

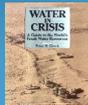
## Dean Antonio F. Mateo, Ph.D.

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**THE URBAN-RURAL GAP AND SUSTAINABLE 14<sup>TH</sup> SHARED GROWTH SEMINAR - APRIL 26, 2012**

**INNOVATIVE RAINWATER HARVESTING UNIT**  
*A Practical Option to Climate Change, Water Crisis and Disasters*

**FILIPINO TECHNOLOGY OF CONVERTING RAINWATER INTO CLEAN, POTABLE, DRINKING WATER**



## RATIONALE OF DEVELOPMENT

- \* 1.4 Billion people do not have access to safe water.
- \* 7 Million die yearly due to water-borne diseases. 2.2 Million of which are under five years old.
- \* 17 Million Filipinos are yet to have a sustainable source of potable drinking water.
- \* The 98 Million Filipinos need about 3,577 MCM of fresh water per year while Industries and Agricultural users need about 56,036 MCM or a Total Water Demand of 59,613 MCM.

## THE PRESENT SITUATION

CONSTRICTING SUPPLY



INCREASING DEMAND



FOR EQUILIBRIUM



**SUPPLY MUST IMPROVE AND DEMAND MUST EFFECTIVELY BE MANAGED**

## THE IRONY



PHILIPPINES RAINFALL PROVIDE MORE THAN 600 BILLION TONS (720 BCM) OF RAIN WATER PER YEAR BEING WASTED THROUGH DEVASTATING FLOODS OR NATURAL RUNOFF.

## THE FUTURE



**FUTURE REGIONAL WARS WILL BE FOUGHT TO SECURE RIGHTS TO FRESH WATER AREAS**

## THE PRACTICAL OPTION

## RAINWATER HARVESTING



## RH USES





## HOW THE RHS WORKS

- 1.0 RAINWATER RUN-OFF FROM CATCHMENT AREAS LIKE THE ROOF IS FUNNELED ALONG GUTTERS AND INTO DOWNPIPES TO THE RAINWATER TANKS.
- 2.0 APPROPRIATE SCREENS AND SAND TRAPS ARE INSTALLED TO STOP DEBRIS AND INSECTS ENTERING THE SYSTEM.
- 3.0 DEPENDING ON REQUIREMENTS AND BUDGET, THE RHS CAN BE A SINGLE OR MULTIPLE TANKS STORAGE SYSTEM WHICH CAN BE USED FOR WASHING, BATHING, IRRIGATING AND DRINKING.
- 4.0 THE RHS CAN BE CONNECTED DIRECTLY TO THE HOUSE PLUMBING SYSTEM THRU VALVES, FLEXIBLE PLASTIC PIPES AND APPROPRIATE FITTINGS.



## RHS ABOVE versus BELOW GROUND

- A) RESIDENTIAL & COMMERCIAL USE :  
ABOVE GROUND RHS PREFERRED
- B) INDUSTRIAL & AGRICULTURAL :  
COMBINATION OF ABOVE & BELOW GROUND RHS RECOMMENDED

## THINGS TO CONSIDER

- 1.0 NUMBER OF PEOPLE IN THE HOUSE
- 2.0 AMOUNT OF WATER CURRENTLY BEING USED
- 3.0 INTENDED USE OF RAINWATER (ex. toilet flushing, etc)
- 4.0 SIZE OF PIPES & COMPONENTS TO SUIT NEEDS
- 5.0 SIZE OF ROOF CATCHMENT
- 6.0 LOCATION OF PROPERTY (coastal areas are generally wetter than inland areas so a larger RHS tank is required inland to be as effective).
- 7.0 ORDINANCES IF ANY

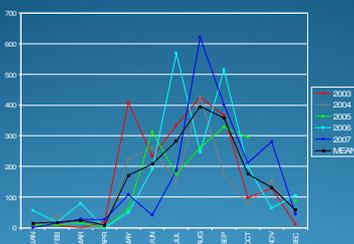


## SAMPLE GRAPHS OF MONTHLY TOTAL AND ANNUAL AVERAGE CLIMATIC DATA 5 YEARS ( 2003 - 2007 )

RAINFALL AMOUNT (mm)  
DURING THE PERIOD OF RESEARCH, RAINFALL AMOUNT (mm) FROM DIFFERENT REGIONS WERE TAKEN  
DURING THE PERIOD OF RESEARCH, 14 CLIMATIC DATA FROM DIFFERENT REGIONS WERE TAKEN

STATION: PORT AREA (MCO), MANILA

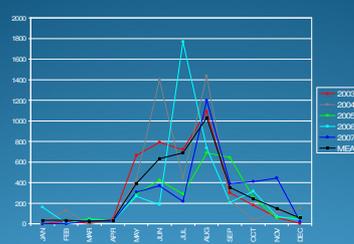
REGION NCR



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
2003	8.5	8.3	1.2	18.4	408.1	232.1	334.1	425.5	366.7	97.9	129.6	11.4	2041.8
2004	1.2	46.5	0	-1	225.3	260.2	150.6	426.3	173.3	75.8	152.8	41.3	1547.1
2005	9.8	8.9	15.8	-1	60.1	312.9	175.1	262.4	328.8	296	33.8	87.2	1990.8
2006	56.1	17.4	79.9	0	50.6	191.5	569.3	246.4	515.4	199	63.7	105.9	2095.2
2007	1.2	15	28	27.2	107.3	41.4	186.6	620.2	400.8	212.1	279.9	45.4	1965.1
TOTAL	76.8	90.1	124.9	45.6	851.4	1038.1	1415.7	1980.8	1785	880.6	659.8	291.2	9240.0
MEAN	15.4	18	25	9.1	170.3	207.6	283.1	396.2	357	176.1	132	58.2	1848.0

STATION: BAGUIO CITY, BENGUET

REGION CORDILLERA



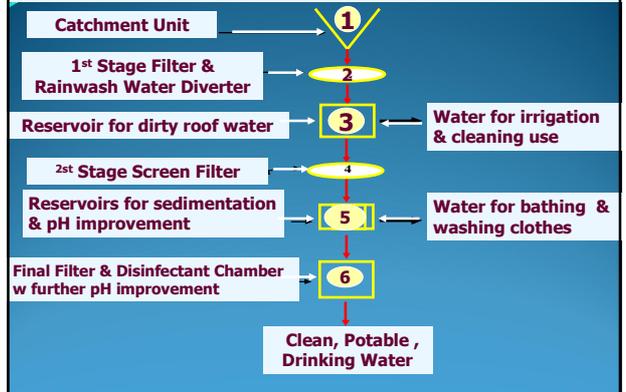
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
2003	-1	25.4	4.8	46.8	662.7	792.4	721.3	1089.4	300.2	179.7	60.4	4.4	3890.5
2004	17	128.6	-1	37.8	428.6	1400.7	445.4	1432.9	225.6	42.4	114.5	154.9	4428.4
2005	0.2	0	54.6	32	291	425.7	292.4	690.2	644.6	256.6	55.2	88	2810.5
2006	160.6	8.8	38.4	29.6	266.5	188.2	1769.8	735.8	207.6	316	72.4	43.2	3886.9
2007	-1	0.6	31.8	27.4	308.6	371	219	1201.5	393.8	410.3	444.8	21.6	3430.4
TOTAL	177.8	163.4	129.6	173.6	1957.4	3178	3447.9	5149.8	1774.8	1205	747.3	292.1	18396.7
MEAN	35.6	32.7	25.9	34.7	391.5	635.6	689.6	1000	355	241	149.5	58	3679.3

## RAINWATER HARVESTING UTILIZING THE FILIPINO DEVELOPMENT

### THE INNOVATIVE RAINWATER HARVESTING SYSTEM (IRHS)



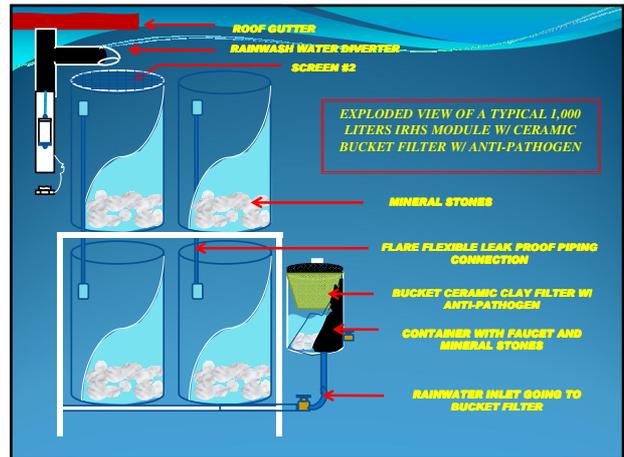
### INNOVATIVE RAINWATER HARVESTING SYSTEM : PROCESS OF CONVERTING RAINWATER INTO CLEAN, POTABLE, DRINKING WATER



### THE STANDARD 1,000 LITERS INNOVATIVE RAINWATER HARVESTING UNIT, COMPLETE WITH COMPONENTS

"The Practical Option to Climate Change, Water Crisis & Disasters"

A Filipino Technology of Converting Rainwater into Clean, Potable, Drinking Water



### DESCRIPTION OF THE INVENTION Most Promising IP Award

This Rainwater Harvesting System Technology developed and converting rainwater and contaminated water to potable water will pass all the 16 PNSDW parameters under the Physical and Chemical Tests with pH improved from 5.8 – 6.3 pH to 8.0 -8.5 pH, and passing the Microbiological Test Results inclusive of the Heterotrophic plate count.

The use of said "Pinoy Technology" will reduce the demand on fresh water needs, either for drinking, bathing or cleaning, and can be used by households, educational institutions, industries and the communities (both urban and rural – evacuation centers) thereby reducing complete dependence from water purifying chemicals.

### DESCRIPTION OF THE INVENTION Most Promising IP Award

More specifically, this "Pinoy Technology" can be used by households, educational institutions, industries and the communities (both urban and rural) thereby reducing complete dependence from water purifying chemicals and from Water Utility Companies. This "Pinoy Technology" of rainwater harvesting and converting rainwater and contaminated water to potable water can best be used by school children in far flung areas in the country where safe fresh water supply is not readily available utilizing their school buildings as catchments areas and by local government units in their evacuation centers during time of emergencies and calamities. The inventor envisions the development of low cost housing units with this "Pinoy Technology". Full utilization of the technology will benefit Filipinos and environment, saving lives and becoming our best option to cushion the effects of a worst case scenario of fresh water shortages, climate change and disasters.

## MAJOR COMPONENTS

### MULTIPLE STORAGE TANKS



1,000 Liters Module



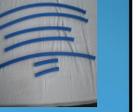
2,000 Liters Module



6,000 Liters Module

### FLEXIBLE FLARE PLUMBING SYSTEM



## MAJOR COMPONENTS

- ### SCREENS & SAND TRAP FILTERS





### RAINWASH WATER DIVERTER





## MAJOR COMPONENTS

### MULTI LEVEL STEEL PLATFORM



### MINERAL STONES




### CERAMIC / CLAY BUCKET & CANDLE FILTERS






## INNOVATIVE RAINWATER HARVESTING SYSTEM UNIT

CREATIVE BREAKTHROUGHS  
 ENVIRONMENTAL BENEFITS  
 SOCIO-ECONOMIC IMPACT



## CREATIVE BREAKTHROUGHS

There were at least six (6) important breakthroughs or discoveries hereunder itemized during the R & D Activities which until now are still continuing, based on available funds:

- Different mix, up to the 4<sup>th</sup> generation, of the clay ceramic filters utilizing local materials. There were at least two (2) mixtures which were found to be acceptable with the 1.85 -4.0 liters per hour flow rate.

The discovery of a solution and process to solve the bacteria or pathogen problems. Several experimentation, revealed the effective use of silver nitrate.

## CREATIVE BREAKTHROUGHS



## CREATIVE BREAKTHROUGHS

2.0 The development of a 1,000 liters IRHS Module, consisting of 4 x 55 gallons P.E. tanks with steel platform, with double flare flexible piping connection, valves, sand trap filter, faucets, rainwash water diverter and the ceramic / clay filter in 20 liters plastic container.



## CREATIVE BREAKTHROUGHS

3.0 The development of a Rainwash Water Diverter, which will provide a cleaner rainwater to the IRHS Storage Tanks. This Rainwash Water Diverter was developed and patented by herein Inventor, using discarded aluminum can as part of the rubber flap valve assembly, an environmentally friendly development.



Internal components of the Rainwash Water Diverter, utilizing the discarded aluminum can, tested and installed in residential and office building.

## CREATIVE BREAKTHROUGHS

4.0 The use of the invented double flare flexible piping connection that ensure leak-proof system and ease of installation.



## CREATIVE BREAKTHROUGHS

5.0 Other breakthroughs are the development of some portable equipment and machines needed to produce the ceramic candle and bucket type filters.



Gas Furnace

Bucket Filter Molding Unit

Candle Filter Molding Unit

## CREATIVE BREAKTHROUGHS

6.0 Finally, the breakthroughs in the experimentations on mineral rocks resulted to the correction of the pH of rainwater normally between 5.8 to 6.3 pH which is acidic. Pure water has a pH of 7.0. Experimentation on at least 16 mineral stones available in the locality revealed three (3) of these stones which can correct pH and raise it from 7.1 to 8.4 pH. The need to look into and test the efficacy of other mineral stones available locally that can improve pH from acidity to alkaline is obviously necessary.

## ENVIRONMENTAL BENEFITS

- 1.0 The IRHS can co-exist with and provide a good supplement to other water sources and utility systems, thus relieving pressure on other water sources;
- 2.0 The IRHS provides a water supply buffer for use in times of emergency or breakdown of the public water supply systems, particularly during natural disasters;
- 3.0 The IRHS reduces storm drainage load and flooding of city streets;
- 4.0 The IRHS shortens the hydrologic cycle and make fresh water more readily available when and where it is needed ; and
- 5.0 The IRHS promotes water conservation and will help cushion the effects of a worse water shortages

## SOCIO-ECONOMIC IMPACT AND OPPORTUNITIES IN UTILIZING RAINWATER

- 1.0 The 98 Million Filipinos need about 3,577 MCM of fresh water per year while Industries and Agricultural users need about 56,036 MCM or a Total Water Demand of 59,613 MCM.  
The Potential Philippine Rainfall theoretically at 720,000 MCM is 12 times sufficient to supply the total annual water demand;
- 2.0 The use of Rainwater even at 10 % of public water supply would have a tremendous economic effect and would secure surface and groundwater resources;
- 3.0 If every Filipino will use 1 cu. m. per month of rainwater, total savings will approximately be P 32 Billion per year;

## RAINWATER HARVESTING SYSTEM DESIGNS /USES



**DIRECT RAINWATER HARVESTING MODULE**



**FOLDABLE RAINWATER CATCHMENT DESIGN 1**



**FOLDABLE RAINWATER CATCHMENT DESIGN 2**



**FOLDABLE INVERTED UMBRELLA CATCHMENT UNIT**

**INNOVATIVE RAINWATER HARVESTING SYSTEM**



**LIFE SAVING KITS**

**PORTABLE EMERGENCY WATER FILTER ASSEMBLY**



**REGULAR ASSEMBLY**



**ASSEMBLY WITH BISCUITS & CANDIES**

**PORTABLE LIFE SAVING WATER FILTER CANISTER**



**REGULAR WATER FILTER CANISTER**



**WATER FILTER CANISTER W / BISCUITS AND CANDIES**



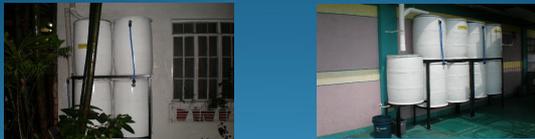
*Life Saving Emergency Water Filter*

**DIFFERENT LIFE SAVING EMERGENCY RAINWATER FILTER UNITS**

**SOME RAINWATER HARVESTING SYSTEM INSTALLATIONS, DESIGNS, USES**



**SOME IRHS INSTALLATIONS**



**1000 Liters IRHS & 2,000 Liters Q.C. & C.C Installations**



**6000 Liters Innovative Rainwater Harvesting System: Hagonoy Bulacan Installation**



**4,000 Liters Innovative Rainwater Harvesting System:  
Polangui, Albay Installation**



**24,000 Liters IRHS Installation : ASIA PACIFIC CHRISTIAN COLLEGE AND SEMINARY, Montalban Seminary / School**

## SOME IRHS INSTALLATIONS



**4,000 Liters IRHS Installation : Apostolic Catholic Church, 1003 EDSA, Q.C.**



**4,000 Liters IRHS Installation: HANBI ICT Center, Navotas City**

## SOME IRHS INSTALLATIONS



**6,000 Liters IRHS Installation : MARIKINA SPORT /EVACUATION CENTER  
Marikina City , January 11,2011**



**ADDITIONAL 12,000 LITERS IRHS INSTALLATIONS: ONE (1) MODULE FOR  
THE OFFICE OF THE MAYOR & ONE(1) MODULE FOR MARIKINA  
ENVIRONMENTAL MANAGEMENT OFFICE ,Marikina City , January 28,2012**

## LUNETTA GREEN TOILET

**A PROJECT OF THE NATIONAL PARK DEVELOPMENT  
COMMITTEE -**

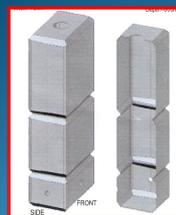


## GREEN TOILET WITH IRHS



**COMPLETED ON FEBRUARY 25, 2012 . AN ADDITIONAL EIGHT (8) MORE  
"GREEN TOILETS" WITH 6,000 LITERS MODULES IRHS WILL BE  
CONSTRUCTED THIS 2012 IN NATIONAL PARKS UNDER THE NPDC**

## FUTURE RAINHARVESTER TANKS FOR SIDEWALLS AND FENCES



**FUTURE RAINHARVESTER TANKS FOR  
SIDEWALLS AND FENCES**



# LECTURE / TRAINING / WORKSHOP TRAINING OF WOMEN PLUMBERS ON RAINWATER HARVESTING SYSTEM DESIGNS , INSTALLATIONS

## SOME SEMINAR/TRAINING/WORKSHOPS



**NATIONAL PARK DEVELOPMENT (Luneta), NURTURE SPA (Tagaytay), ENVIRONMENTAL MANAGEMENT & MAYOR'S OFFICE (Marikina City), DENR, UP HORTICULTURE SOCIETY, DOST (Bicutan) & many others**



## OTHER PRACTICAL USES OF RAINWATER COLLECTED

## PLASTIC BOTTLES AS PRESSURE IRRIGATION



PIN HOLE LOCATED ABOUT 1/4" OR 2CM FROM THE BOTTOM

## PLASTIC BOTTLES AS PULSE IRRIGATION



## REFILLABLE 1 GALLON PLASTIC BOTTLE AS DRIP OR PULSE IRRIGATION SYSTEMS



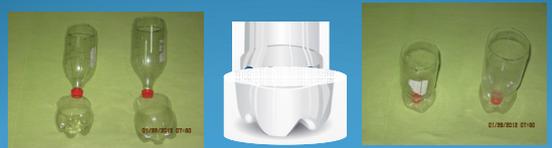
**REFILLABLE 1 GALLON PLASTIC BOTTLE AS PULSE & DRIP IRRIGATION SYSTEM IN OPERATION**



**OTHER PRACTICAL USES OF RAINWATER COLLECTED**



**RECYCLING PLASTIC BOTTLES FOR USE AS PLANT POT**



**ROOF TOP FARMING USING RAINWATER COLLECTED**



**ROOF TOP FARMING USING RAINWATER COLLECTED**



**ROOF TOP FARMING USING RAINWATER COLLECTED**



**ROOF TOP FARMING USING RAINWATER COLLECTED**





# THE HARVEST



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*COUNTRIES ARE PROGRESSIVE WHOSE GOVERNMENT HAVE POLICIES AND PROGRAMS WHICH ENCOURAGE THE ESSENTIAL CREATIVITY OF MAN. THE LACK OF RESOURCES CAN BE OVERCOME BY THE DEPTH OF COMMITMENT OF THE PEOPLE WITH THE MISSION AND VISION OF ACHIEVING GRANDIOSE GOALS. . . .*

*SUCCESS AND PROGRESS ARE THEREFORE ABOUT GOOD GOVERNANCE AND POLICIES, THE COMMITMENT AND GOOD INTENTIONS OF THE HUMAN SPIRIT AND THE CREATIVITY OF THE HUMAN RESOURCE*

**DEAN ANTONIO F. MATEO, Ph.D**

