WORLD RESOURCES INSTITUTE

GLOBAL TOOLBOX FOR NUTRIENT MANAGEMENT

GEF IWC8 • Nutrient Management Training Roundtable

May 9, 2016

SARA WALKER

INTRODUCTION TO THE TOOLBOX

The purpose of the toolbox is to demonstrate policy and technological options, which offer potential solutions for managing nutrients to decision makers and practitioners alike.

THE TOOLBOX CAN HELP TO MEET SUSTAINABLE DEVELOPMENT GOALS

Sustainable nutrient management and the SUSTAINABLE DEVELOPMENT GOALS

Goal 2: Incorporate concept of nutrient use efficiency (NUE) where application of nitrogen and phosphorous fertilizers are based on plant requirements, and that there is adequate nutrient replenishment to mitigate soil degradation.

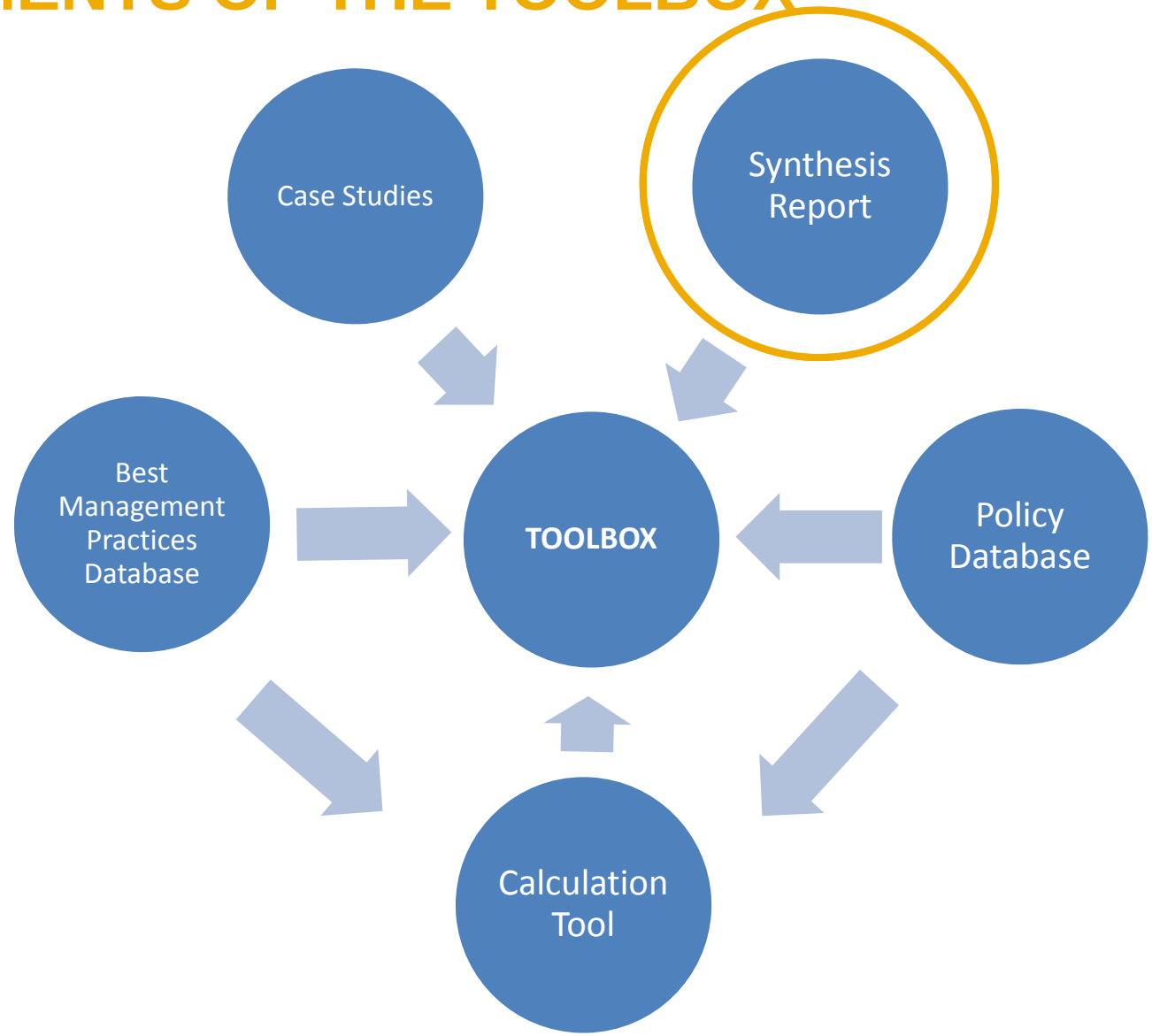
Goal 6: Minimize excessive nutrient (reactive nitrogen and phosphorous) leakage to the environment to reduce adverse environmenta conditions and pollution; Encourage nutrient recycling e. g. wastewater reuse and capture of nutrients for recycling into other productive sectors - strengthen circular economies and enhance cleaner production efforts.

Goal 13: Reduce airborne emissions from volatilized nitrogen compounds (with greenhouse gas potential) released from agricultural and livestock production systems in particular. An emerging issue is the potential increasing persistence and occurrence of prolific harmful algal blooms triggered by altered ocean and surface water body dynamics.

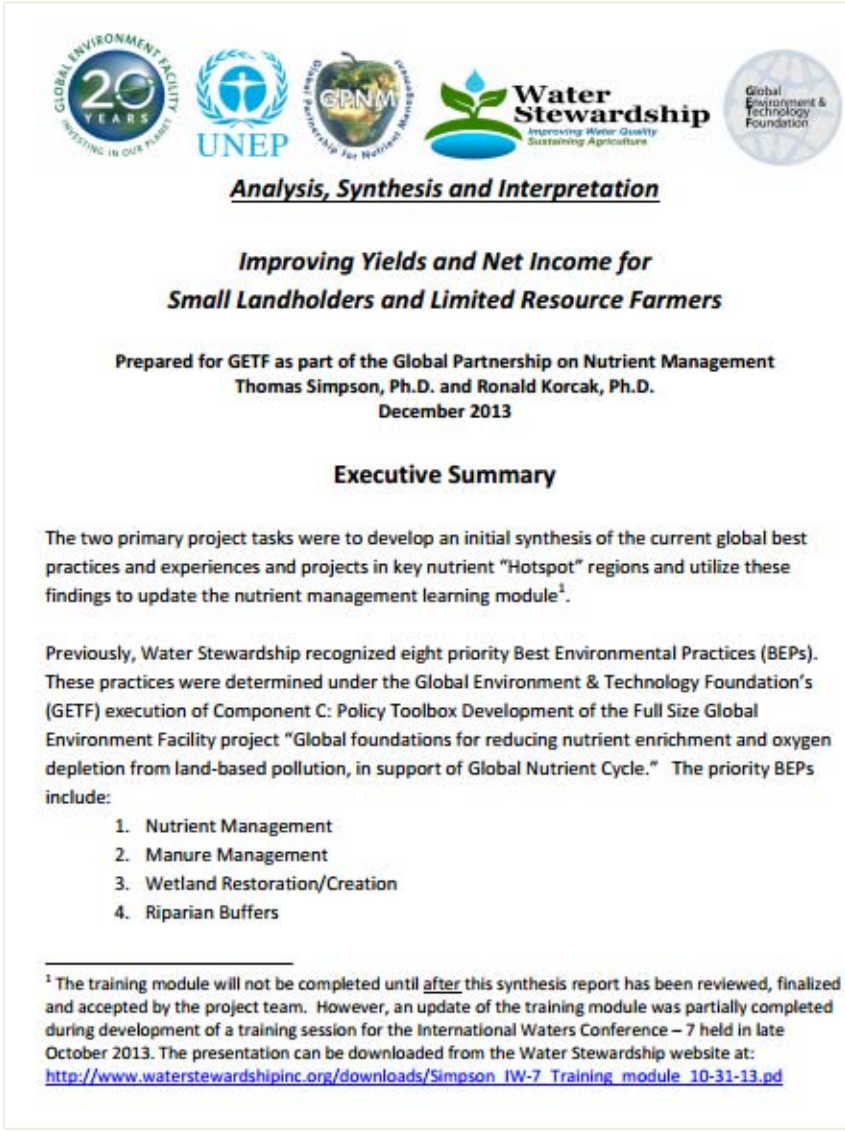
Goal 14: Reduce nutrient loading to the marine environment from land-based sources that include agricultural runoff (crop and livestock production), discharge of untreated domestic and industrial wastewater.

Goal 15: Enhance nutrient use efficiency toward reducing land degradation where nutrient removal through crop/biomass harvest exceeds replenishment.

ELEMENTS OF THE TOOLBOX



SYNTHESIS REPORT



Analysis, Synthesis and Interpretation

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

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

Executive Summary

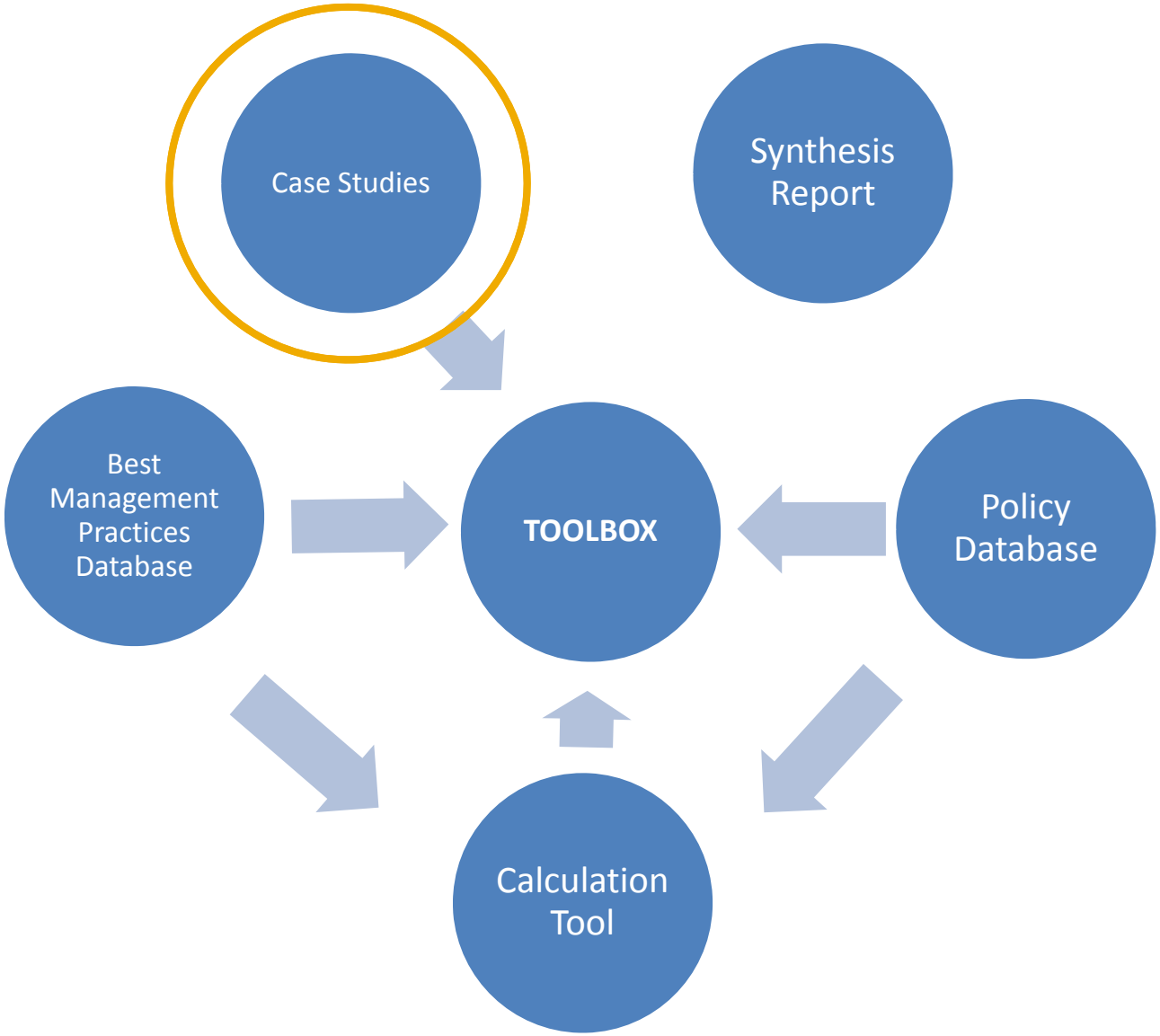
The two primary project tasks were to develop an initial synthesis of the current global best practices and experiences and projects in key nutrient "Hotspot" regions and utilize these findings to update the nutrient management learning module[1].

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:

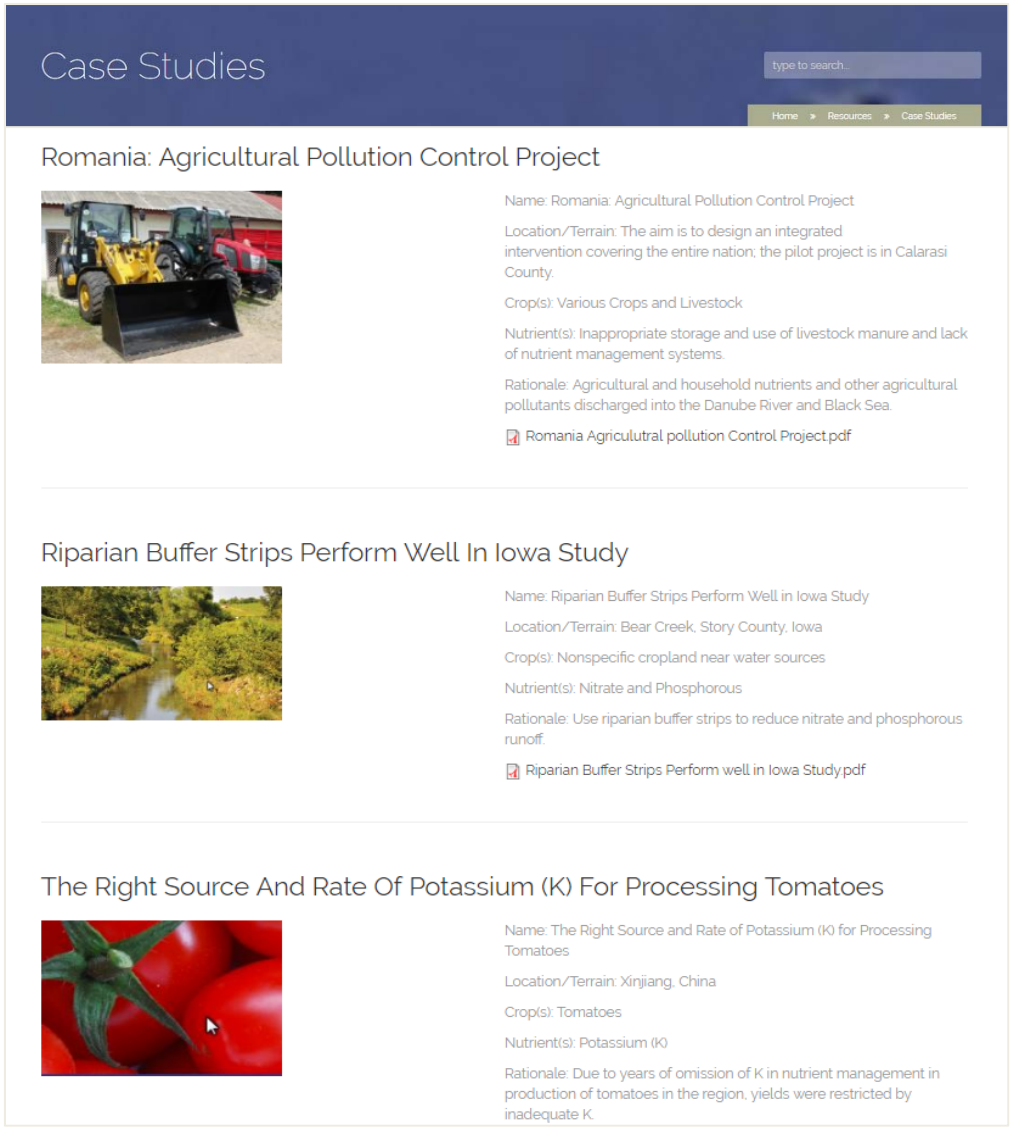
1. Nutrient Management
2. Manure Management
3. Wetland Restoration/Creation
4. Riparian Buffers

[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

ELEMENTS OF THE TOOLBOX



CASE STUDIES



CASE STUDIES

GLOBAL PARTNERSHIP ON NUTRIENT MANAGEMENT

BMP Case Study

Overview

Name: Croatia: Agricultural Pollution Control Project

Location/Terrain: Croatia: Danube River basin

Crop(s): Various crops and livestock

Nutrient(s): Nutrient overloading from fertilizers, especially nitrates

Rationale: Reduce nutrient discharge from agricultural source to surface and ground water bodies.

Issue(s) of Concern/Challenges:

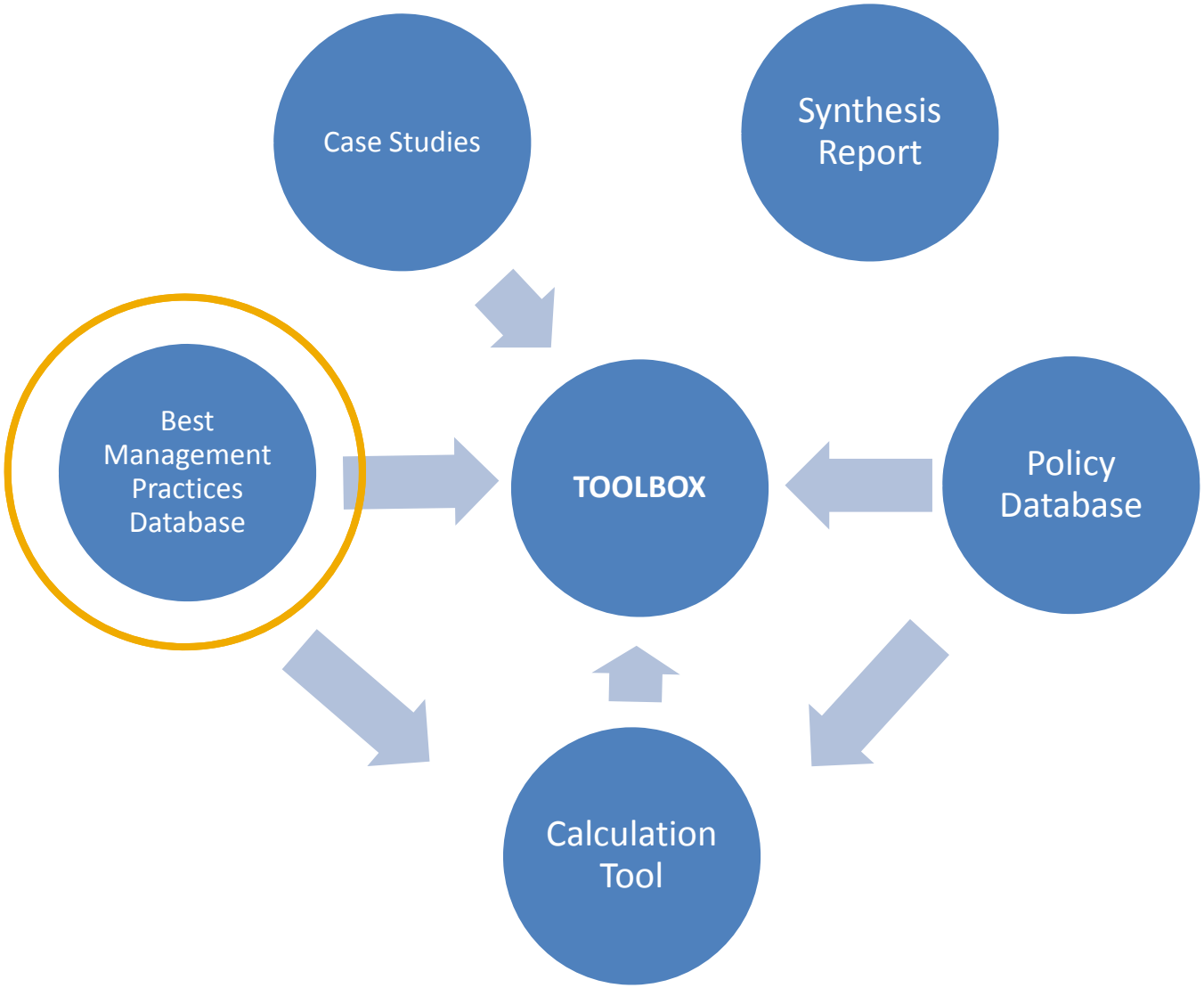
The heavy use of fertilizers, soil erosion and compaction, poor maintenance of soil organic matter, small numbers of households/farms familiar with good agricultural practices and no subsides for environmentally friendly farmers has led to nutrient discharges infiltrating into surface and ground water bodies.

Practice Objectives:

To significantly increase the use of environmentally friendly practices by farmers in the Danube River basin in order to reduce nutrient discharge

Practice Description:

ELEMENTS OF THE TOOLBOX



BEST MANAGEMENT PRACTICES DATABASE

Practices searchable by: sector

Agriculture

Urban

Practices searchable by: category

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

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

BEST MANAGEMENT PRACTICES DATABASE

Practices searchable by: climatic zone

Arid	Tropical
Semiarid	Temperate

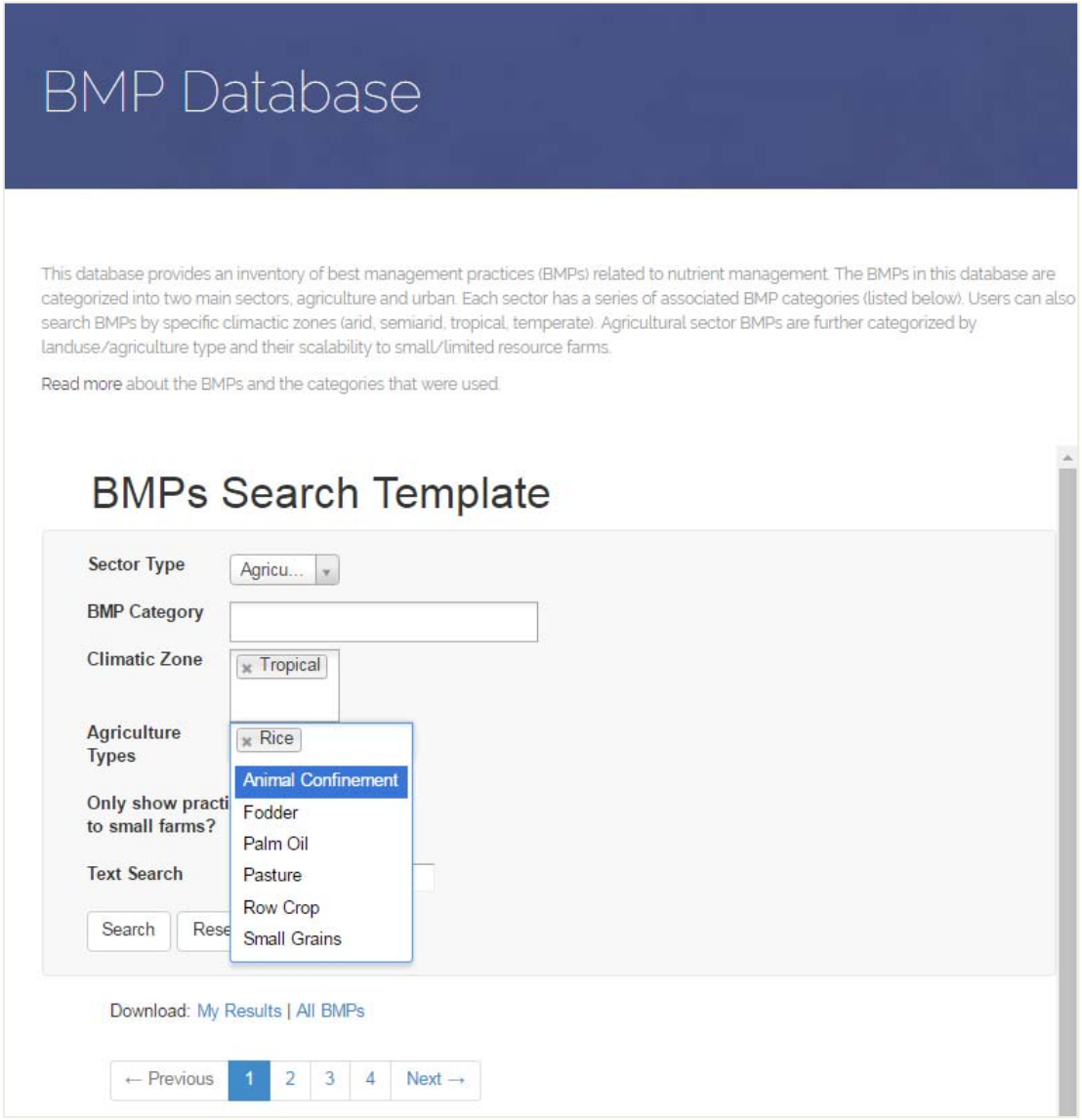
Practices searchable by: land use/agriculture type

Animal confinement	Rice
Fodder	Row crop
Palm oil	Small grains
Pasture	

Practices searchable by: scalability to small farms

Only show practices scalable to small farms? ☐

BEST MANAGEMENT PRACTICES DATABASE



BEST MANAGEMENT PRACTICES DATABASE

Leaf Color Chart (Real Time Nutrient Management)

Category: Nutrient Management
Practice Type: Management
Landuse/Agriculture Type: Rice
Climatic Zones: Tropical
Regions: South Asia
Pollutants Treated: Nitrogen

Leaf Color Chart (LCC) for Fertilizer N Management in Rice. Photo courtesy of Bangladesh Rice Knowledge Bank/IRRI.

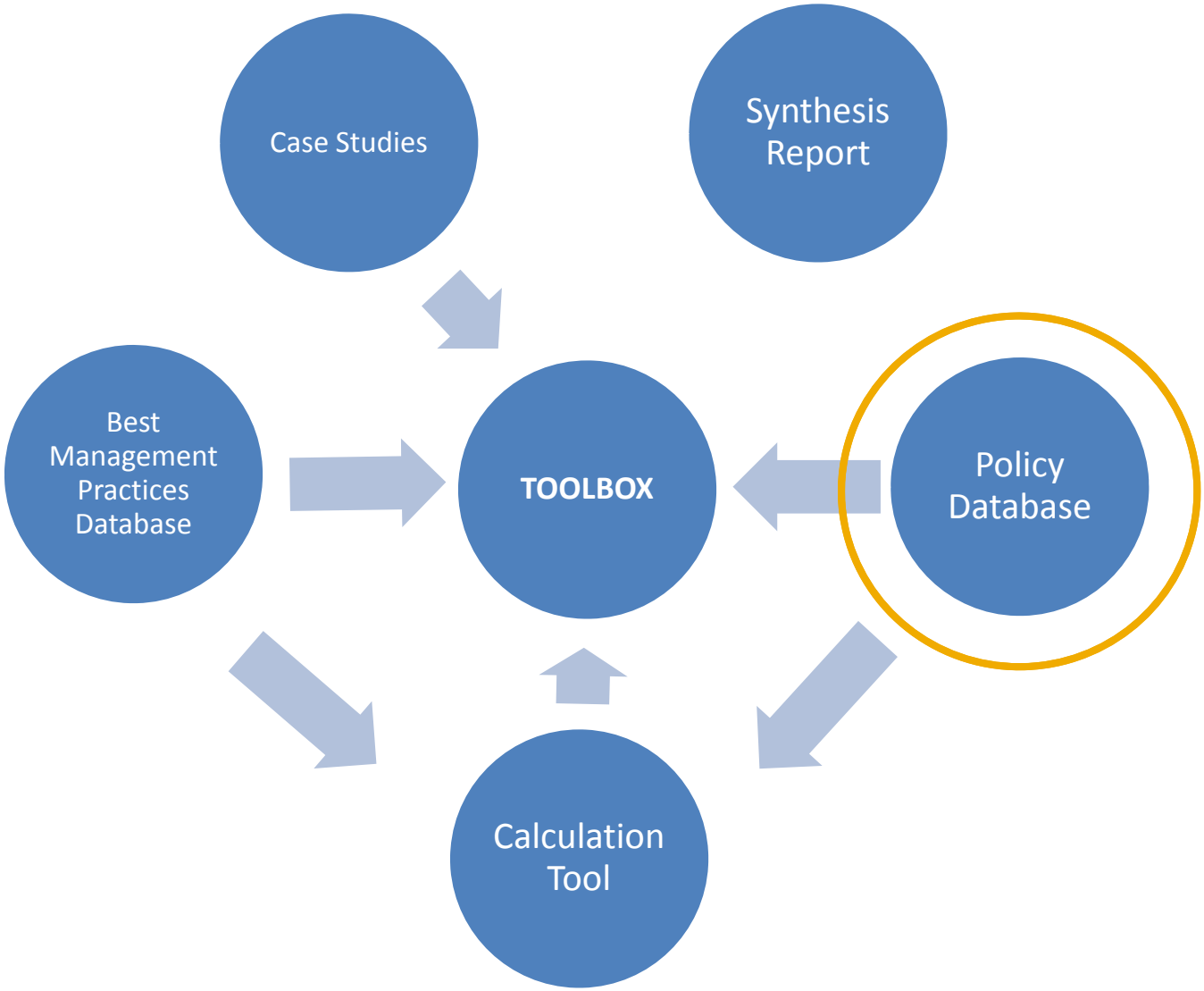
Description: The Leaf Color Chart (LCC) is a simple and inexpensive tool that relates the color of rice leaves to critical nitrogen content and allows for real time nitrogen management. LCC-based real time nitrogen management can be practiced in rice production by monitoring leaf color in 7 to 10 day intervals during the growing season.
Fertilizer N is applied wherever the leaves are less greenish than the threshold LCC value, which corresponds to critical leaf N content. LCC-based real time N management maintains optimal yields and results in higher N-use efficiency and less N applied as compared to using blanket N application recommendations. [1]

Implementation Considerations: The LCC was originally developed for rice production, but has also been adapted to maize and wheat production. It is an extremely low-cost and accessible test for measuring nitrogen deficiencies in real time.

Scalable to small farms? Yes

[1] T.K. Srivastava, A.K. Singh and V. Visha Kumari. Indian Journal of Fertilizers., (2013). Fertiliser Best Management Practices in Sugarcane. Volume 9 (4), pp. 96-108

ELEMENTS OF THE TOOLBOX



POLICY DATABASE

Policies searchable by: category

- Environmental outreach & education
- Regulatory approaches
- Price-based instruments
- Market-based instruments
- Ecosystem restoration and protection
- Institutions & capacity
- Research, monitoring, & evaluation

POLICY DATABASE

Policies searchable by: type

- Environmental outreach & education
- **Regulatory approaches**
  - -environmental bans and restrictions
  - -environmental standards
  - -environmental caps & limits
  - -regulatory frameworks
- Price-based instruments
- Market-based instruments
- **Ecosystem restoration and protection**
  - -ecosystem restoration
  - -protected areas
  - -land purchases
  - -covenants & easements
  - -stewardship agreements
- Institutions & capacity
- Research, monitoring, & evaluation

POLICY DATABASE

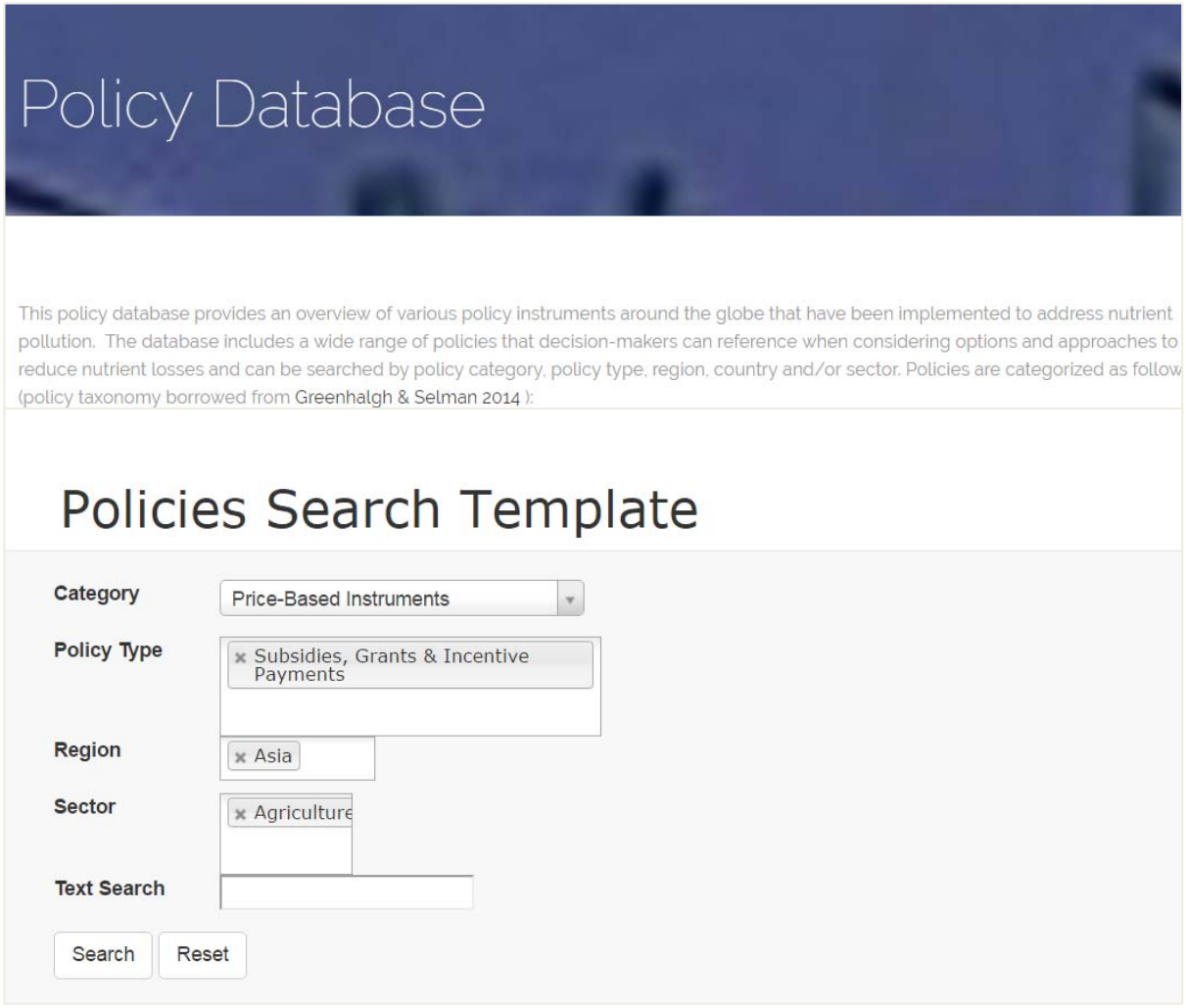
Practices searchable by: region

Asia	North America
Europe	Oceana
Middle East	South America

Practices searchable by: sector

Agriculture	Transport
Aquaculture	Urban
Fisheries	Wastewater
Mixed	

POLICY DATABASE



POLICY DATABASE

Download: My Results | All Policies

Direct Payments for Environmentally Friendly Farming

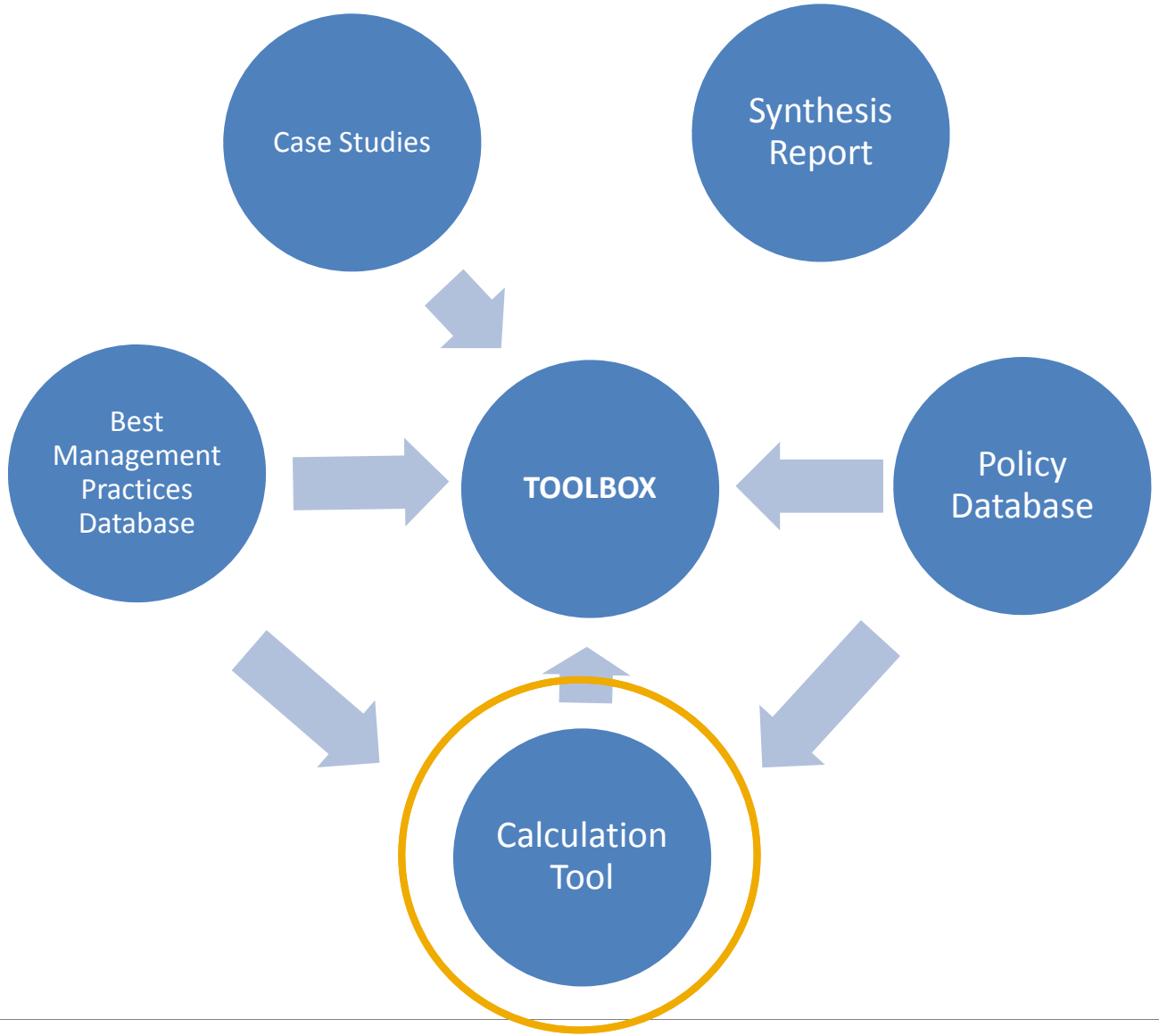
Category: Price-Based Instruments
Policy Type: Subsidies, Grants & Incentive Payments
Sector: Agriculture
Region: Asia
Country: South Korea
Description: Korea's direct payments for environmentally friendly farming were introduced in 1999 to compensate for the reduction of yields brought by the adoption of environmentally friendly farming practices. State government provides supports to local governments to finance facilities and equipment in designated environmentally friendly farming areas. In addition, a pilot program providing direct payments for environmentally friendly livestock practices was introduced in 2004. It was continued for nine hundred livestock-producing farm households with a budget of KRW 5.8 billion (USD 6 million) in 2006.
Outcome: During the period 2001-2005, 191 environmentally friendly areas were built up. In 2006, the payment per hectare for environmentally friendly farming was increased to between KRW 524 and 794,000 (USD 548 to 831) for dry fields and between KRW 217 and 392,000 (USD 227 to 410) for paddy fields. About 27,000 farm households who produced low-chemical, chemical-free and organic products received total payments of KRW 11.4 billion (USD 11.9 million) in 2006.

Reference: Direct Payments for Environmentally Friendly Farming

Organic Agriculture Act of 2010

Category: Price-Based Instruments
Policy Type: Subsidies, Grants & Incentive Payments; Tax Credits & Rebates
Sector: Agriculture
Region: Asia

ELEMENTS OF THE TOOLBOX



CALCULATION TOOL

- Estimates nutrient export from major river basins globally
  - Based on Global NEWS model
  - Local level evaluation possible with local data inputs
- Evaluates alternative scenarios for managing nutrients across sectors

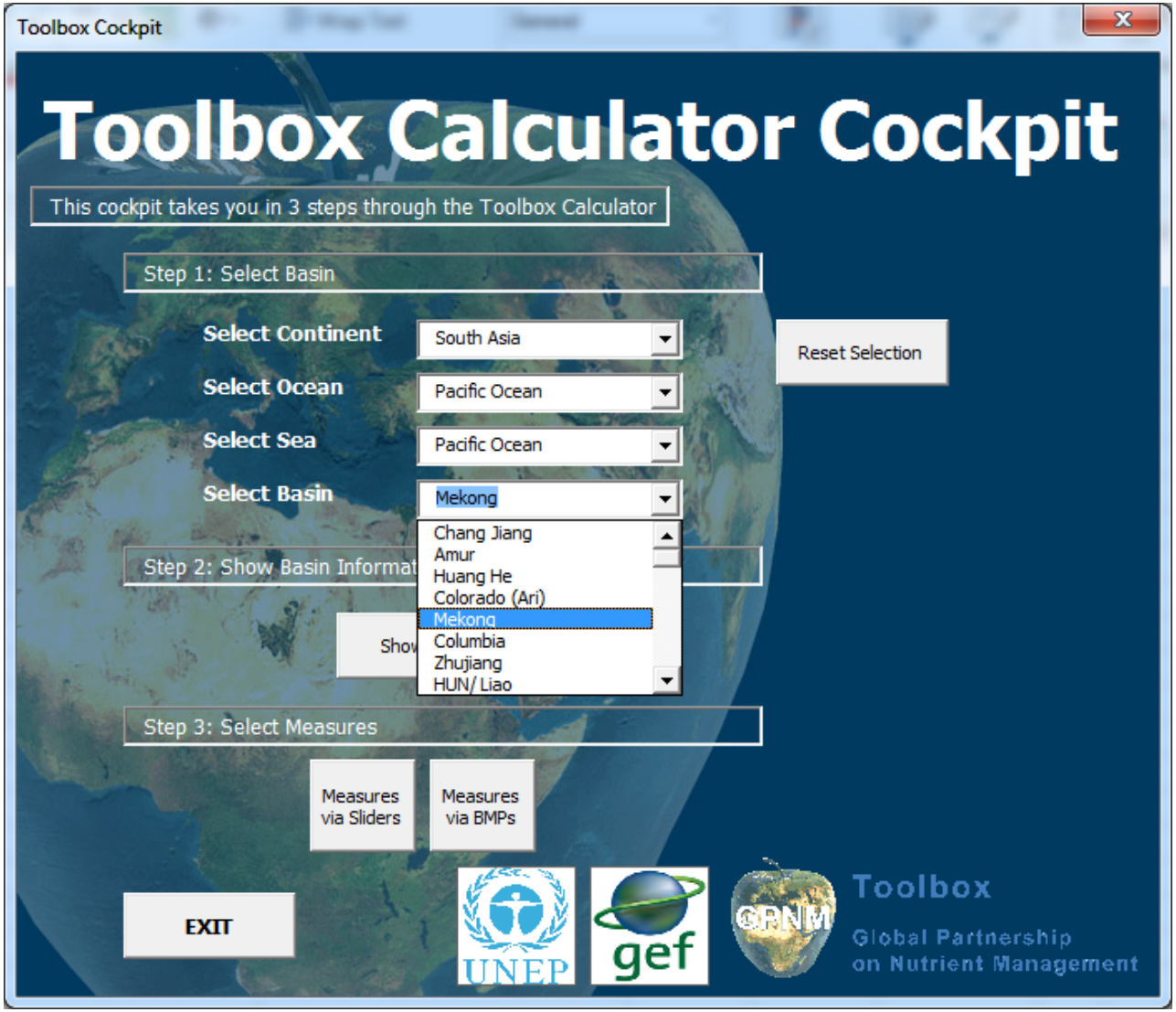
CALCULATION TOOL

Step 1

User defines area of interest:

- Continent
  - Ocean
    - Sea
      - Basin

CALCULATION TOOL



CALCULATION TOOL

Step 2

- Based on geographic selection, tool provides data on:
  - Land area
  - Population
  - Gross domestic product
  - Agricultural activities
  - Wastewater

CALCULATION TOOL

CALCULATION TOOL

Step 3

User selects measures to run scenarios:

- Measures via sliders

  - increase/decrease agricultural inputs, sewage treatment, etc.

  OR

- Measures via BMPs

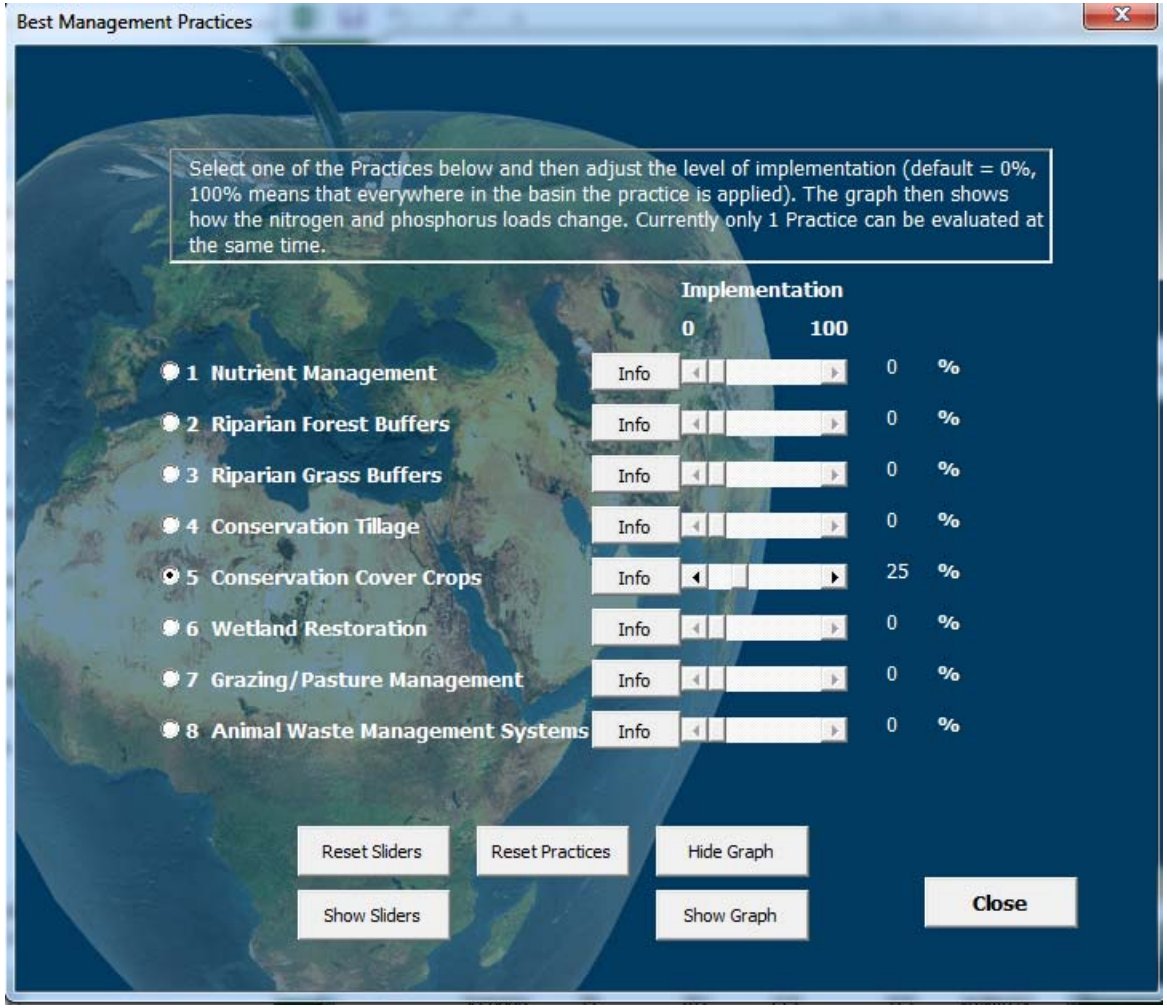
  - increase/decrease BMP implementation

CALCULATION TOOL

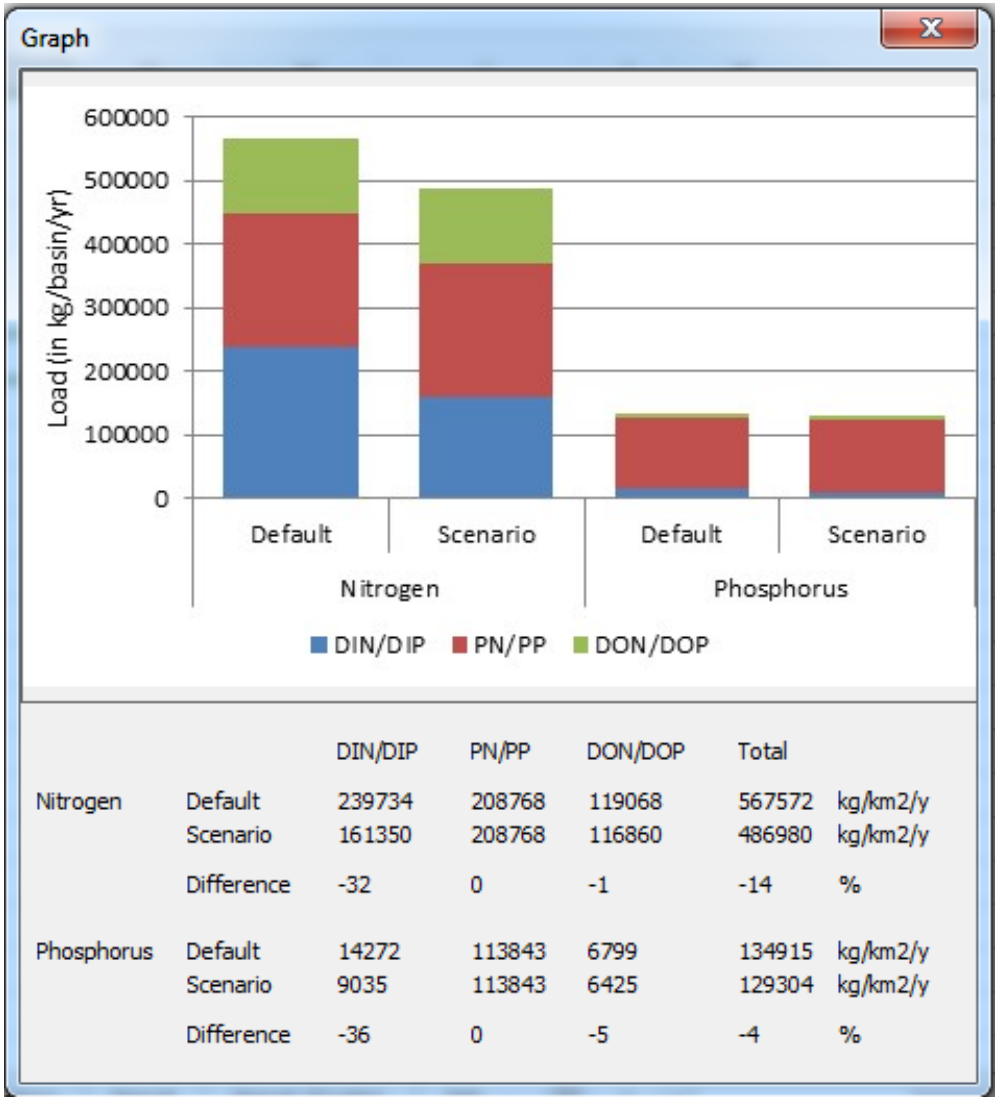
Select measures via sliders

CALCULATION TOOL

Select measures via BMPs



CALCULATION TOOL



		DIN/DIP	PN/PP	DON/DOP	Total	
Nitrogen	Default	239734	208768	119068	567572	kg/km2/y
	Scenario	161350	208768	116860	486980	kg/km2/y
	Difference	-32	0	-1	-14	%
Phosphorus	Default	14272	113843	6799	134915	kg/km2/y
	Scenario	9035	113843	6425	129304	kg/km2/y
	Difference	-36	0	-5	-4	%

CURRENT CALCULATION TOOL LIMITATIONS

- Number of best management practices limited
- Inability to simultaneously simulate nutrient reduction effects of multiple best management practices
- Data inputs best suited for global, regional assessments
- Estimates nutrient export but no link to water quality impacts

UPCOMING ENHANCEMENTS TO CALCULATION TOOL

- Linking BMPs in BMP database to Toolbox Calculator
- Adding capability for stacking BMPs in Toolbox Calculator
- Adding capability for users to enter their own local data in the Toolbox Calculator
- Linking nutrient loading levels to hypoxia

THANK YOU!

Sara Walker
swalker@wri.org
+1 202-729-7824

WRI.org

Image: Chesapeake Bay Program

INTERACTIVE ROUNDTABLE SESSION

14:00 to 14:30

- Divide into small groups of 3-5 people per computer
- Follow instructions on handouts

nutrientchallenge.org/toolbox2/gpnm-toolbox

14:30 to 15:00

- Report back to larger group with your responses