

Integrated Nutrient Management in the Caribbean: A presentation to U.S. AID



DISCUSSION DRAFT

January 2, 2014



U.S. WATER PARTNERSHIP
Working together for a water secure world.

Goals & Solutions

The U.S. Water Partnership's **mission** is to unite and mobilize the best of U.S. expertise, resources, and ingenuity

THE PARTNERSHIP'S GOALS



Visit our website www.uswaterpartnership.org to learn more.

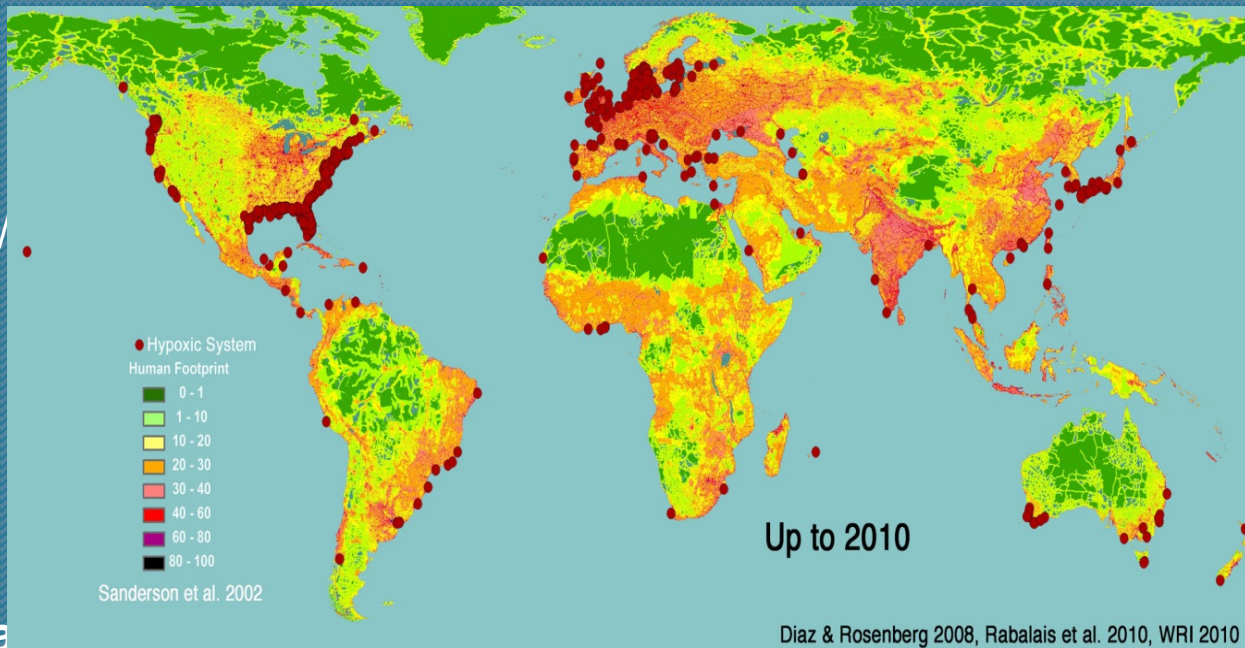
Value Proposition for U.S. AID and the Caribbean

- Increased farmer yields, food security and economic potential – higher quality jobs
- Leverage UWI Centre for Food Security & Entrepreneurship – assist in meeting targets to transition to more food production
- Leverage GPNM regional Caribbean platform to share information
- Accelerated WWT goals – treat, reuse, reduce nitrates, IWRM
- Assist in achieving Cartagena Convention LBS protocol
- Reduced environmental footprint
- More effective coordination
- Lower costs
- Improved, integrated, credible capabilities

Nutrients cause eutrophication (leading to adverse impacts including mortality of benthic organism, collapse of fisheries and shellfish poisoning)

**>500
eutrophic/
hypoxic
coastal
systems**

**>245,000
km² of
water area
worldwide**



**Global loss
of
ecosystem
services
=USD 200
billions/year**

The Global Partnership on Nutrient Management (GPNM) has been launched to answering this challenge

- a global partnership of governments, scientist community, industry, NGOs and international organisations
- an One UN initiative
- guided by a Steering Committee; UNEP is the Secretariat

GPNM Members are:

Government:

Industry: IFA, WPI, NFC, IPNI

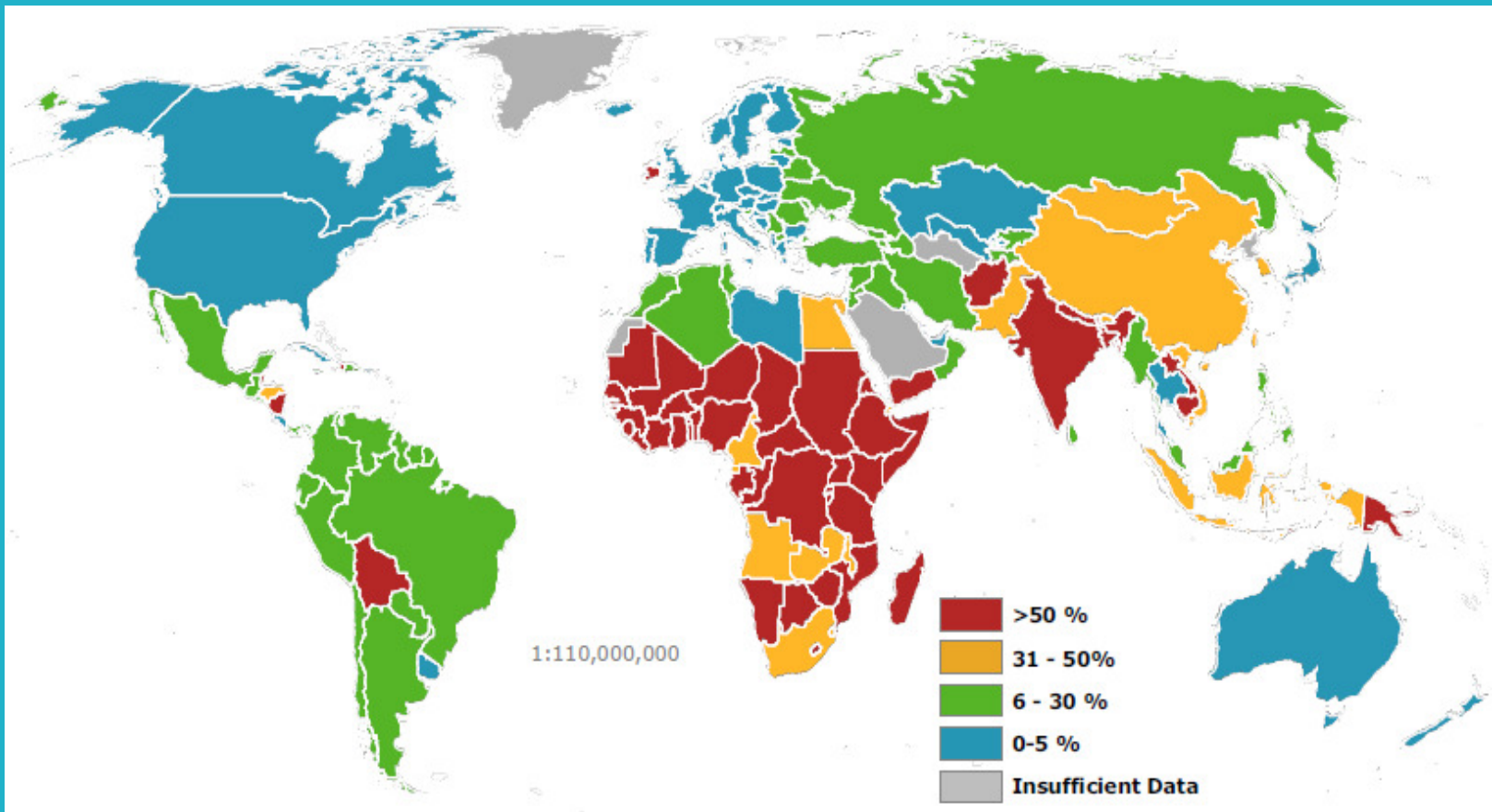
Science: IGBP, INI, IFDC, SCOPE, ING, NEC, WU-USA, NEL, ETH-Zurich, UoU- Netherlands, AU-India, CU-Bangkok, CAU - Beijing, China – UK SAIN, Global TraPs.....

UN System: FAO, UN-Habitat, IOC/UNESCO, UNDP, IAEA, UNEP

NGOs: GETF, TNC, SCON, Water Stewardship Inc.

Regional projects: BOBLME, PEMSEA

Global Sanitation Challenges



Over 2 billion people lack access to sanitation

Source: JMP. 2012

Global Sanitation Challenges

61% of global population uses improved sanitation facilities

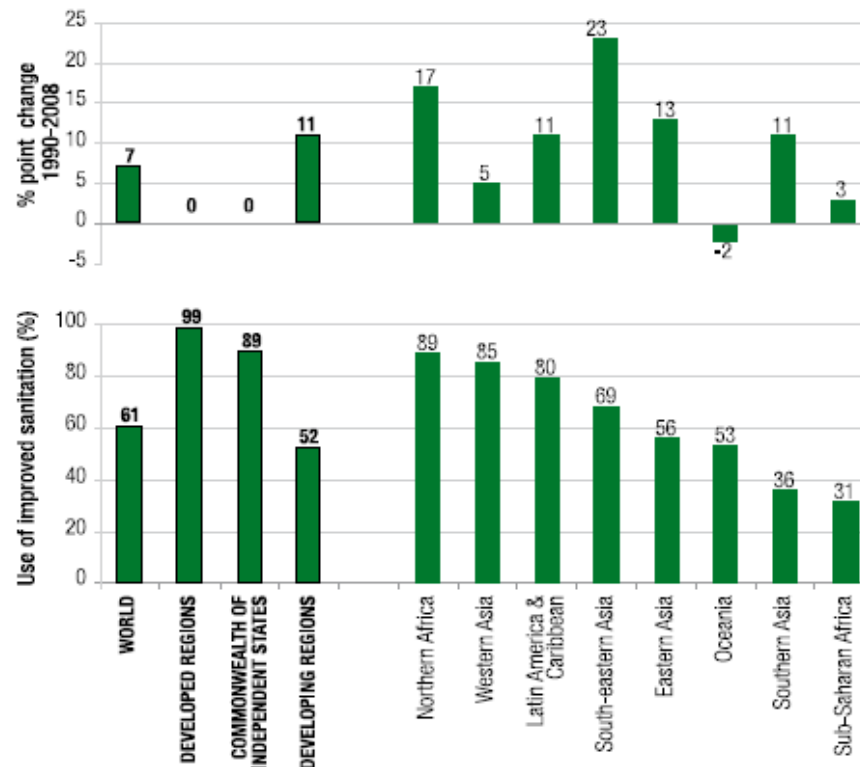


Figure 2 Regional use of improved sanitation facilities in 2008 and percentage point change 1990-2008

2.6 billion people – 72% of whom live in Asia – do not use improved sanitation facilities

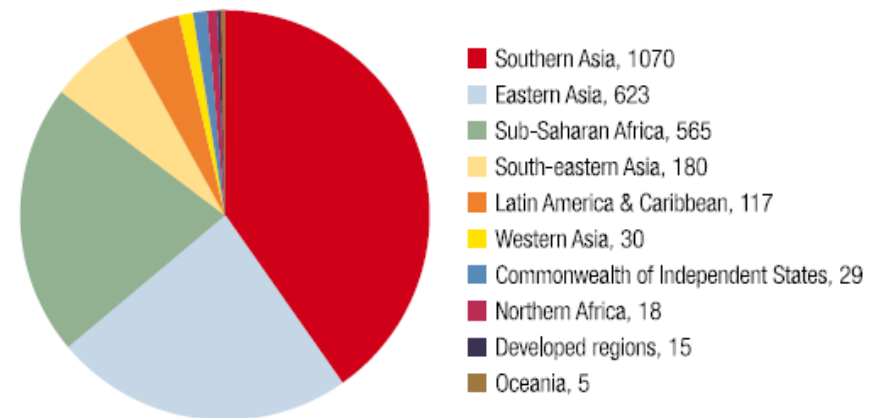
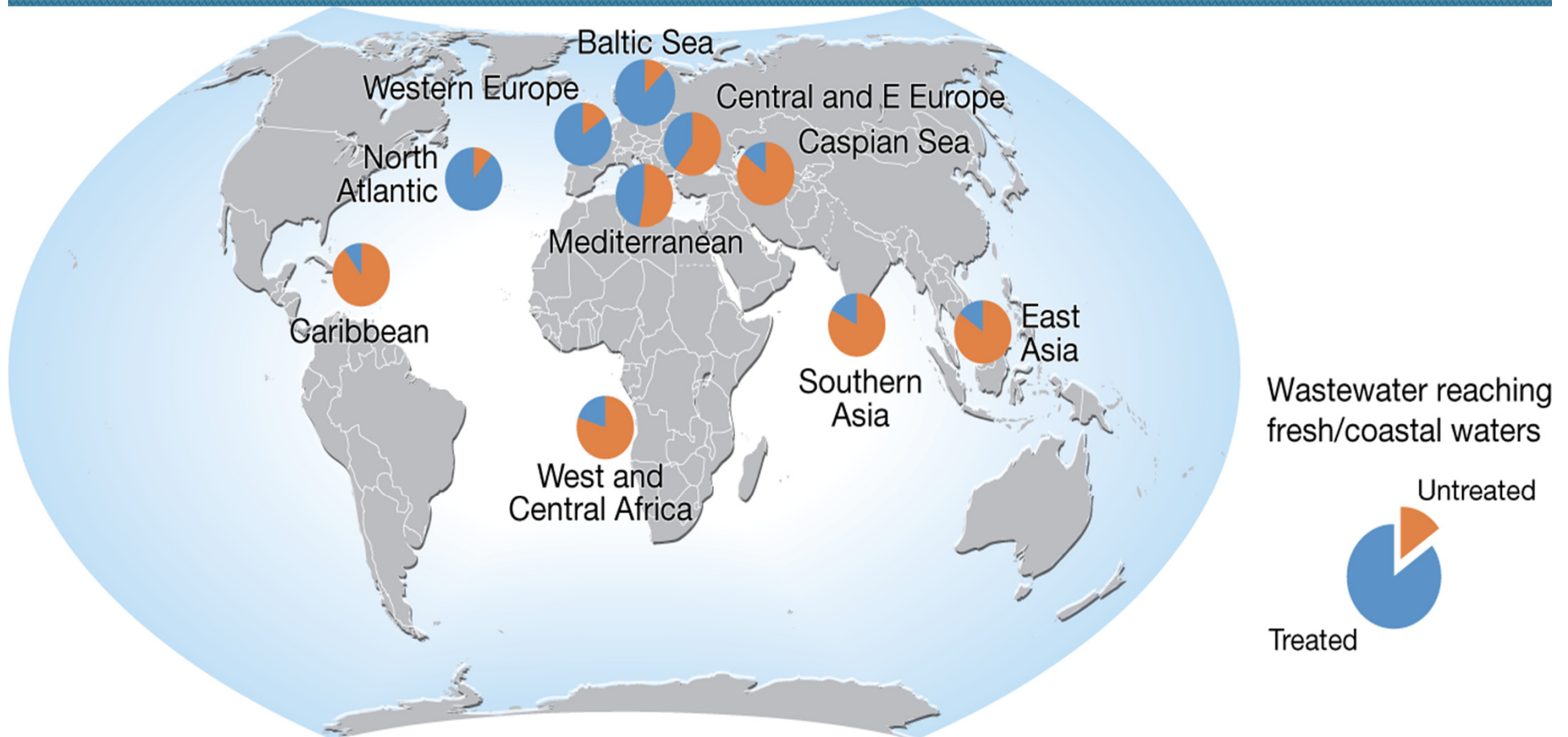


Figure 3 Regional distribution of the 2.6 billion people not using improved sanitation facilities in 2008, population (million)

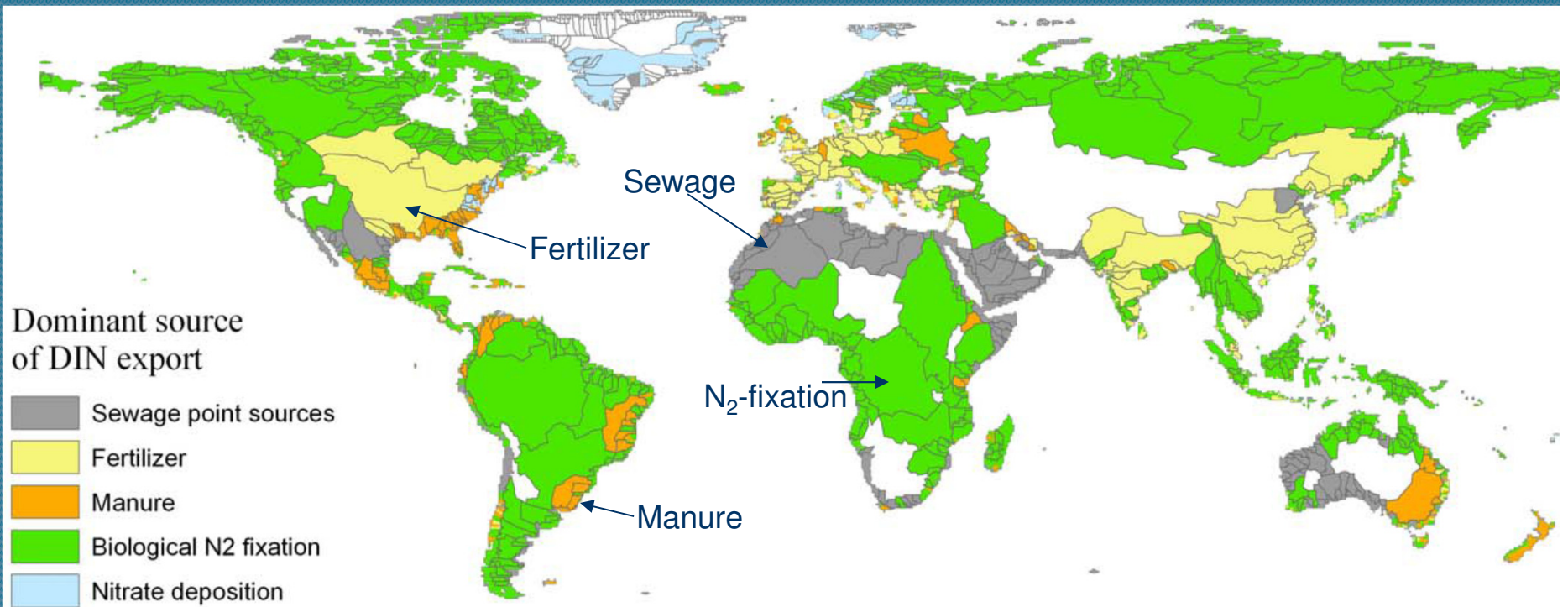
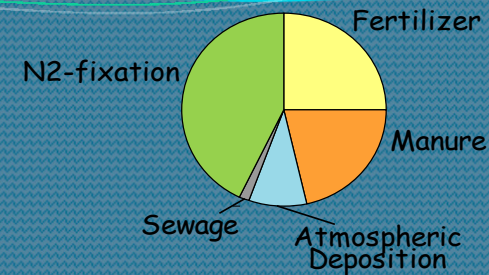
Global Ratio of Wastewater Treatment



Source: <http://maps.grida.no/go/graphic/ratio-of-wastewater-treatment>

Impacts on Watersheds:

DIN Export Variation in Dominant Source (Single largest source)



From: Dumont, et al. 2005 GBC

Drivers for Change

1. Balancing economic development with environmental stewardship
2. Continuing population growth
3. Maintaining links to the local Caribbean approaches
4. Controlling point source WW discharges & non point source agricultural pollution & erosion
5. Addressing inappropriate disposal of solid waste & septic leakage



Organic
Pollution



Nutrient
Pollution



Hazardous
Substances Pollution



Hydromorphological
Alterations

Impact on Watersheds

- **Leaching of human waste** into shallow groundwater
- Contaminating **aquifers** that impacts the clean water supply
 - Public health – blue baby syndrome, increasing nitrates
 - Biodiversity
 - Economic growth

An Integrated Solution

Training

Providing integrated wastewater, environmental & nutrient management training, leveraging current GPA /GETF approach

Converging Forces

**Technology
Deployment**

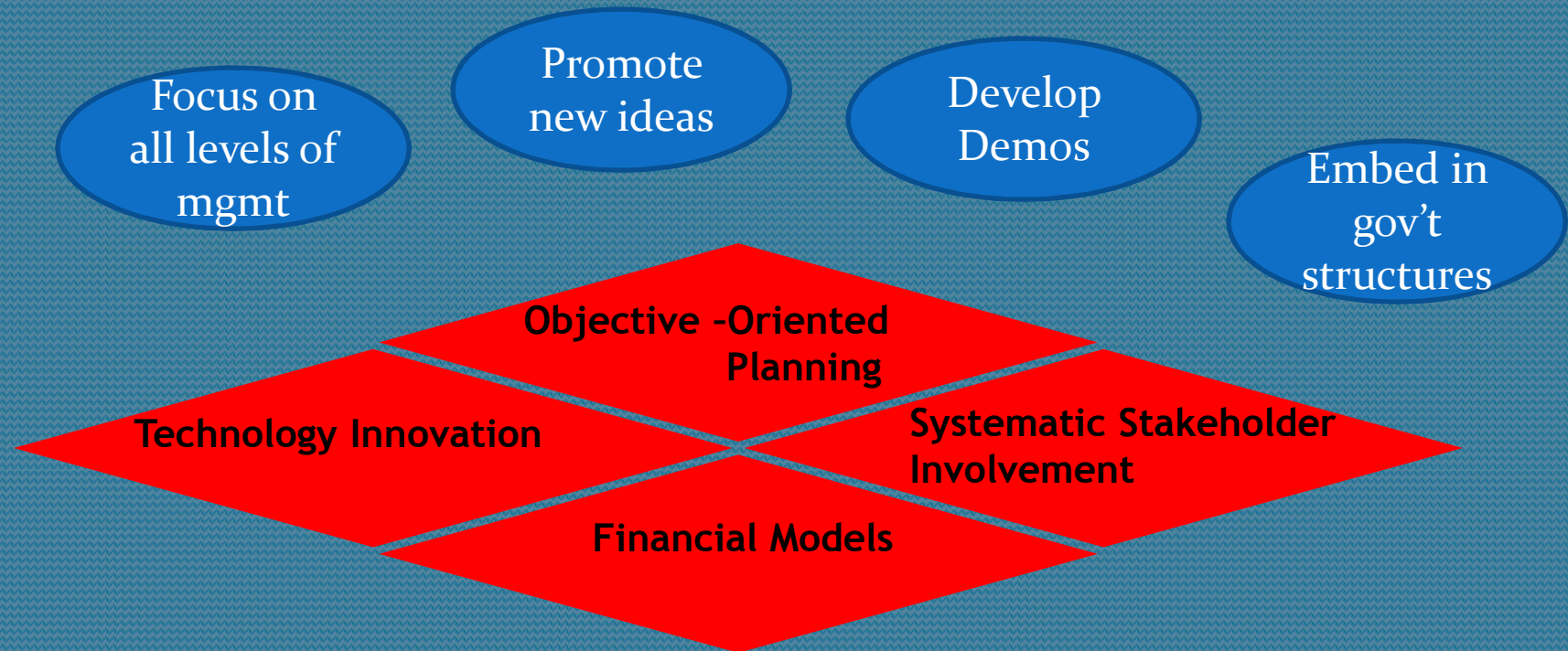
Accelerating the use of clean WWT & NM technologies through partnerships

**Nutrient
Reduction
BMPs**

Helping farmers identify the most cost effective and efficient practices

Training: Improved Wastewater Management

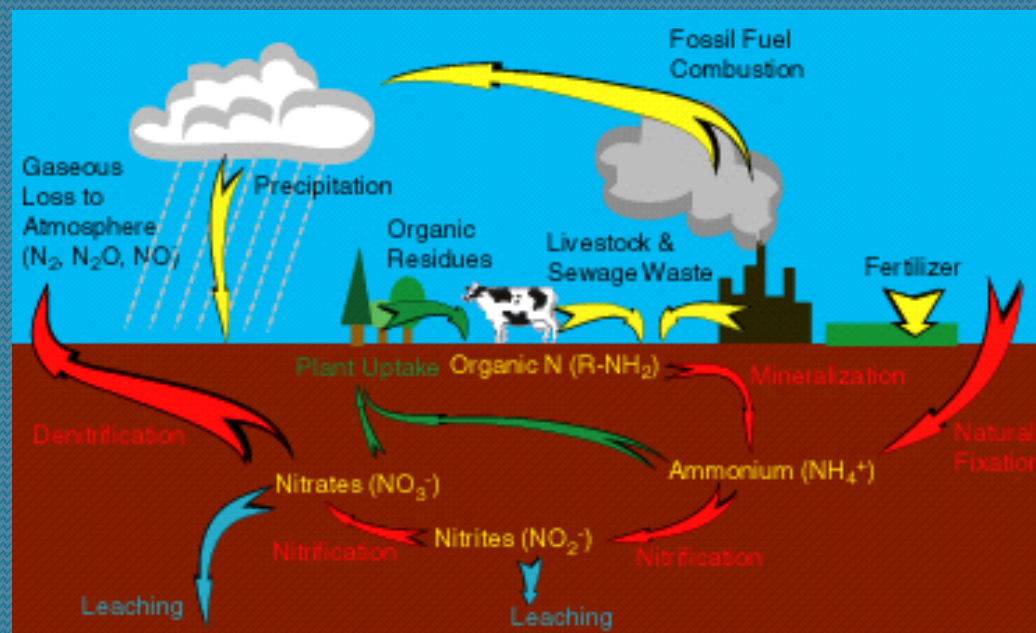
Strategy: Leverage UNEP delivered wastewater management training jointly with UNESCO-IHE, and in partnership with UN/DOALOS, funded by UNDP-GEF and the European Union



Outcomes: Reduce nutrient pollution Improve coordination Lower Costs

Training: Improved Nutrient Management

- Strategies:
1. Leverage & modify the UNEP Global Nutrient Management Partnership & Black Sea/Central & Eastern European curricula to meet Caribbean needs
 2. Capitalize on the expertise of the USDA, producer associations (the Fertilizer Institute, IPNI, Iowa Soybean Association), UNEP, Water Stewardship, UWI and IBM



Outcomes: More effectively manage the nitrogen cycle Promote on farm EMSs, 4As

Nutrient Reduction Best Practices

Strategies:

Leverage GEF/UNEP project to promote nutrient reduction best practices and relationships with the USDA Natural Resources Conservation Service, eXtention, the Chesapeake Bay Program, the Fertilizer Institute, IPNI and others to promote key BMPs:

Potential BMP	Definition
Ammonia emissions reduction	Poultry litter acidifier treatment, biofilters and permeable plastic covers
Dairy precision feeding	Feed formulation so as to reduce N and P in manure
Dirt/gravel road erosion/sediment control	Driving surface aggregate, raising the profile, grade breaks, additional drainage outlets, berm removal
Horse pasture management	➤50% cover, managed species, traffic management
Livestock/poultry mortality composting	On-farm composting vs. burying
Livestock pasture management	Rotational grazing, dairy managed intensive grazing, beef and other livestock intensive grazing
Infiltration filtration	Bio-retention, filters, open channel, Permeable pavement and pavers Infiltration basins and trenches
Nutrient use efficiency	Reduce application rate, “decision farming”

Outcomes:

Improve farm efficiency ,
Reduce nutrient pollution

Lower costs

Reduce erosion

WW Solutions Comparison

+ better than average; 0 mid range; - worse than average

Technology Type	Cap Ex	O&M	Energy use	Treatment Efficiency
Activated sludge	-	-	-	+
Filtration	+	0	0	0
Vertical Biological Reactors	-	-	-	+
Natural	0	+	+	+
Septic	0	+	+	-
Constructed Wetlands	+	+	+	0

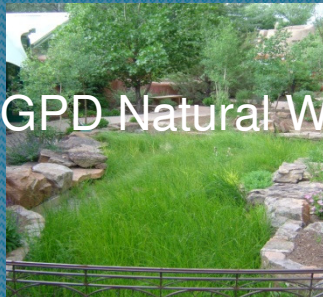
WW Technology Deployment

Strategies:

1. Increase access to WWT & sanitation by:
 - Facilitating purchasing relationships with primary conventional & innovative, decentralized technology developers
 - Evaluating & offering recommendations on appropriate technologies for local conditions

Sample decentralized options

8,000 GPD Natural WWT



Outcomes:

\$3 per gal packaged system



Sample conventional options

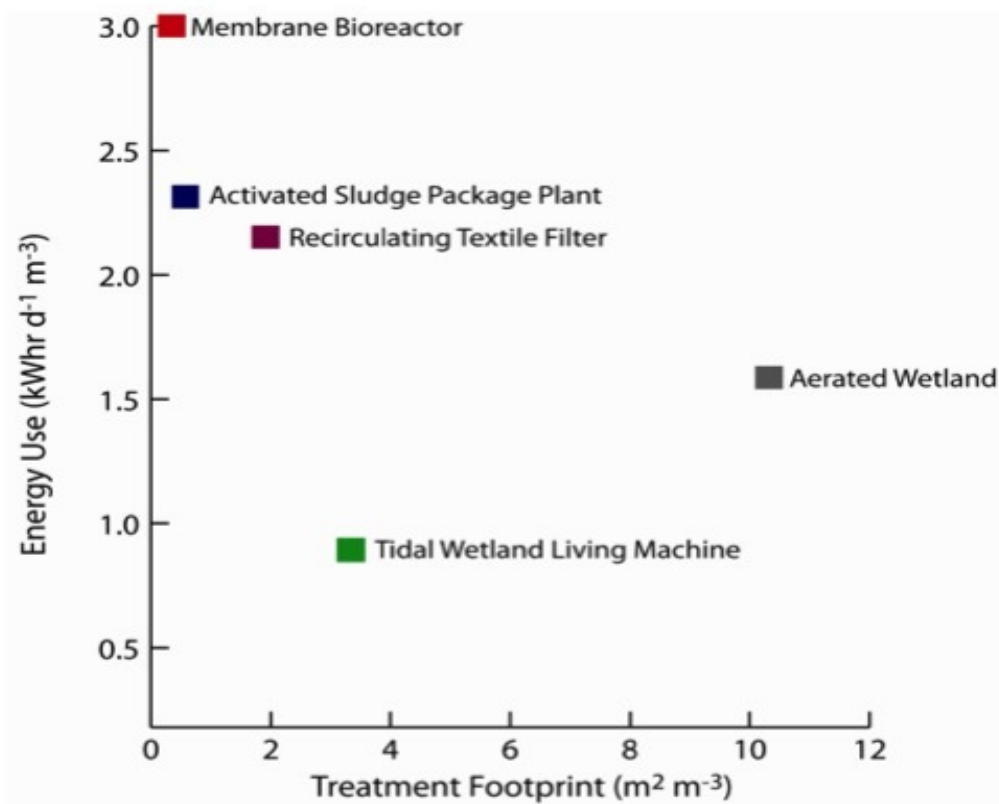
Size	People	Capacity	Average Cost
Small	< 10,000	< 1 MGD	\$1.5 M to \$2 M
Medium	>10,000, < 100,000	1 to 5 MGD	\$2 M to \$15 M
Large	>100,000	5 to 20 MGD	\$15 M to \$100 M

Technology Deployment: *Critical Success Factors*

1. Shared understanding of problem and a sense of need—thirst for solutions
2. Financing mechanisms
3. A business model and partners that support a sustainable enterprise
4. Continuous improvement cycle

Foot Print

Technology: Energy vs. Footprint



Low Cost Intervention

- Constructed Wetlands:
 - Less expensive (between \$145,050 - \$255,012 per hectare)
 - Long life expectancy
 - Pleasing aesthetics
 - Removes pathogens
 - Provides denitrification
 - Removes nitrogen and phosphorous with no sign of reduced capacity
 - Multiple uses (biodiversity and carbon sequestration)
 - Most promising technology to be applied in developing countries, because of the simplicity of their design, operation and maintenance and lower cost

Initial Next Steps/Sample Work Plan

Develop a joint programme on integrated nutrient management, partnering U.S. Water Partnership, Caribbean governments, IBM, University of Nebraska, USDA, Valmont, and the UN System – Seed funding needed

Major Activities

Month 1-3

- Secure initial funding
- Partnership development
- Translate & modify materials & curricula
- Plan to implement the GPA

Months 4- 12

- Technology evaluation
- Greater institutional coordination in the region
- Capacity building WW & NM
- Technology and methodology transfer on wastewater treatment and fertilizer use
- Initial WW training
- Initial farmer training
- Best practices workshop

Months 13-24

- Implement integrated programme





Discussion & Questions?????