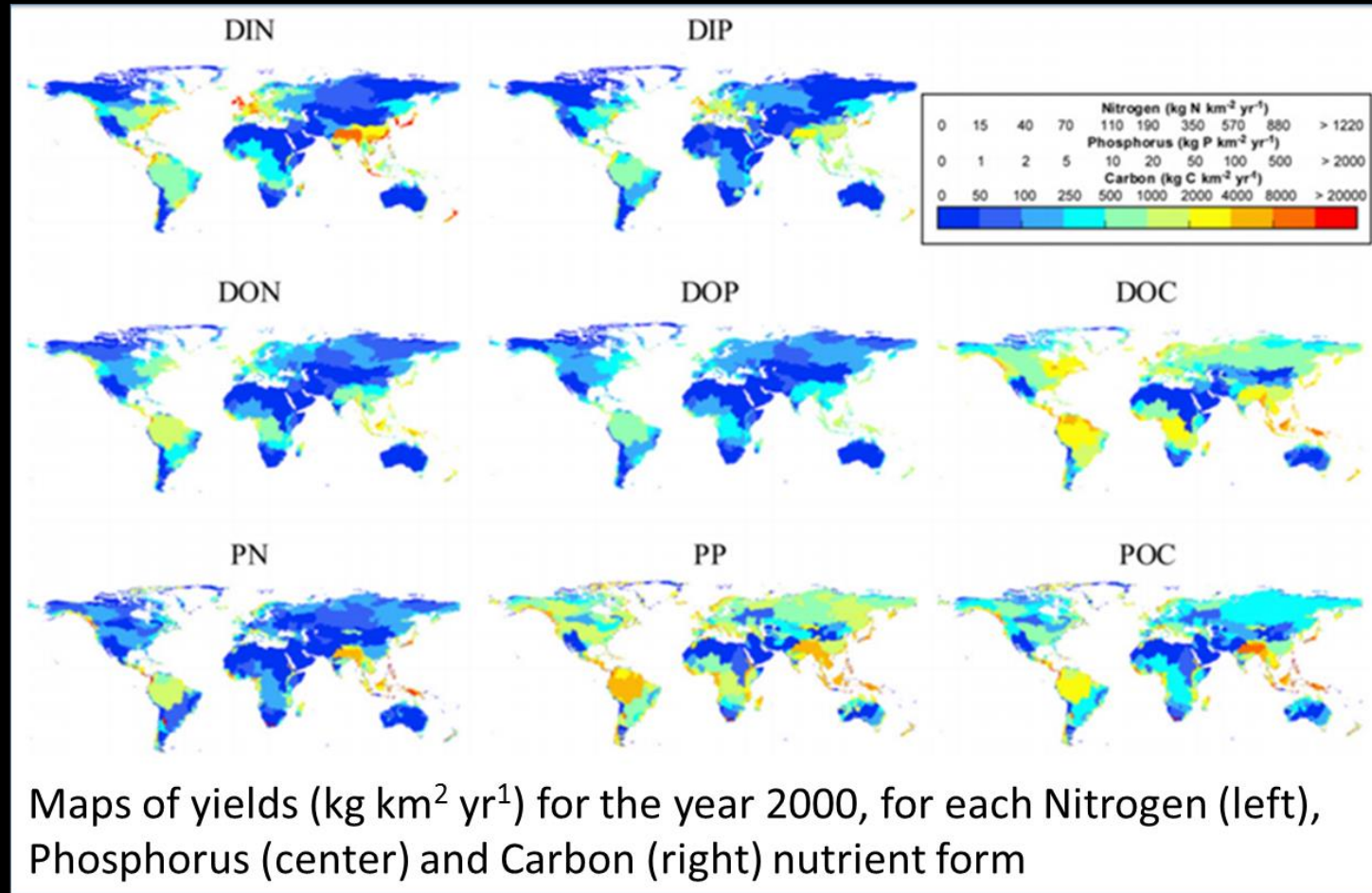
- Uses the **Global Nutrient Export from WaterSheds (NEWS) model** to estimate the current status of total nitrogen and phosphorus loads (i.e., dissolved inorganic, dissolved organic, and particulate) in more than 5,000 major river basins around the world.
- **Evaluate nutrient loading implications of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



Predicting nutrient loads from river basins

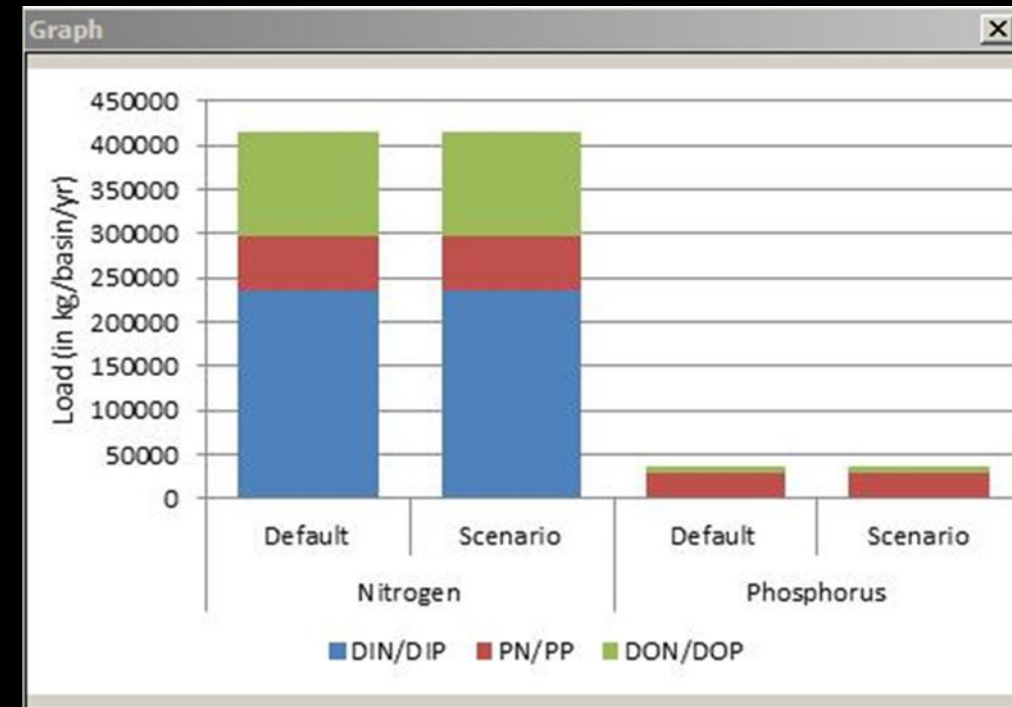
- **Global NEWS** is a global, spatially explicit, multi-element and multi-form model of nutrient exports by rivers.
- **Key reference:** Global Nutrient Export from WaterSheds 2 (NEWS 2): Model development and implementation

<http://staff.washington.edu/emilio/pubs/Mayorga2010-EMS-GlobalNEWS2.pdf>



Predicting nutrient loads from river basins

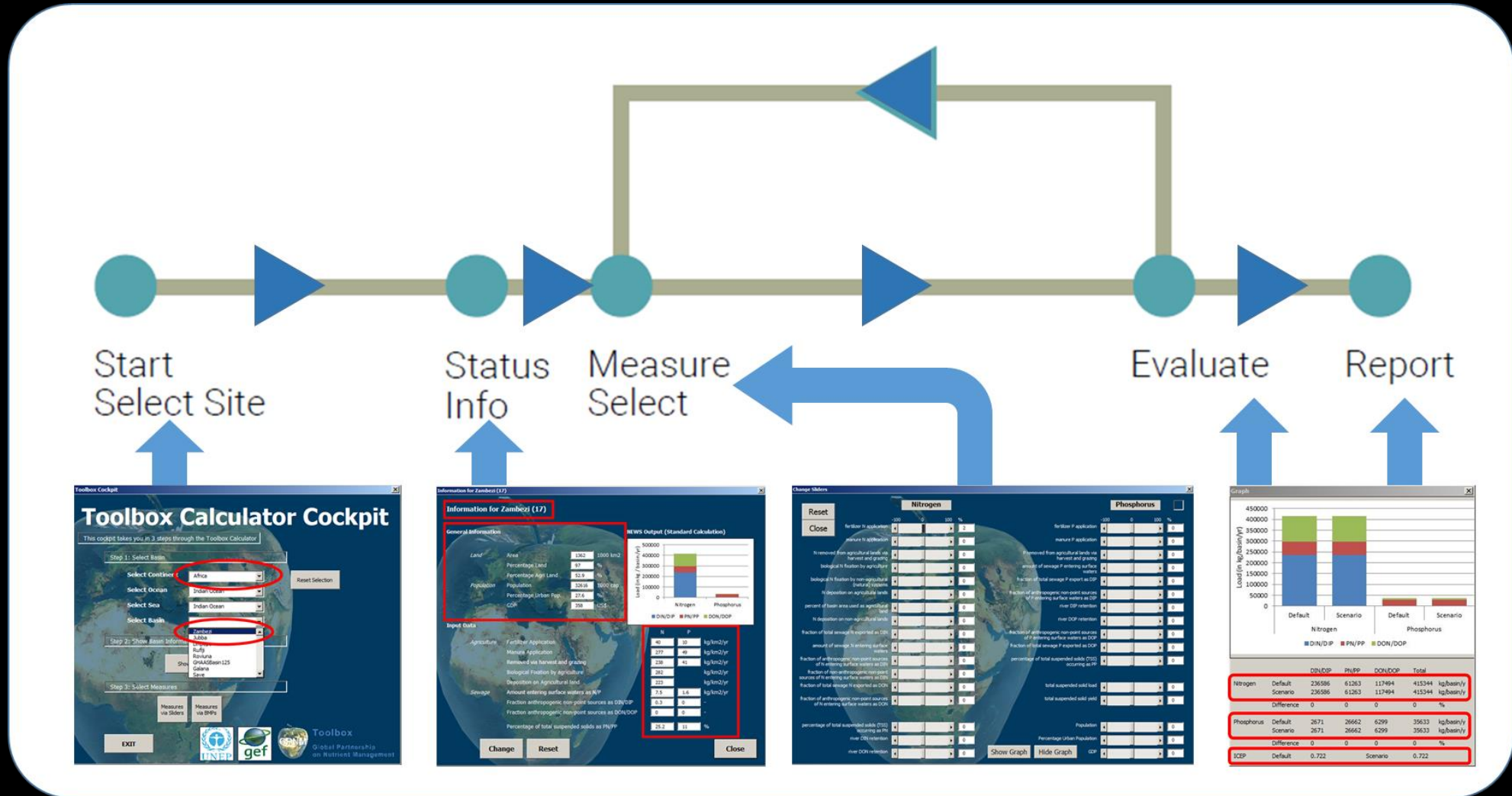
- Each bar presents nitrogen and phosphorus loading rates in kg/basin/yr for the **“default,” or baseline conditions compared to the future “scenario.”**
- Bars divided by nutrient pollutant form:
 - sum of **dissolved inorganic N (DIN)**, **particulate N (PN)** and **dissolved organic N (DON)** = **total nitrogen**
 - sum of **dissolved inorganic P (DIP)**, **particulate P (PP)** and **dissolved organic P (DOP)** = **total phosphorus**
- Percent difference between the two scenarios is also presented.
- Bottom: **Index of Coastal Eutrophication Potential (ICEP)** results
 - Positive ICEP values indicate this potential for harmful algal blooms or eutrophication.



		DIN/DIP	PN/PP	DON/DOP	Total	
Nitrogen	Default	236586	61263	117494	415344	kg/basin/y
	Scenario	236586	61263	117494	415344	kg/basin/y
	Difference	0	0	0	0	%
Phosphorus	Default	2671	26662	6299	35633	kg/basin/y
	Scenario	2671	26662	6299	35633	kg/basin/y
	Difference	0	0	0	0	%
ICEP	Default	0.722				
	Scenario				0.722	

Predicting nutrient loads from river basins

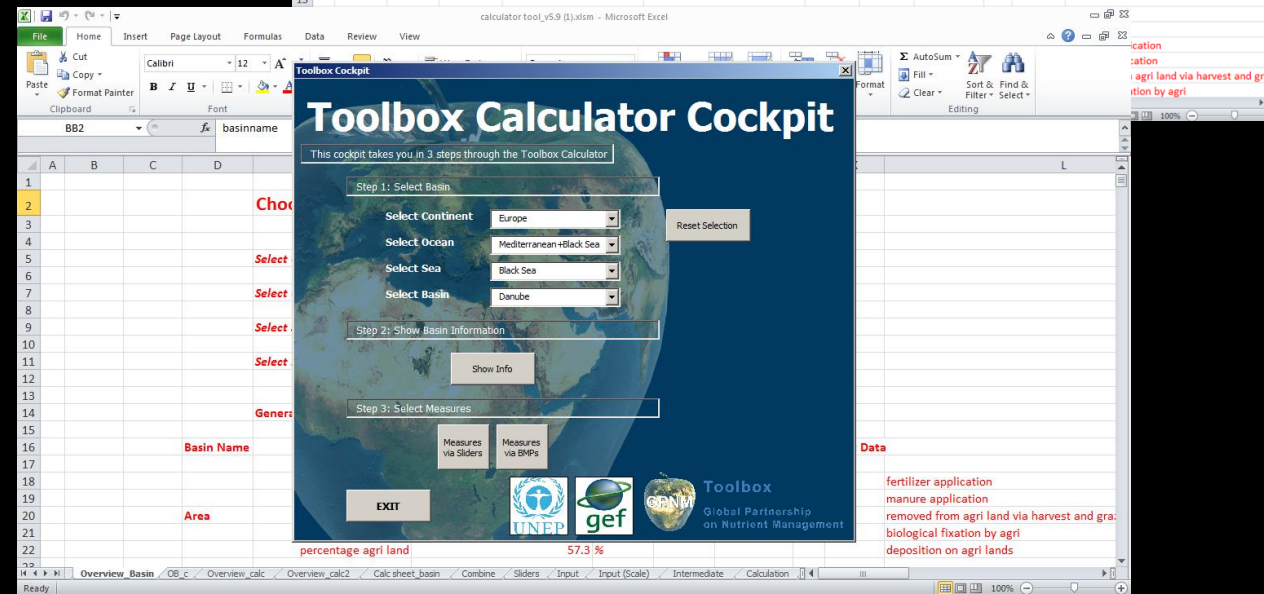
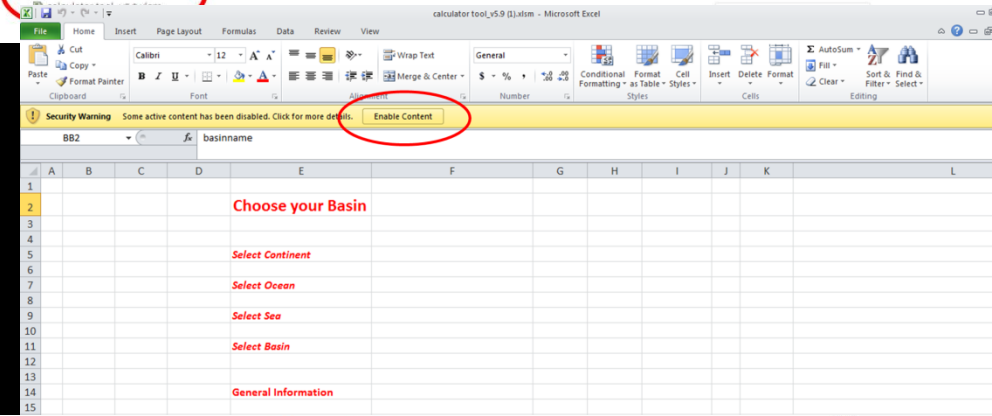
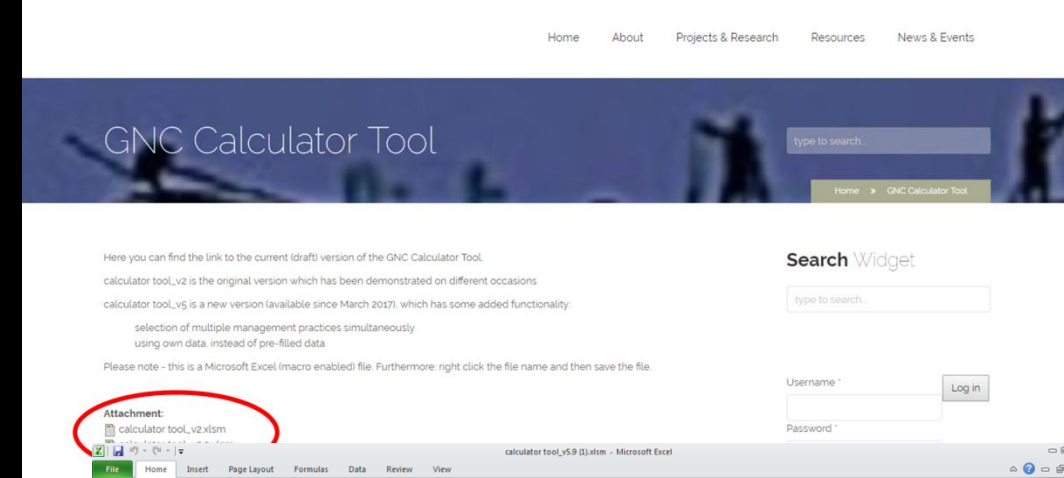
Nutrient calculator Process Flow



Accessing the Nutrient Calculator

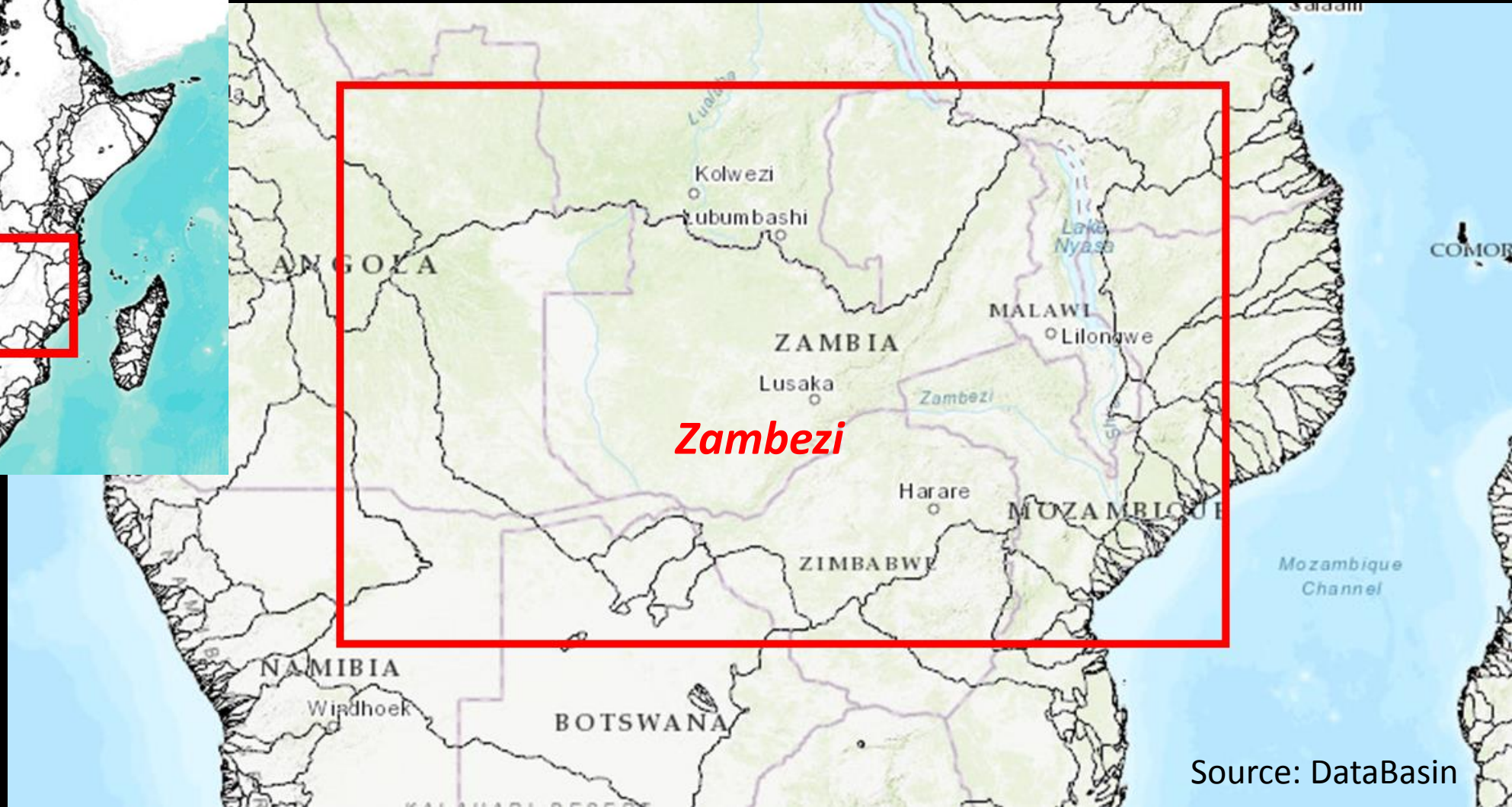
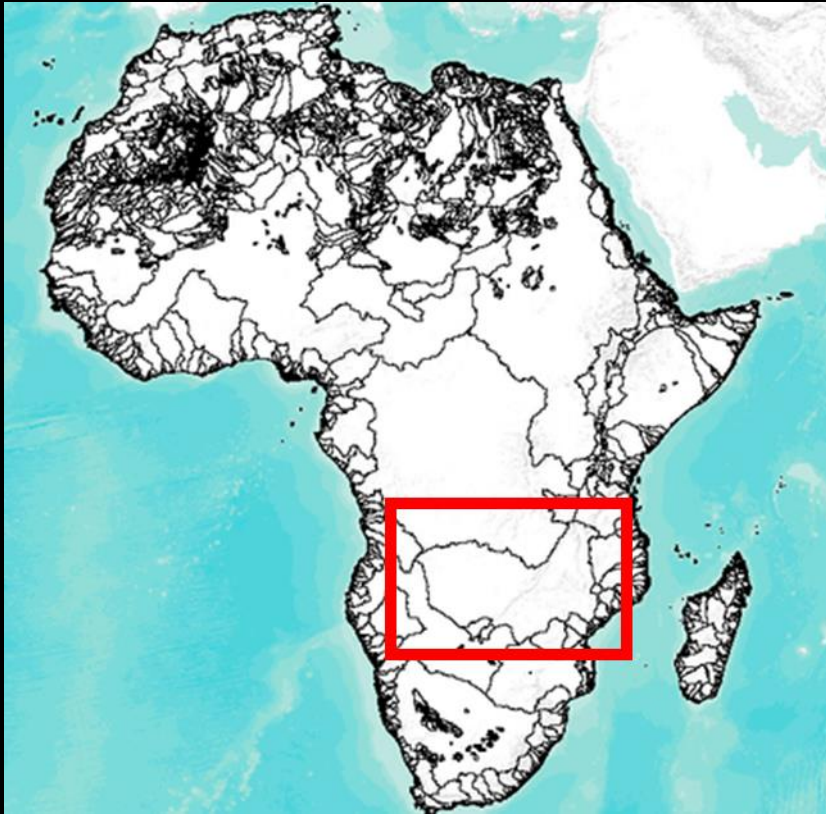
<http://www.nutrientchallenge.org/calculator%20tool>

- Click on Excel file; use calculator tool_v5.9.xlsm
- File will download
- Open the Excel file, you will see the above image of the back end of the calculator
- Click Enable content
- User interface will open it.



Let's explore!!

Example – Zambezi River



Opening screen
>>Select the basin

The screenshot shows the 'Toolbox Calculator Cockpit' interface. At the top, the title 'Toolbox Calculator Cockpit' is displayed in large white font. Below the title, a subtitle reads 'This cockpit takes you in 3 steps through the Toolbox Calculator'. The interface is divided into three main sections:

- Step 1: Select Basin:** This section contains four dropdown menus: 'Select Continent' (set to Africa), 'Select Ocean' (set to Indian Ocean), 'Select Sea' (set to Indian Ocean), and 'Select Basin'. The 'Select Basin' dropdown is open, showing a list of basins with 'Zambezi' selected. A red circle highlights the 'Africa' dropdown, and another red circle highlights the 'Zambezi' selection in the 'Select Basin' dropdown.
- Step 2: Show Basin Information:** A 'Show' button is visible next to the 'Select Basin' dropdown.
- Step 3: Select Measures:** Two buttons are present: 'Measures via Sliders' and 'Measures via BMPs'.

Additional elements include a 'Reset Selection' button on the right side and an 'EXIT' button at the bottom left. The bottom right corner features logos for UNEP, gef, and the Global Partnership on Nutrient Management (GPNM), along with the text 'Toolbox Global Partnership on Nutrient Management'. The background of the interface is a satellite-style map of the African continent.

General information on basin of interest

- Input data on agriculture and sewage, total loadings of N and P in kg/basin/yr
- Data displayed represent default values from the Global NEWS model's 2000 baseline

User may edit fields in white boxes if they have better data for the basin of interest. Default values may be returned by selecting the "Reset" button. Closing and re-opening the application will also reset the values.

Information for Zambezi (17)

Information for Zambezi (17)

General Information

Land	Area	<input type="text" value="1362"/>	1000 km ²
	Percentage Land	<input type="text" value="97"/>	%
	Percentage Agri Land	<input type="text" value="52.9"/>	%
Population	Population	<input type="text" value="32616"/>	1000 cap
	Percentage Urban Pop.	<input type="text" value="27.6"/>	%
	GDP	<input type="text" value="358"/>	US\$

NEWS Output (Standard Calculation)

Category	DIN/DIP	PN/PP	DON/DOP
Nitrogen	~240,000	~50,000	~120,000
Phosphorus	0	~30,000	0

Input Data

	N	P	
Agriculture	<input type="text" value="40"/>	<input type="text" value="10"/>	kg/km ² /yr
Manure Application	<input type="text" value="277"/>	<input type="text" value="49"/>	kg/km ² /yr
Removed via harvest and grazing	<input type="text" value="238"/>	<input type="text" value="41"/>	kg/km ² /yr
Biological Fixation by agriculture	<input type="text" value="282"/>		kg/km ² /yr
Deposition on Agricultural land	<input type="text" value="223"/>		kg/km ² /yr
Sewage	<input type="text" value="7.5"/>	<input type="text" value="1.6"/>	kg/km ² /yr
Fraction anthropogenic non-point sources as DIN/DIP	<input type="text" value="0.3"/>	<input type="text" value="0"/>	-
Fraction anthropogenic non-point sources as DON/DOP	<input type="text" value="0"/>	<input type="text" value="0"/>	-
Percentage of total suspended solids as PN/PP	<input type="text" value="25.2"/>	<input type="text" value="11"/>	%

Change Reset Close

Scenario evaluation

Two ways to evaluate scenarios

1. Measures via 'sliders'
2. Measures via BMPs

Toolbox Cockpit

Toolbox Calculator Cockpit

This cockpit takes you in 3 steps through the Toolbox Calculator

Step 1: Select Basin

Select Continent: Africa

Select Ocean: Indian Ocean

Select Sea: Indian Ocean

Select Basin: Zambezi

Reset Selection

Step 2: Show Basin Information

Show Info

Step 3: Select Measures

Measures via Sliders

Measures via BMPs

EXIT

UNEP

gef

GPNM

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Scenario evaluation

Measures via 'BMPs': User specifies level of implementation by % for up to eight agricultural best management practices (BMPs) within arable lands in basin. Does not include measures from the wastewater or other point sources.

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.

Practice	Implementation (%)
1 Nutrient Management	0
2 Riparian Forest Buffers	0
3 Riparian Grass Buffers	0
4 Conservation Tillage	0
5 Conservation Cover Crops	0
6 Wetland Restoration	0
7 Grazing/Pasture Management	0
8 Animal Waste Management System	0

Measures via Sliders: Selection of actions by relative % of implementation to adjust N and P 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.

Action	Implementation (%)
fertilizer N application	2
manure N application	0
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	0
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
fertilizer P application	0
manure P application	0
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

Scenario evaluation

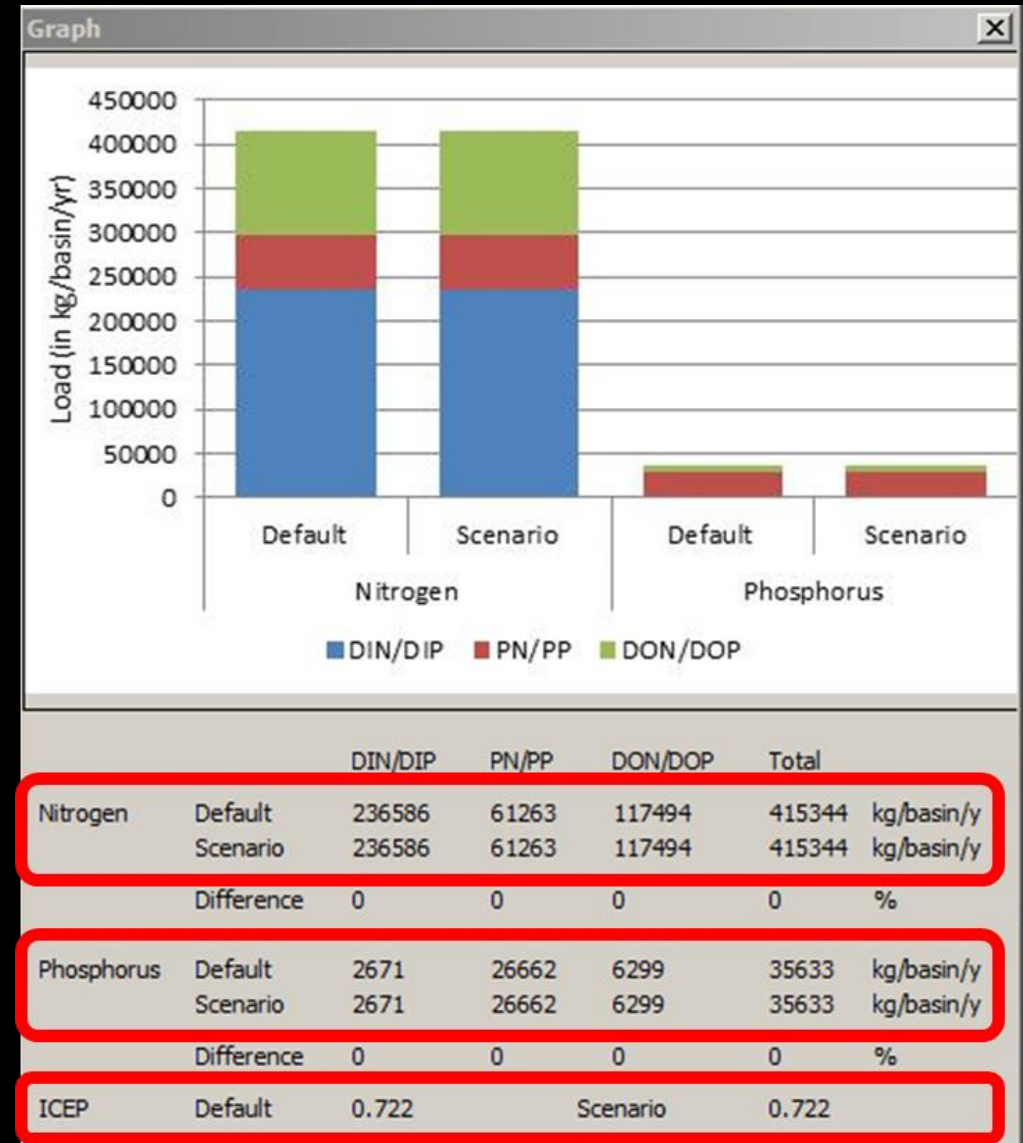
Best Management Practices

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
- 2 Riparian Forest Buffers
- 3 Riparian Grass Buffers
- 4 Conservation Tillage
- 5 Conservation Cover Crops
- 6 Wetland Restoration
- 7 Grazing/Pasture Management
- 8 Animal Waste Management System

Buttons: Reset Sliders, Reset Practices, Hide Graph, Show Sliders, Show Graph, Close



1. **Default** estimates of N and P
2. **Scenario** estimates – generated based on implementation of BMPs

Information on the best management practice

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.

Practice	Implementation	%
1 Nutrient Management	Info <input type="text" value="0"/>	0 %
2 Riparian Forest Buffers	Info <input type="text" value="0"/>	0 %
3 Riparian Grass Buffers	Info <input type="text" value="0"/>	0 %
4 Conservation Tillage	Info <input type="text" value="0"/>	0 %
5 Conservation Cover Crops	Info <input type="text" value="0"/>	0 %
6 Wetland Restoration	Info <input type="text" value="0"/>	0 %
7 Grazing/Pasture Management	Info <input type="text" value="0"/>	0 %
8 Animal Waste Management System	Info <input type="text" value="0"/>	0 %

Buttons: Reset Sliders, Reset Practices, Hide Graph, Show Sliders, Show Graph, Close

BMP Information

Nutrient Management

Description

Nutrient management is a set of conservation practices designed to ensure that nutrients are applied according to crop needs and in a way that they can be utilized most effectively by the crop and reduce losses from the field. The core principals of nutrient management, often referred to as the 4 R's of nutrient stewardship, refer to applying the right source of plant nutrients, at the right rate, at the right time, and at the right place. Proper nutrient management can result in the reduced need for fertilizers, higher yields, and reduced environmental impacts. Nutrient management tools and techniques for ensuring proper rate, timing, placement and balance of nutrients can include nutrient management plans, soil and plant tissue testing, fertilizer incorporation, split fertilizer applications, and so on.

Considerations

Nutrient management is one of the most cost-effective best management practices and can in fact result in reduced costs to the producer through reduced fertilizer application with little to no trade-offs in yield. Low tech and high tech options exist for implementing good nutrient management practices. Many other practices, such as manure management are components of nutrient management. Nutrient management is often based on soil testing and crop testing and understanding of soil, climate and cropping practices.

Efficiency

Nitrogen	Phosphorus	Sediment
5-9.25%	8-10%	

Source (efficiency)

"Nutrient Application Management." Chesapeake Bay Program. Web. Sept. 2014. <http://www.chesapeakebay.net/.

Source (information)

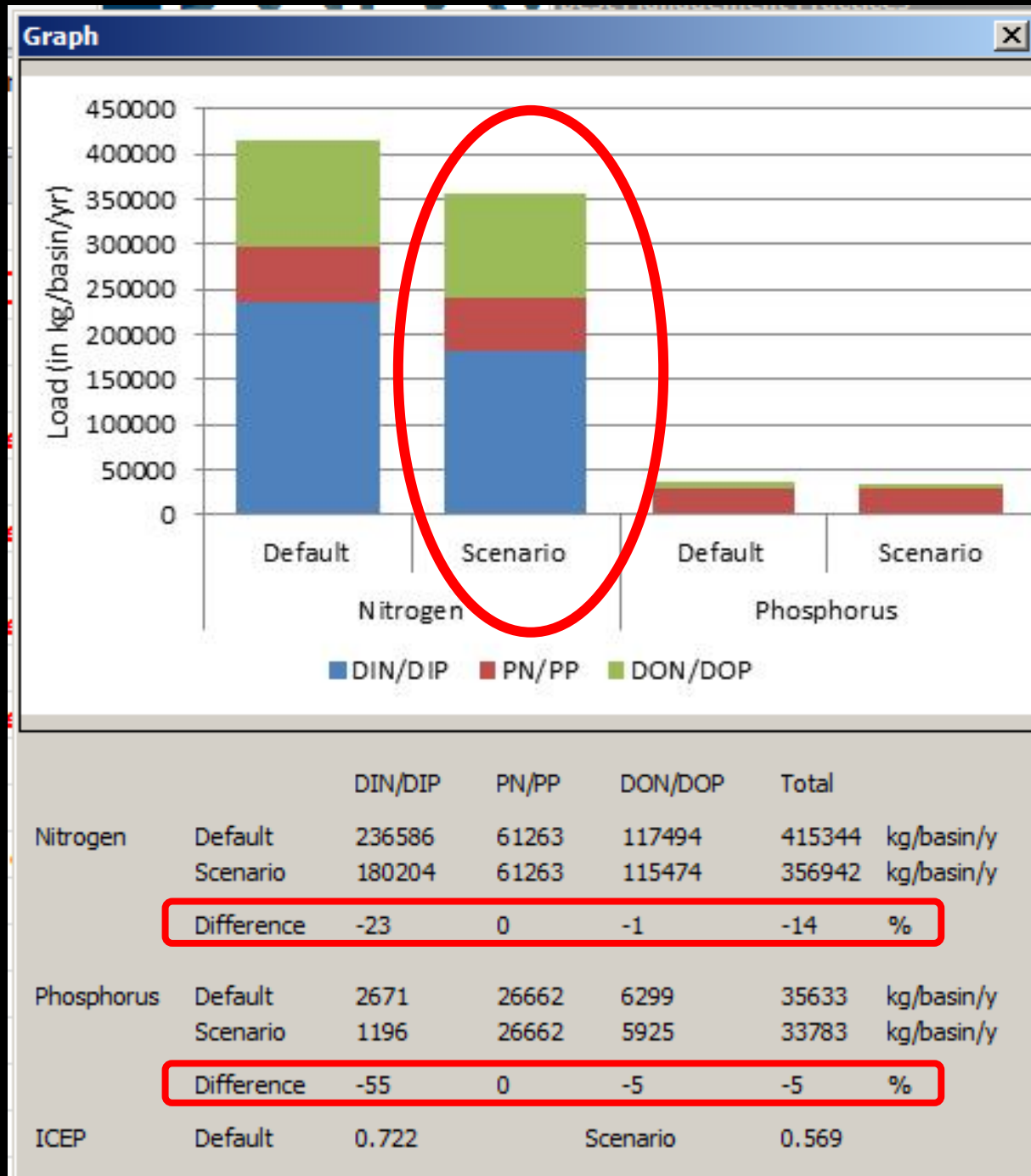
Kaushik Majumdar, Adrian M. Johnston, Sudarshan Dutt, T. Satyanarayana, and Terry L. Roberts. Indian Journal of Fertilizers., (2013). Fertiliser Best Management Practices. Concept, Global perspectives and Applications. Volume 9 (4), pp. 14-31.

Close

Measures via BMPs

Scenario evaluation

Move the sliders – In this case 100% implementation of best management practices



Predicting coastal eutrophication

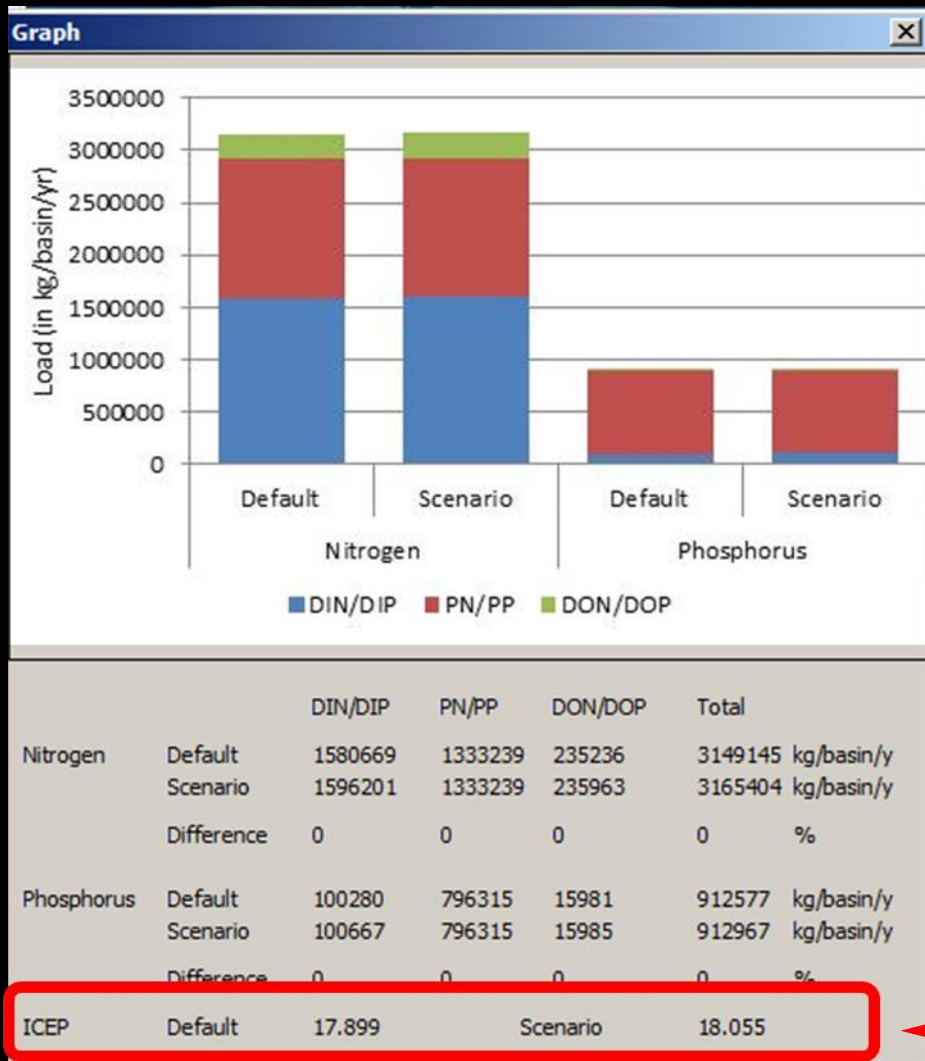
Ecosystem impacts

- ICEP is an indicator for monitoring SDG target SDG 14.1
- **Indicate relative dominance between diatoms and algal species (leads to eutrophic conditions)**
- Positive ICEP values indicate this potential for harmful algal blooms or eutrophication.
- Researchers have suggested the following categorization - **gauge level of risk of eutrophication** in coastal waters
 - > 5: Highest risk
 - 1 to 5: High risk
 - 1 to -1: Medium risk
 - -1 to -5: Low risk
 - <-5: Lowest risk

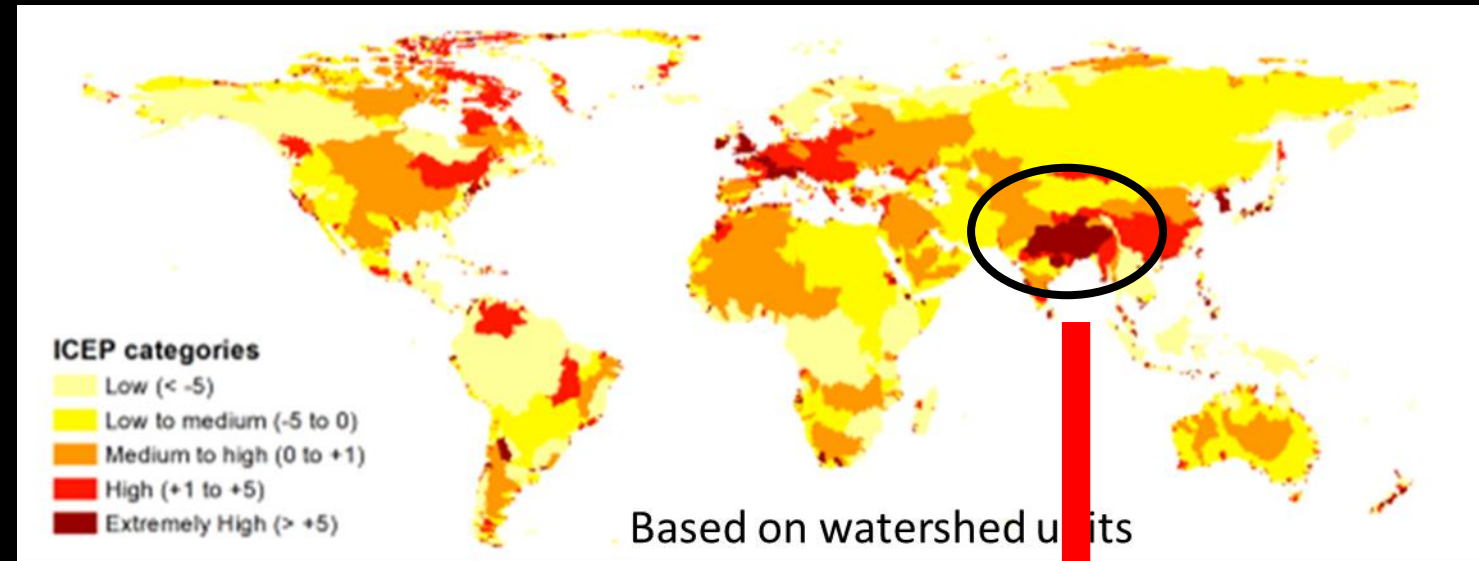


Predicting coastal eutrophication

Example of the Ganges Basin; high nutrient loading delivery



- Index of Coastal Eutrophication Potential
- Ratio between delivery of N, P and Si from watershed
- **ICEP value: 17.9 (> 5: Highest risk)**

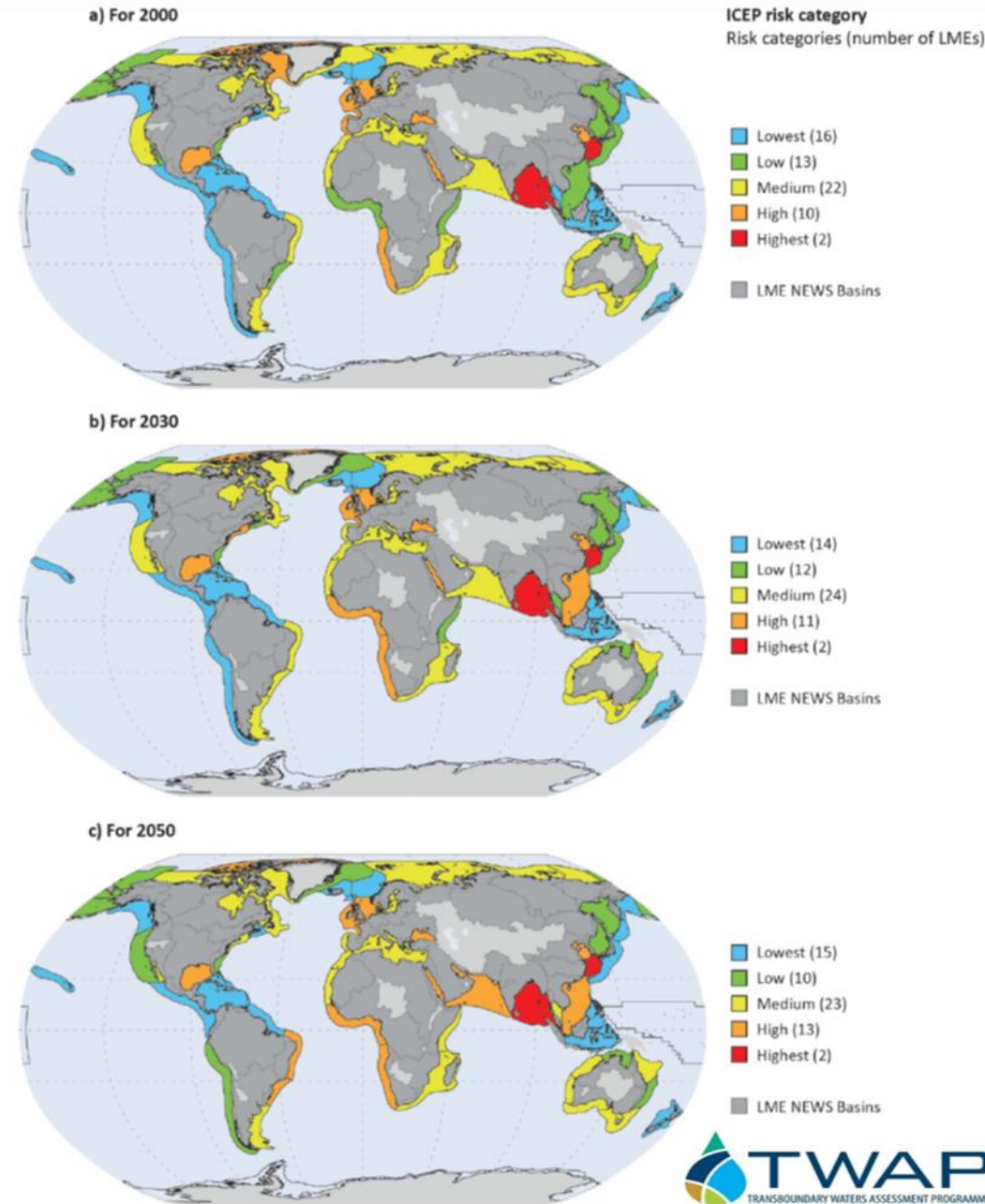


Predicting coastal eutrophication

Global-scale policy considerations

- Future scenarios by large marine ecosystems based on ICEP values (TWAP project)
- NOTE: the spatial influences over the LME is not uniform!
- (maps are illustrative)
- Impacts will be related to coastal ecosystems in receiving environments in river discharge areas
- Value: support regional-scale policy to address land-based pollution

Figure 7.12 Index of Coastal Eutrophication Potential (ICEP) risk categories for LMEs for a) 2000, b) 2030, and c) 2050. Based on the ratio of nutrients (N and P relative to Si) entering LMEs from rivers, potential for non-siliceous harmful algae blooms is 'high' or 'highest' in 12 LMEs. The risk is most evident in portions of southern and eastern Asia, Western Europe and Gulf of Mexico, although also applying to LMEs in a number of other regions. If current trends continue, the potential for non-siliceous harmful algae blooms will have increased in 12 LMEs by 2050 relative to 2000 conditions.



What can we take from this?

- Use tool as a starter for understanding LBS loading from point and non-point sources from river basins
- Contribute to work in improving the tool
- Developers collaborating to expand functionality to allow users to include local data
- Use in conjunction with local datasets
- Contributions to the SDG target 14.1; also 6.3 on freshwater quality
- Contribute to the LBSA protocol



Contribution to...



SUSTAINABLE DEVELOPMENT

GOALS

Core SDG targets

- Target 6.3 – good ambient water quality
- Target 14.1 – reduced nutrient pollution in the marine environment



Resources and contact information

Collaborators in GPNM Toolbox development and support

- **Albert Bleeker**, Albert.Bleeker@pbl.nl; PBL Netherlands Environmental Assessment Agency
- **Sara Walker**, SWalker@wri.org; World Resources Institute
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Global NEWS Model development, nutrient modelling

- **Lex Bouwman**, Lex.Bouwman@pbl.nl; **Arthur Beusen**
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Contact at United Nations Environment Programme

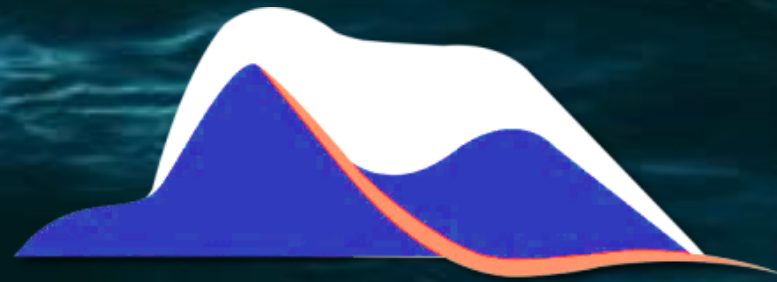
- **Christopher Cox**, christopher.cox@un.org; UN Environment

**For more information
visit us at**

<https://www.unenvironment.org/explore-topics/oceans-seas/what-we-do/addressing-land-based-pollution>



**United Nations
Environment Programme**



GPA

**Global Programme of Action for the
Protection of the Marine Environment
from Land-based Activities**