Towards Sustainable Water Resources Management in the Philippines: *Challenges and Issues to Secure Water for All*

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Outline

- Rationale
- Water resources status and threats
- Issues and challenges
- Actions and partnerships towards securing water for all
- Summary and concluding remarks
- Recommendations

Rationale

- Water resources in Asia have already been threatened,
  - *both in terms of quantity and quality, and*
  - *they cast a shadow on sustainable development in the region;*
- The fundamental objective of water management is:
  - *to supply water where and when it is needed.*

Source: IGES, 2005

Rationale

Megatrends/threats:

- Climate change and climate variability
- Land use and cover change
- Increasing urbanization
- Accelerated population growth

Rationale

- However, past water management often emphasized “how to increase the water supply to meet the increasing demand” and paid little consideration to water resource conservation.
- Water management governance has often been fragmented, and coordination among water-related agencies has been weak.

Source: IGES, 2005

Rationale

- Water-related issues are broad, but there are two conspicuous issues that have commanded significant international attention.
  1) *They are the supply of safe drinking water; and*
  2) *the promotion of integrated water resources management (IWRM).*

Source: IGES, 2005

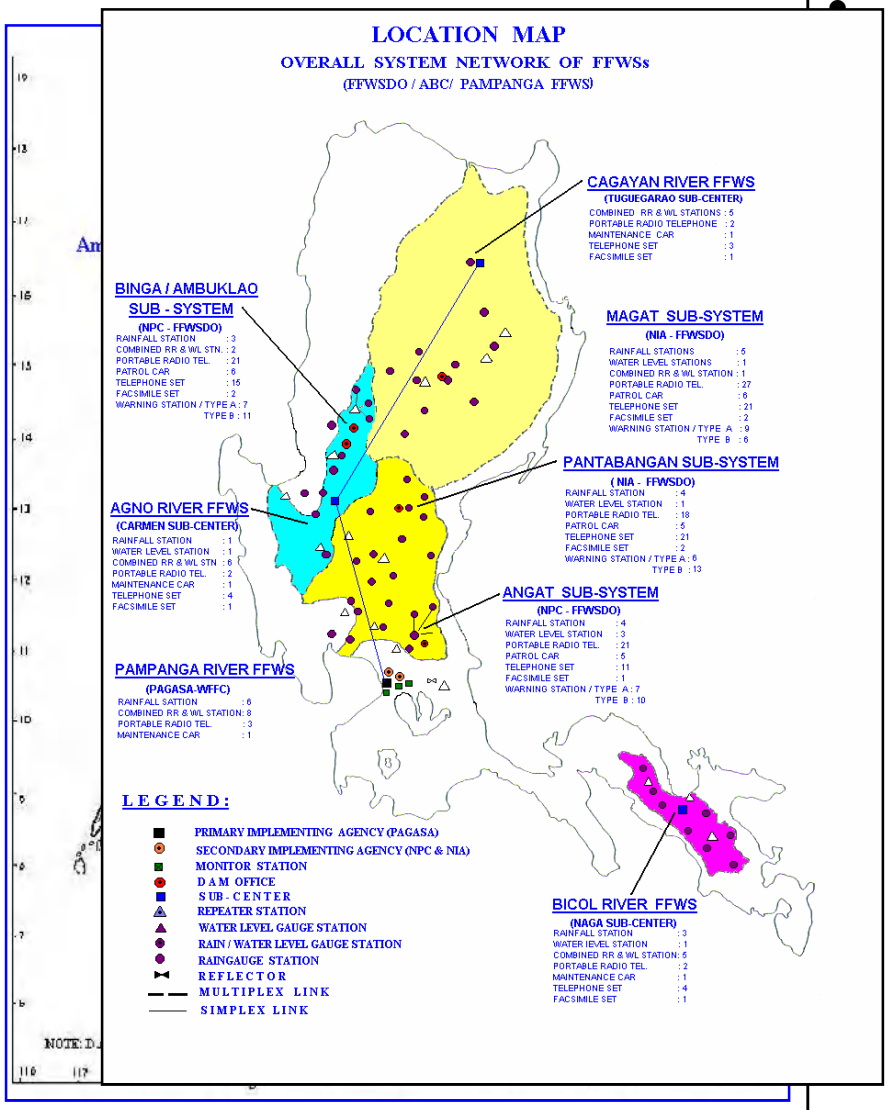
The Philippine Water Resources

Land Area	300, 000 sq. km.
Annual average rainfall	2,454 mm
Annual average runoff	1,000 mm
Number Principal River Basins	421 (Drainage A = 41 – 2,780 sq.km)
Number of Major River Basins	20 (Drainage A > 990 sq. km)
Number of Natural Lakes	59
Groundwater Reservoir	50, 000 sq. km.

Source: 1971-2000 Climatological Normals, PAGASA

The Philippine IWRM Directional Framework, NWRB

Water Availability in the Philippines



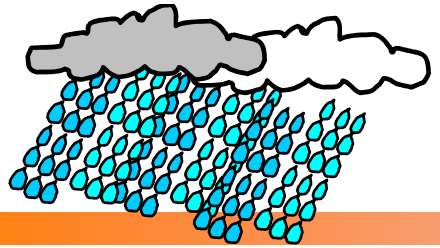
Source: BSWM

- **Total renewable water resource (TRWR)=479 km^3/yr: i.e., *surface water* runoff (444 km^3/yr), a portion of the rainfall that flows into streams and *groundwater* (180 km^3/yr), that portion which penetrates into the ground water reservoir, with an overlap of 145 km^3/year (AQUASTAT, 2007).**
- **The major source of *surface freshwater supply* are the 421 river basins in the country, each with a drainage area of at least 40 sq. km.**
- **Another surface freshwater supply sources are 59 natural, inland lakes, freshwater swamps and marshes.**
- **There are four major groundwater reservoirs in Cagayan, Central Luzon, Agusan, and Cotobato.**
- **The total dam capacity - 4,753 MCM in 2000 consisting of about 54 small dams and 6 large dams**

Water Resources Potentials (MCM/year)

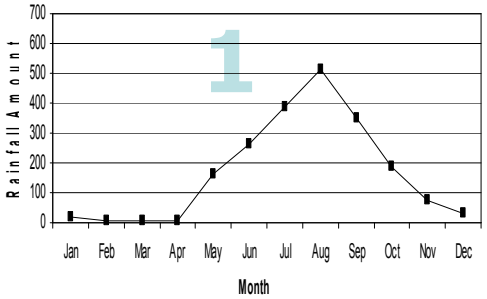
Water Resources Region	Groundwater	Surface Water	Total Potential	Water Demand in 2025	Estimated available water in 2025
I	1,248	3,250	**4,498**	3,041	**1,457**
II	2,825	8,510	**11,335**	12,466	**-1,131**
III	1,721	7,890	**9,611**	18,168	**-8,557**
IV	1,410	6,370	**7,780**	10,052	**-2,272**
V	1,085	3,060	**4,145**	4,167	**-22**
VI	1,144	14,200	**15,341**	7,595	**7,749**
VII	879	2,060	**2,939**	2,729	**210**
VIII	2,557	9,350	**11,907**	1,956	**9,951**
IX	1,082	12,100	**13,182**	4,598	**8,584**
X	2,116	29,000	**31,116**	3,682	**27,434**
XI	2,375	11,300	**13,675**	4,141	**9,534**
XII	1,758	18,700	**20,458**	12,806	**7,652**
TOTAL	**20,200**	**125,790**	**145,990**	**85,401**	**60,586**

Source: Master Plan for Water Resources Development in the Philippines, JICA-NWRB

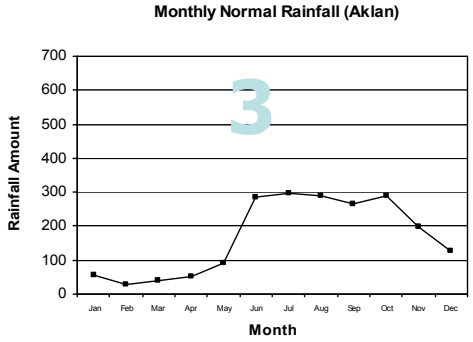


The Philippine Climate

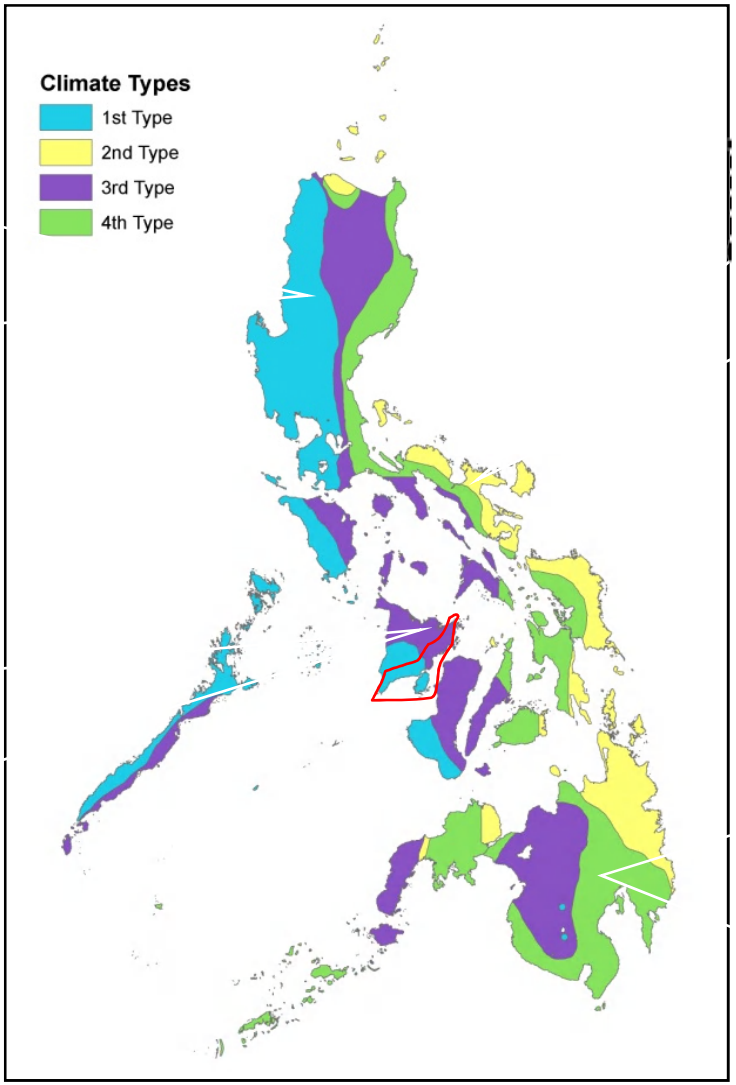
(based on rainfall temporal occurrence)

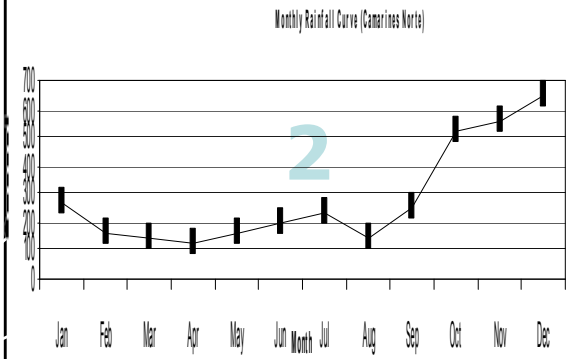


Two pronounced season; Dry from Nov-Apr and wet the rest of the year

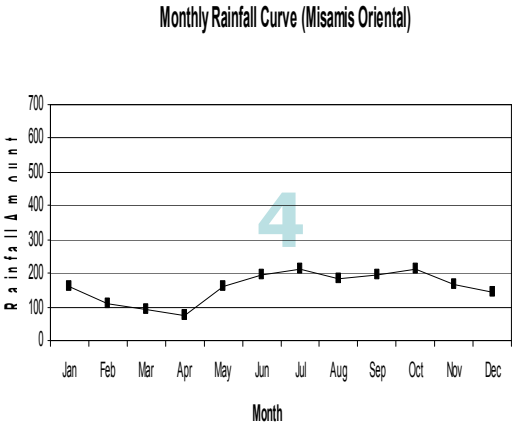


Season not so pronounced; Relatively dry from Nov-Apr and wet the rest of the year





No dry season with maximum rainfall from Nov-Jan

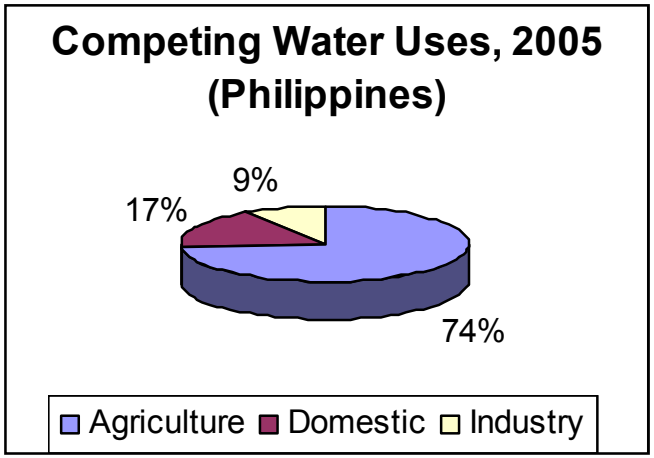


Rainfall more or less distributed throughout the year

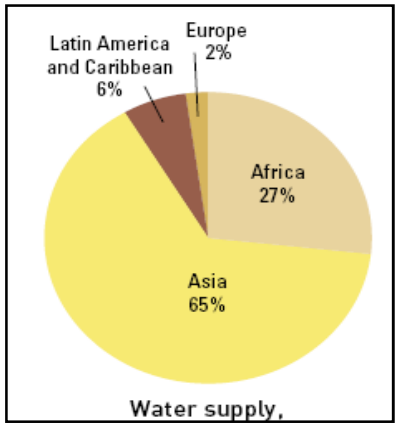
Source: PAGASA

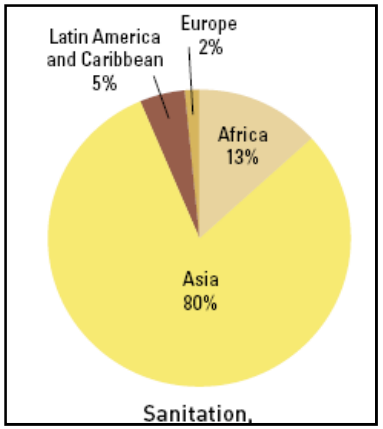
Competing Water Uses

- ***Agriculture use*** **is about 70% of the world's total water use and about 82% for low-income and middle-income countries. Crop production is the largest water-consuming sector (UN-Water, 2006).**
- ***Domestic use*** **of water accounts for 8% worldwide. Clean water for basic human needs is small in terms of volume, but needs to be available in the home or, at the very least, close by.**
- ***Industrial use*** **of water accounts for 10% in low- and middle income countries compared to 22% for competing uses for the whole world and up to 59% for high-income countries (World Bank, 2001)**
- **About 1.1 billion people lack access to improved *water supply* and 2.4 billion to improved *sanitation*.**
- **Asia has the highest number of people un-served by either water supply or sanitation**



Competing water uses in low and middle income countries (UN Water, 2006)





Water supply and sanitation distribution of unserved population (WHO/UNICEF Joint Monitoring Programme, 2002)

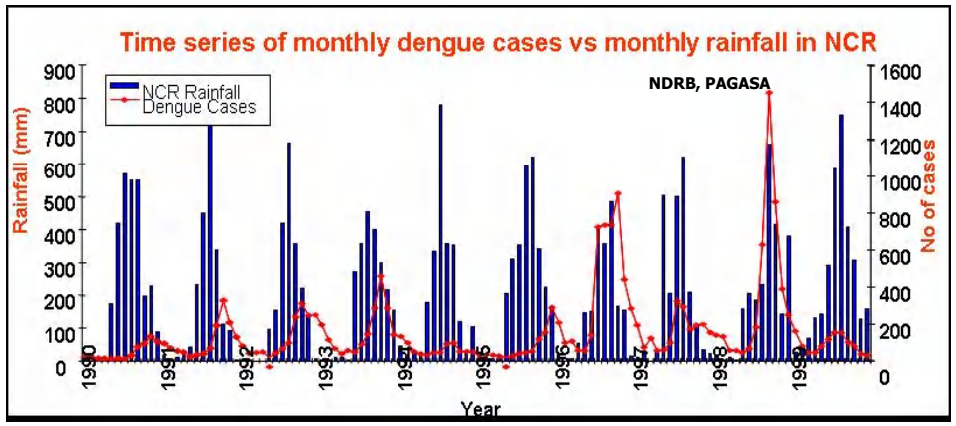
Source: Amadore, 2008

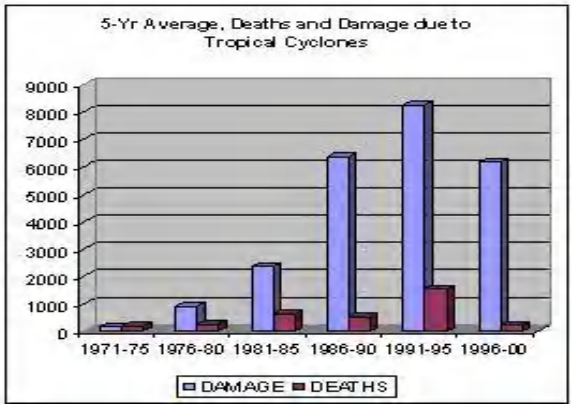
Weather-related Natural Disasters (Philippines)

Flashfloods, Metro Manila

Landslide, Cherry Hill

Severe drought





Generators of Weather-related Natural Disasters

- **Floods/flashfloods, landslides, water-related diseases – intense weather/climate systems (tropical cyclones, monsoon rains, La Nina, climate variability/change, etc.)**
- **Drought, forest fire, water-related diseases, etc. – El Nino phenomenon, climate variability/change**

Source: Amadore, 2008

Renewable water resources

- **Based on the total renewable water resource (TRWR) of 479 km³/yr and on population figures of NSO:**

	Total renewable water resource (per capita)	For Domestic Use *(resource per capita)*
1990	- 7,890 m³/inhab/yr = 21,616 liters/inhab/day;	3,674 liters/inhab/day
1995	- 6,980 m³/inhab/yr = 19,125 liters/inhab/day;	3,251 liters/inhab/day
2005	- 5,618 m³/inhab/yr = 15,391 liters/inhab/day;	2,616 liters/inhab/day
2007	- 5,407 m³/inhab/yr = 14,816 liters/inhab/day;	2,518 liters/inhab/day

- **The direct source (main) of renewable freshwater is rainfall.**
- **The decline in renewable water resources per capita per year in the computation above is mainly due to population growth.**
- **The fraction of the population with access to safe drinking water was only 36% (urban areas, 67%; rural areas, 20%) in 1970 but increased to 85% (urban, 90%; rural 77%) in 2002.**
- **The fraction of population with access to sanitation was 57% (urban areas, 90%; rural areas, 40%) in 1970 and 73% (urban areas, 92%; rural areas, 61%) in 2002.**

Comparison of Total renewable water resources (cubic km*, km³)/ *Water withdrawal as percentage of renewable water resources :

- **Philippines – 479/4%; Malaysia – 580/1%; Mayanmar – 1,045/3% ; Rwanda – 5.2 /1%; Pakistan – 222 /73%**

Source: Amadore, 2008

Competing Local Uses of Water

Trends in freshwater withdrawal *(km^3/yr)*

	1995	2000	2005
Agri.	21.1	21.1	25.4
Dom.	4.27	4.73	5.70
Ind.	2.30	2.69	3.20
Total,	27.7	28.5	34.3
%,TRWR	5.7	5.9	7.1

"Withdrawal" typically refers to water taken from a water source for use. It does not refer to water "consumed" in that use. The domestic sector typically includes household and municipal uses as well as commercial and governmental water use. The industrial sector includes water used for power plant cooling and industrial production. The agricultural sector includes water for irrigation. fishery and livestock (AQUASTAT, 2007)

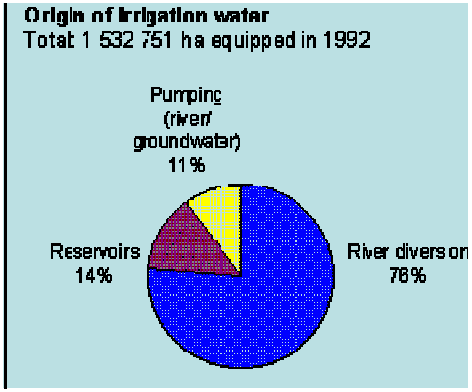
In terms of total/domestic freshwater withdrawal per capita (liters/inhab/day)*

1995 – 1,106/170

2000 – 1,020/169

2005 – 1,102/183

***A minimum of 20 litres/day/person of sufficient clean water is suggested, although the average water use in Europe and the USA ranges between 200 and 600 liters/day.**



***Irrigation* is agriculture's biggest user of freshwater**

Source: Amadore, 2008

SOURCES OF WATER POLLUTION

BSWM, 2009

Impacts to WR' availability

⇨ Rainy Season

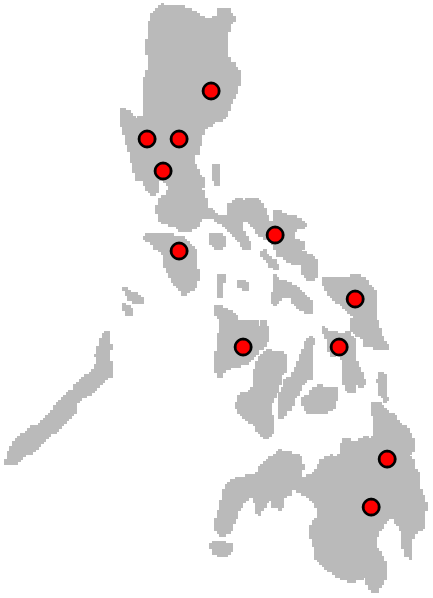
Excessive Runoff

Increasing Flood Peaks

Severe Erosion

Flooding of lowland areas

Silted Rivers



BSWM, 2009

Impacts to WR' availability

⇨ Dry Season

High Temp & Dry Soils

Reduced Stream flow

Declining Groundwater Level

Insufficient Water for Irrigation

- Reduction in Yield
- Total Crop Loss

Limiting Water Supply for Domestic Purposes

BSWM, 2009

Future Freshwater Availability (Philippines)

Population Statistics (NS0, 2008) - Philippines:

- **Total population (Census, 2007) = 88,574,614**
- **Projected total population (2025) = 120,224,500**
- **Projected total population (2040) = 141,669,900**

Total renewable water resource per capita (at constant, 479 km^3/year):

Water scarcity threshold is about 1,700 m^3/person/yr (4,657 L/P/D)

- **2007 > 5,407 m^3 /inhab/yr = 14,816 liters/inhab/day**
- **2025 > 3,984 m^3 /inhab/yr = 10,915 liters/inhab/day**
- **2040 > 3,381 m^3 /inhab/yr = 9,288 liters/inhab/day**

Total freshwater withdrawal	***Per capita water withdrawal***
1995 > 27.7 km^3/yr or 75,890 ML/D;	**1,106 liters/inhab/day**
2000 > 28.5 km^3/yr or 78,082 ML/D;	**1,020 liters/inhab/day**
2005 > 34.3 km^3/yr or 93,972 ML/D;	**1,102 liters/inhab/day**

Projected total water withdrawal	***Per Capita (Projection)***
2025 > 47.2 km^3/yr or 129,342 ML/D;	**1,076 liters/inhab/day**
2040 > 57.4 km^3/yr or 157,479 ML/D;	**1,112 liters/inhab/day**

Source: Amadore, 2008

Pressures on local water resources

- ***Population growth and economic development:*** **More people, rapid urbanization and lifestyle changes will increase water use and abstraction**

  >>> Total population - 88,574,614 (NSO Census, 2007)
  >>> Projected total population (2025) - 120,224,500
  >>> Projected total population (2040) - 141,669,900
- ***Pollution of water bodies*** **alters chemistry and ecology of rivers, lakes and wetlands. Domestic sewage, industrial wastes and heavy use of fertilizers and agro-chemicals are polluting the streams and waterways at an alarming rate. Of the more than 400 rivers, about 40 rivers are polluted.**
- ***Land conversion*** **alters runoff patterns; inhibits natural recharge; fills water bodies with silt; alters natural flood control, habitats for fisheries, recreation, water supply, water quantity and quality**
- ***Infrastructure development*** **(dams, dikes, levees, diversions etc.) Loss of integrity alters timing and quantity of river flows, nutrient and sediment transport (flood plain fertility) and thus delta replenishment; blocks fish migrations**
- ***Over-harvesting and exploitation*** **depletes living resources, ecosystem functions and biodiversity;** ***groundwater depletion***
- ***Climate variability/change and extreme climate events***

Source: Amadore, 2008

What can we do?

- Increase the resilience and coping capacity of the sector with the current and future changes (**Adaptation)**

WATER for ALL

- Limit the cause of climate change through measures that could slow down the build up of atmospheric GHGs concentrations by reducing current and future emissions and by increasing GHG sinks (**Mitigation)**

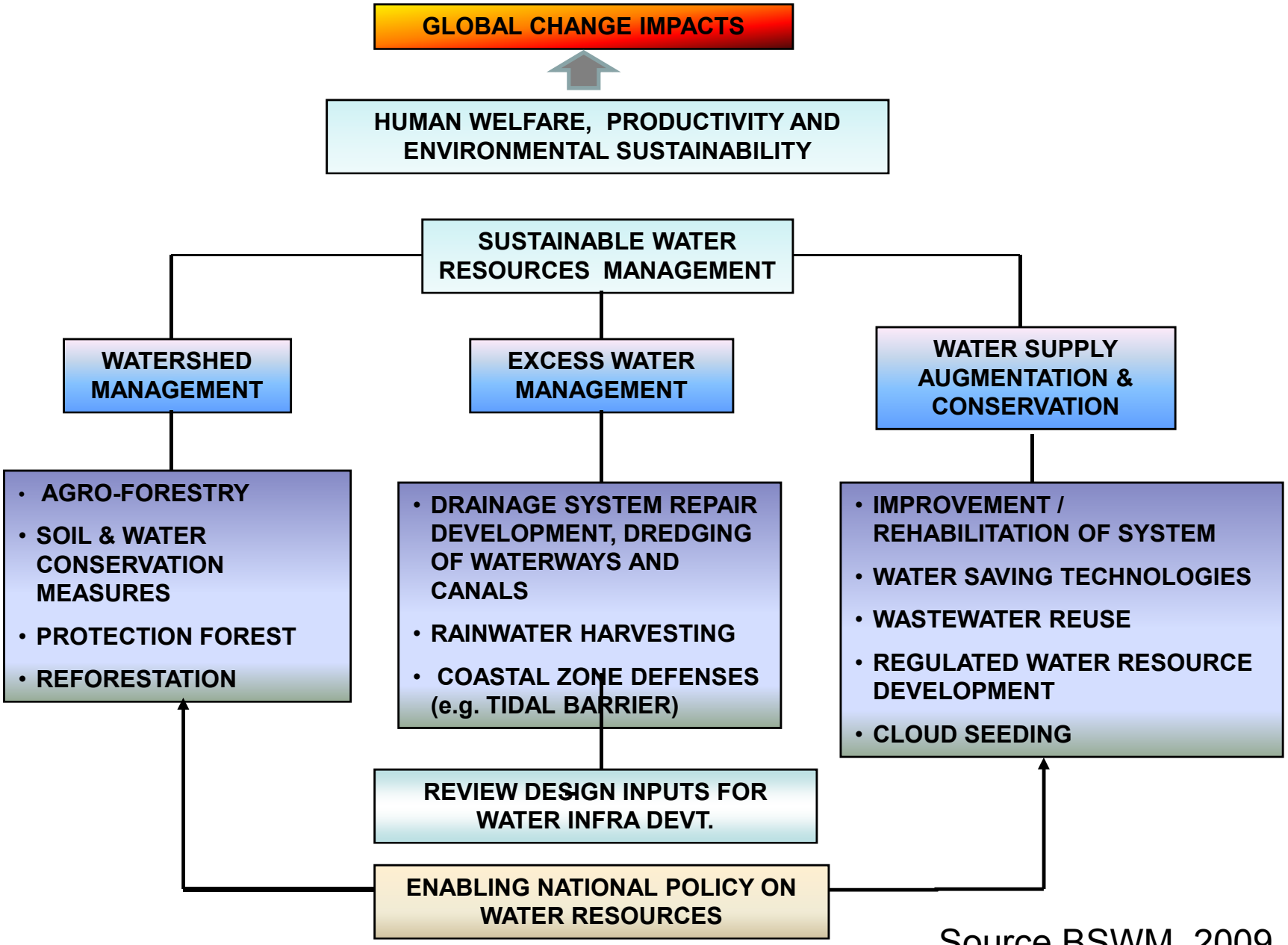
MMSU Water-related RDE Activities

- Water management, water re-use, low-cost micro-irrigations (MMSU undergraduate and graduate students,1976-present);
- Irrigation water management for crop diversification and system management procedures (MMSU-IWMI, 1987-1990);
- Systems approaches on land use planning, crop, water resources management (MMSU-IRRI-PhilRice-UPLB-LGUs, 1996-2001);

MMSU Water-related RDE Activities

- Groundwater contamination (MMSU-IRRI-PhilRice, 1992-2002);
- Food safety and water quality monitoring (MMSU-NEDA-DBP-LGUs, 2007-2009);
- Groundwater management: Farmer water school (BWSM-ACIAR-MMSU, Nov-Jun, 2009);
- Proposals:
  - Water Resources Center
  - River Basin IWRM
  - Effect of Climate Change on Water Resources

Adaptation strategies



Source BSWM, 2009

WATERSHED MANAGEMENT

TERRACING

VERTIVER GRASS TECHNOLOGY

PLANTED VEGETATIVE STRIPS/AGRO FORESTRY

MULTI-STOREY CROPPING

REFORESTATION

MULCHING & MINIMUM TILAGE

Source BSWM, 2009

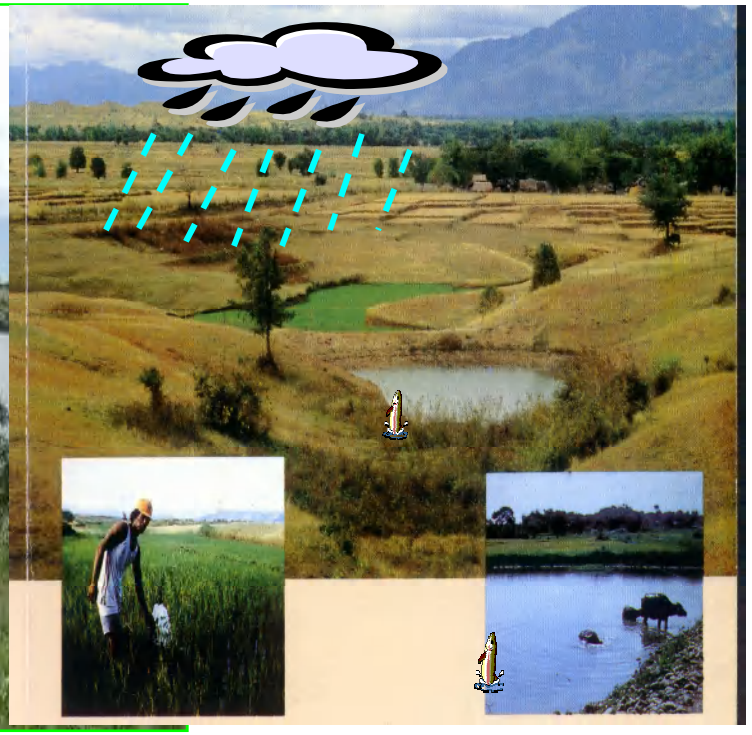
EFFICIENT WATER UTILIZATION

EFFICIENCY AND PRODUCTIVITY

Source BSWM, 2009

RAINWATER HARVESTING

Small Water Impounding Project (SWIP)

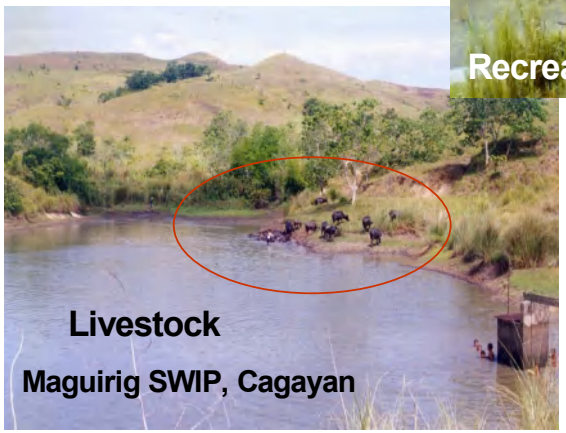


Small Farm Reservoir (SFR)

Maasin SWIP, Talugtog, Nueva Ecija, Philippines

Source BSWM, 2009

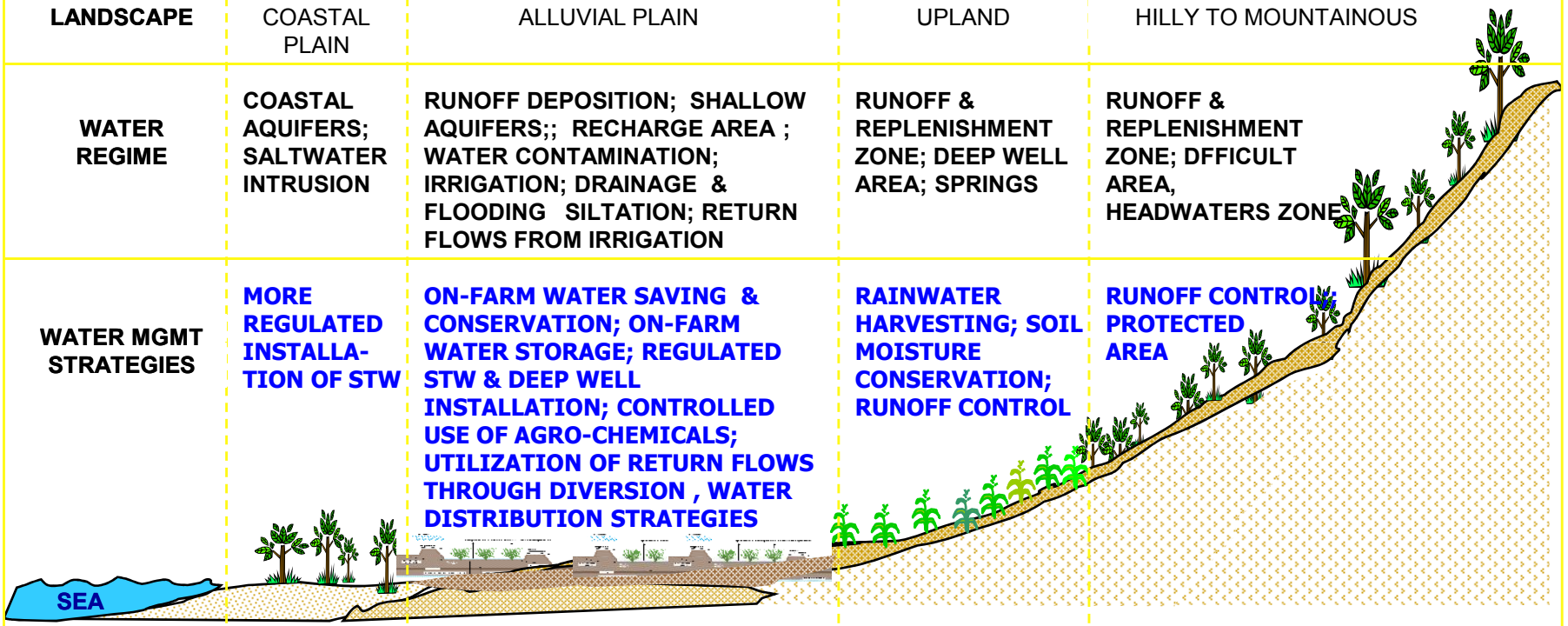
THE USE OF WATER FROM SWIP



Source BSWM, 2009

SUSTAINABLE WATER MANAGEMENT

LANDSCAPE	COASTAL PLAIN	ALLUVIAL PLAIN	UPLAND	HILLY TO MOUNTAINOUS
WATER REGIME	COASTAL AQUIFERS; SALTWATER INTRUSION	RUNOFF DEPOSITION; SHALLOW AQUIFERS;; RECHARGE AREA ; WATER CONTAMINATION; IRRIGATION; DRAINAGE & FLOODING SILTATION; RETURN FLOWS FROM IRRIGATION	RUNOFF & REPLENISHMENT ZONE; DEEP WELL AREA; SPRINGS	RUNOFF & REPLENISHMENT ZONE; DFFICULT AREA, HEADWATERS ZONE
WATER MGMT STRATEGIES	MORE REGULATED INSTALLA-TION OF STW	ON-FARM WATER SAVING & CONSERVATION; ON-FARM WATER STORAGE; REGULATED STW & DEEP WELL INSTALLATION; CONTROLLED USE OF AGRO-CHEMICALS; UTILIZATION OF RETURN FLOWS THROUGH DIVERSION , WATER DISTRIBUTION STRATEGIES	RAINWATER HARVESTING; SOIL MOISTURE CONSERVATION; RUNOFF CONTROL	RUNOFF CONTROL; PROTECTED AREA
LAND USE		RICE, CORN, VEGETABLES, & OTHER AGRICULTURAL CROPS,	AGRO-FORESTRY CASH CROPS	PROTECTION FOREST. , GRASSLAND

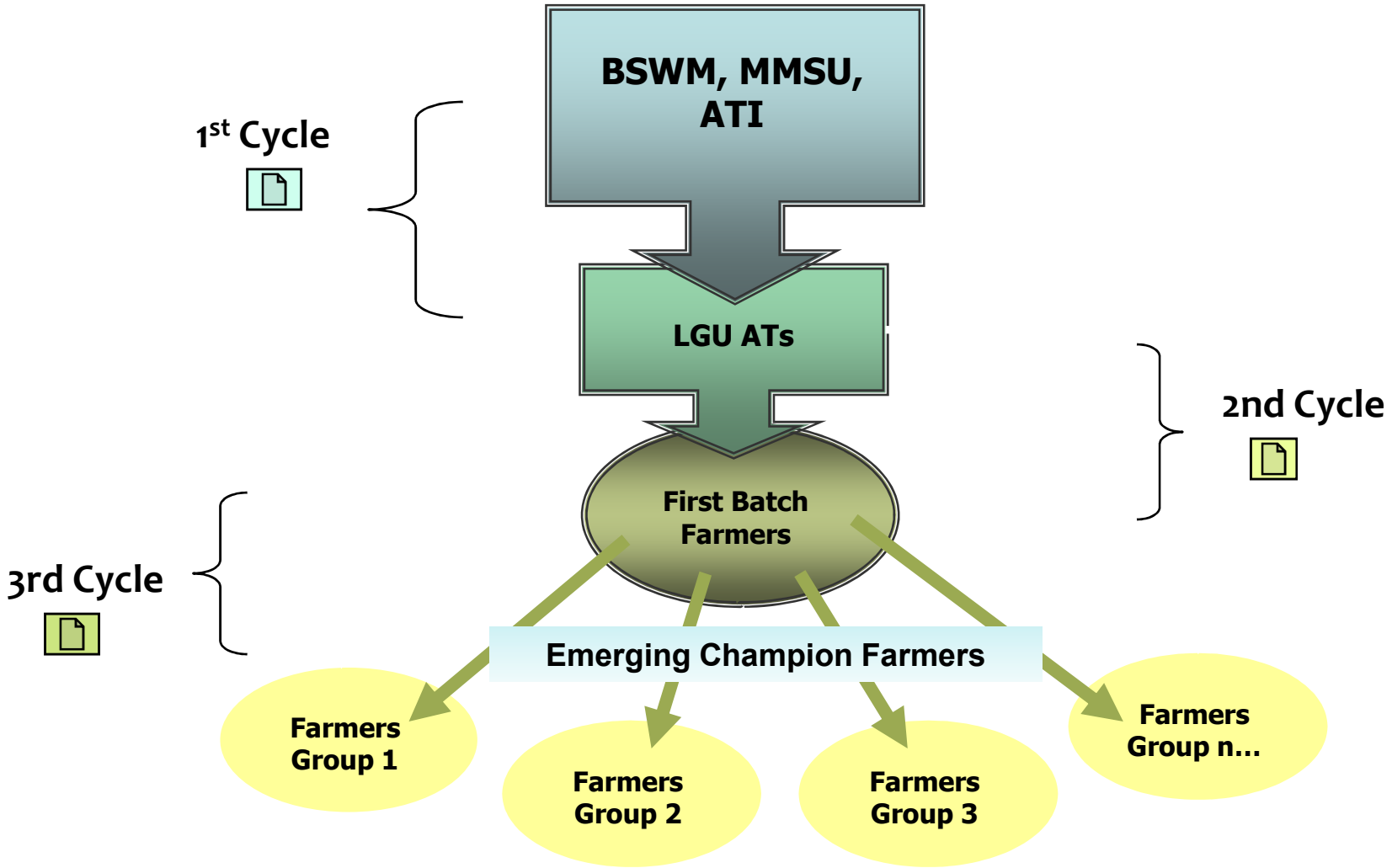


INTEGRATED WATER MANAGEMENT IN A BASIN

Source BSWM, 2009

FRAMEWORK OF Farmer Water School

Multi-Cycle Approach



Source BSWM, 2009

FRAMEWORK OF Farmer Water School

Modules on water-related topics were developed to train technicians during the 1st Cycle on Nov 4-14, 2008 at ATI, MMSU; field works to apply modules; translate modules to local dialect for 2nd Cycle.

WASTEWATER RE-USE

DENR

DENR Administrative Order No. 2005-10
IMPLEMENTING RULES AND REGULATIONS
of the
Philippine Clean Water Act of 2004
(Republic Act No. 9275)

ENVIRONMENTAL MANAGEMENT BUREAU
Department of Environment and Natural Resources
2005

Rule 13.3 of the IRR. *Wastewater reused for irrigation and other agricultural purposes.* The DA through its implementing agencies and bureaus shall provide guidelines for the safe re-use of wastewater for irrigation and other agricultural purposes. Such guidelines shall form the basis for the DENR to set standards for the disposal on land and computation of wastewater discharge fee.

Department of Agriculture - Administrative Order No. 26 dated November 21, 2007

Supplemental Implementing Rules and Regulations Prescribing The Procedures and Technical Standards For The Issuance of a DA Certification Allowing For The Safe Reuse of Wastewater For Purpose of **Irrigation**, Fertilization, and Aquaculture, Pursuant to Section 22.C of R.A. 9275 Otherwise Known As The Philippine Clean Water Act of 2004."

Source BSWM, 2009

“Water for All” Water Policy

- In 2001, the Asian Development Bank (ADB) outlined its vision for integrated water management in the region in its water policy.
- The policy recognizes the Asia and Pacific region's need to formulate and implement integrated, cross-sectoral approaches to water management and development. It also advocates that:
  - *water is a socially vital economic good ;*
  - *water needs careful management ;and*
  - *a participatory approach will help conserve and protect water resources;*

“Water for All” Water Policy

- The principal elements of the water policy are as follows:
  - Promote a national focus on water sector reform
  - Foster the integrated management of water resources
  - Improve and expand the delivery of water services
  - Foster the conservation of water and increase system efficiencies
  - Promote regional cooperation and increase the mutually beneficial use of shared water resources within and between countries
  - Facilitate the exchange of water sector information and experience
  - Improve governance and capacity building

Country Water Champions

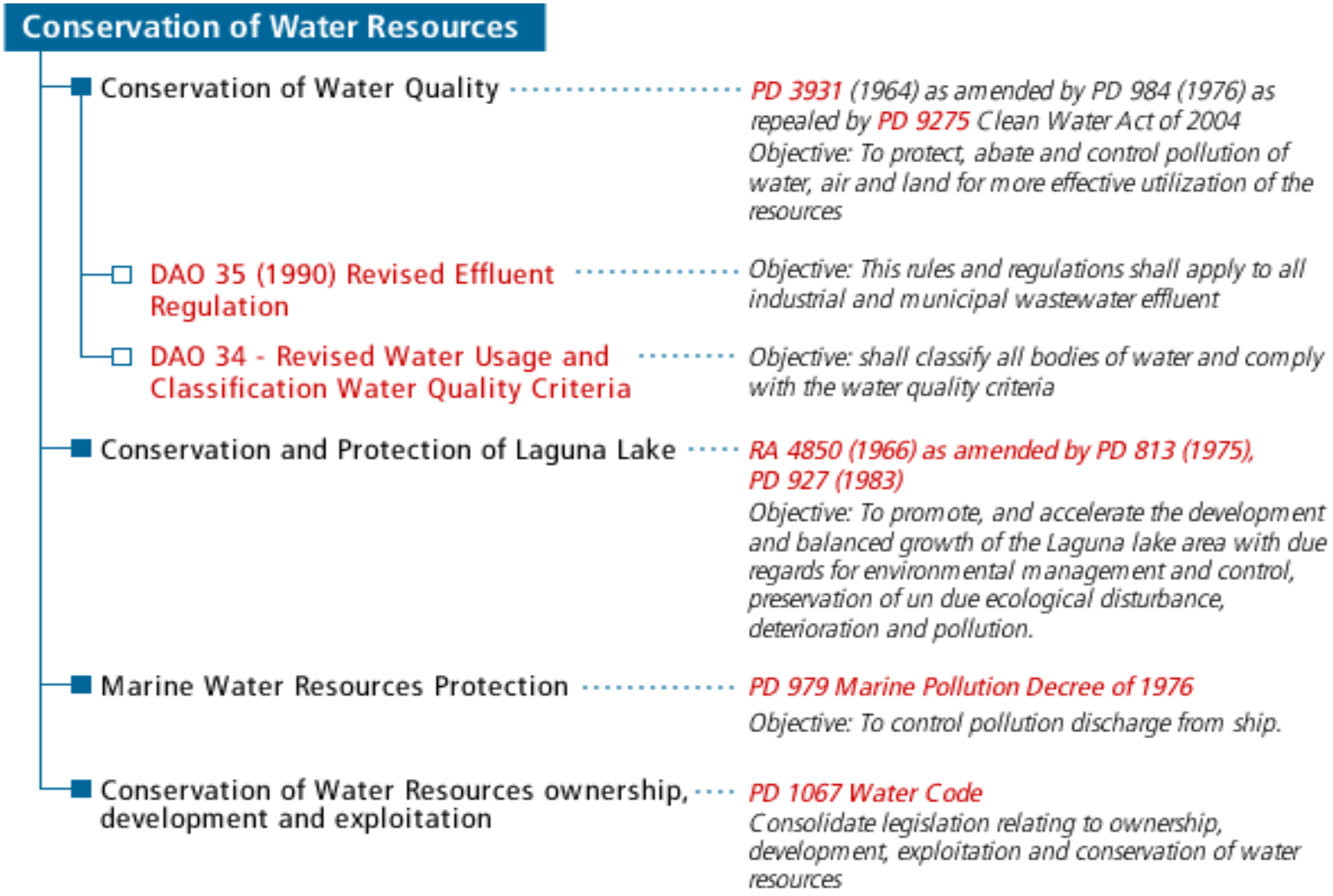
- **Bringing Water To The Rural Poor (ADB, 2004)**
  - **construction of 5,869 water supply facilities;**
  - **organization of 4,172 village water supply associations;**
  - **training of about 4000 representatives of communities and local institutions;**
  - **On the sanitation side, the project has installed 126 public toilets. 252 school toilets. 91,400 household toilets and 64 water analysis laboratories.**

Country Water Champions

- **Investment Priority;**
- **(India Indonesia* Pakistan Philippines Viet Nam)**
- **Rural**
  - **Irrigation**
  - **Rural water supply and sanitation (WSS)**
- **Urban**
  - **Urban WSS in Metro Manila, and outside of Metro Manila where water supply is managed by Water Districts and Local Governments**
- **Basin**
  - **Policy reform; IWRM strategic plans**

Source: ADB, 2006

Chart of Policy System for Water Environment in the Philippines

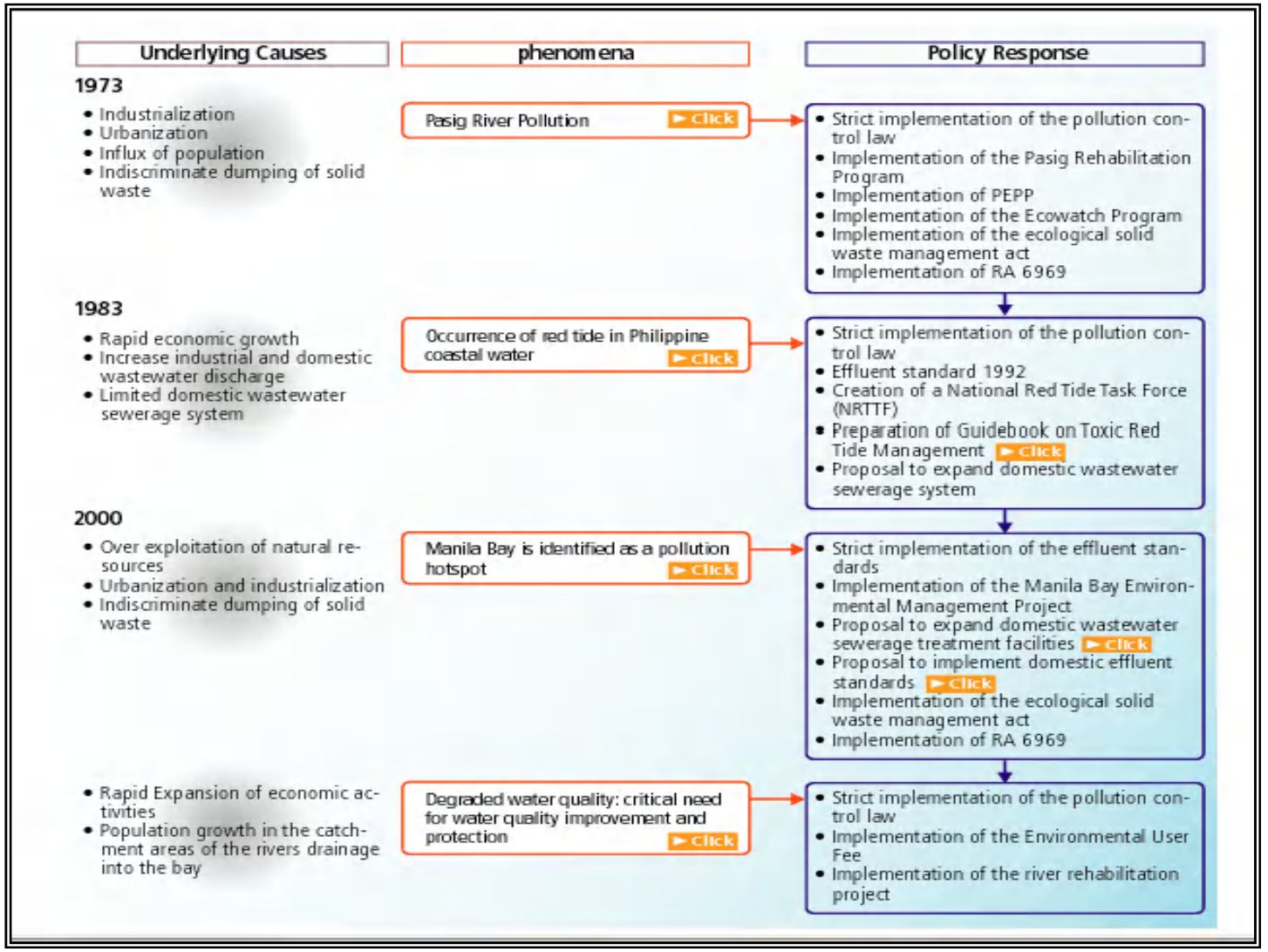


Source: WEPA, 2009

Chart of Policy System for Water Environment in the Philippines

Source: *WEPA, 2009*

Some Policies and Measures



Source: *WEPA,2009*

Enabling Conditions

Priority Policies and Programs

- Medium Term Philippine Development Plan (2004-2010)

  General Strategy - Adoption of the IWRM approach

  – *Identify/Establish Water Resources Regional Councils (WRRCs)/ River Basin Organizations (RBOS)*
  – *Pursue Raw Water Pricing*
  – *Maintain and Sustain Data Collection and Data Base for Water Resources*
  – *Conduct Assessment in terms of availability and demands for prioritized water constraint areas*

Source: NWRB

Enabling Conditions

Priority Policies and Programs

- Medium Term Philippine Development Plan (2004-2010)
  Specific Strategies

  - ***Potable Water for the entire country by 2010 with priority given for 432 waterless municipalities outside Metro Manila.***
  - ***Ensure that all barangays/municipalities will be provided with water supply sources have the corresponding sanitation facilities for proper disposal of wastewater / septage***
  - ***Continue to provide adequate capacity building programs and technical assistance on water supply and sanitation***
  - ***Develop technology options for water supply (solar desalination, windmill technology***

Source: NWRB

Enabling Conditions

Priority Policies and Programs

- Medium Term Philippine Development Plan (2004-2010)

  Specific Strategies

  – *Promote private sector investment*
  – *Conduct groundwater resources and vulnerability assessment covering 310 priority LGUs*
  – *Monitor drinking water of selected poor communities*
  – *Complete the groundwater resources inventory in major urban areas, control extraction through moratorium*

Source: NWRB

IWRM Plan Framework

- Outcome No. 1: Improved Effectiveness, Accountability, and Synergy among Water Related Institutions and Stakeholders

  – *Strategic Theme No. 1*
  Promoting Participatory Water Governance and Supportive Enabling Environment

  – *Strategic Theme No. 2*
  Strengthening Knowledge Management and Building Capacity for IWRM

Source: NWRB

IWRM Plan Framework

- **Outcome No. 2: Effective Protection and Regulation for Water Security and Ecosystem Health**
  - *Strategic Theme No. 3*
    Ensuring Rational, Efficient and Ecologically Sustainable Allocation of Water
  - *Strategic Theme No. 4*
    Enhancing Effectiveness in Groundwater Management and Aquifer Protection
  - *Strategic Theme No. 5*
    Achieving Clean and Healthy Water
  - *Strategic Theme No. 6*
    Managing and Mitigating Risks from Water Related Disasters and Climate Change

Source: NWRB

IWRM Plan Framework

- **Outcome No. 3: Sustainable Water Resources and Responsive Services for Present and Future Needs**
  - *Strategic Theme No. 7*
    Promoting Water Conservation/Stewardship and Improving Water Use Efficiency
  - *Strategic Theme No. 8*
    Expanding Access and Ensuring Availability of Affordable and Responsive Water Supply and Sanitation Services

Source: NWRB

IWRM Plan Framework

- **Outcome No. 4: Innovative Response to Future Challenges**
  - *Strategic Theme No. 9*
    - Exploring New Pathways to Water Resource Management
    - Water Sensitive Design and Water Rights Trading

Source: NWRB

Immediate Concerns

- Finalization of National IWRM Framework Plan
  - *Issuance of Presidential policy directive to adopt and mainstream IWRM in the plans and programs / initiatives of partner agencies*
  - *Formation of technical advisory group for various strategic themes*
- Development of National IWRM Strategic Plan
- Development of Flood Mitigation Plans for 20 Major River Basins
- Strengthening of Economic Regulatory Bodies
- Identifying incentives for investment into the sector

Source: NWRB

Other Key Issues and Challenges

- Planning process is highly centralized in the National Government; fragmented and sub-sectoral in approach.
- Mainstreaming IWRM Plans in the regional and local levels
- Insufficient investment for water supply and sanitation
- Lack of technical capability of implementing agencies (LGUs etc.)
- Necessity to improve coordination and systematic basic water data collection systems for efficient and effective flow of information
- Necessity to link freshwater management with coastal management

Summary

- There is enough water for every Filipino! The Philippines is blessed with plenty of raw water resources, through its abundant rainfall and natural storage in rivers, lakes, swamps, aquifers, etc.
- On the whole, the renewable freshwater resource greatly exceeds its present and even future needs.
- The greatest challenge is accessibility, i.e., bringing water to the users or at least near them.
- Population growth and economic development, water pollution, over-harvesting and exploitation, land conversion, and infrastructure development are presently exerting pressure on local water resources

Concluding Remarks

- Sustainable water resources management is an issue of increasing global concern and is perceived as the major resource challenge;
- Sustainable development in ecological, economic and social systems can only be achieved if sufficient water is available at the right time, right amount and right place;

Concluding Remarks

- Innovative and joint R&D of specific case studies of appropriate water-saving and conservation technologies to aid policy options for water management are important;
- Building a network of researchers/scientists to further the development of system's approach solutions, and the export and implementation of water-related technologies in foreign, including developing countries;

Recommendations

- Continued partnership, information and educational campaigns among all stakeholders on the sustainability of water for all.
- MMSU be included in this network of Science Council in Asia and Joint Project: ”Sustainable water resource management in Asia”; and
- Propose Philippines as venue for 2010 Science Council in Asia Water Resources Management Conference.

Thank You

Science Council of Japan