DRINKING WATER
Regulations, Testing and Consumer Responsibility

23 July 2020
Zoom Webinar

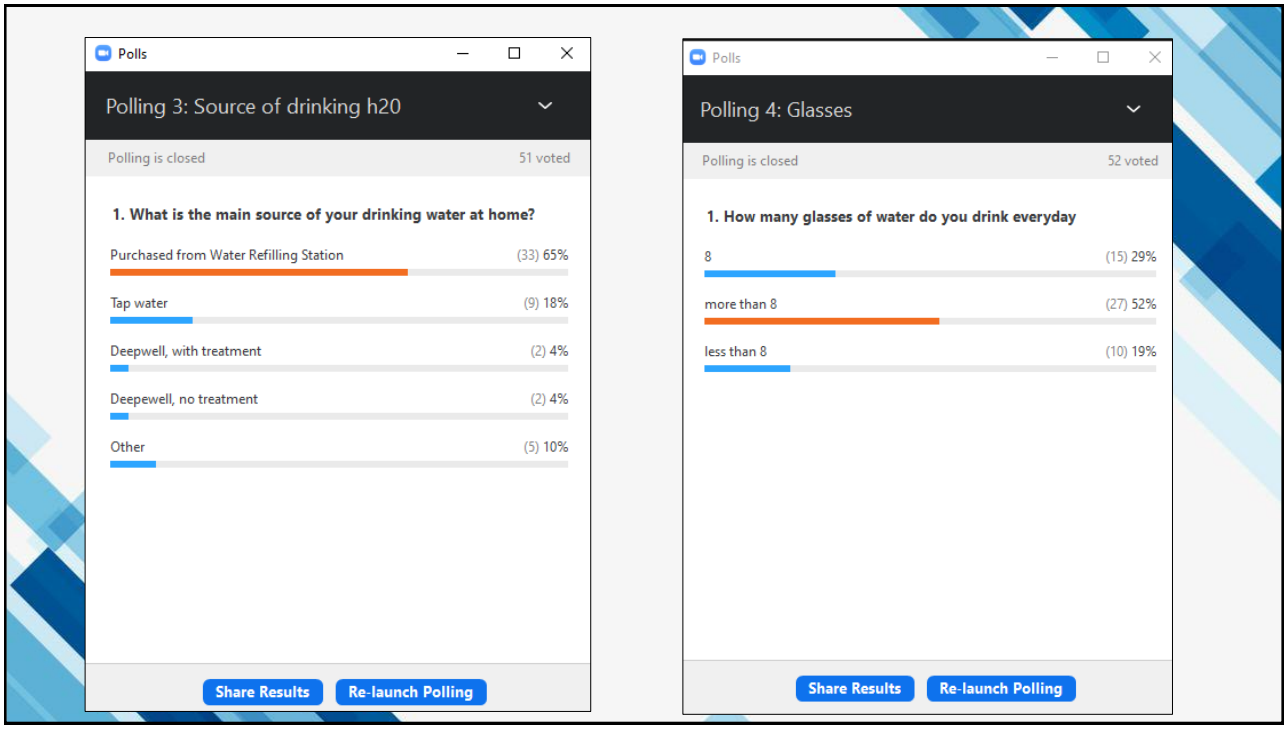
Admer Rey C. Dablio, RCh
Senior Science Research Specialist
Chemistry Laboratory
Standards and Testing Division,
Industrial Technology Development Institute
Department of Science and Technology
PHILIPPINES

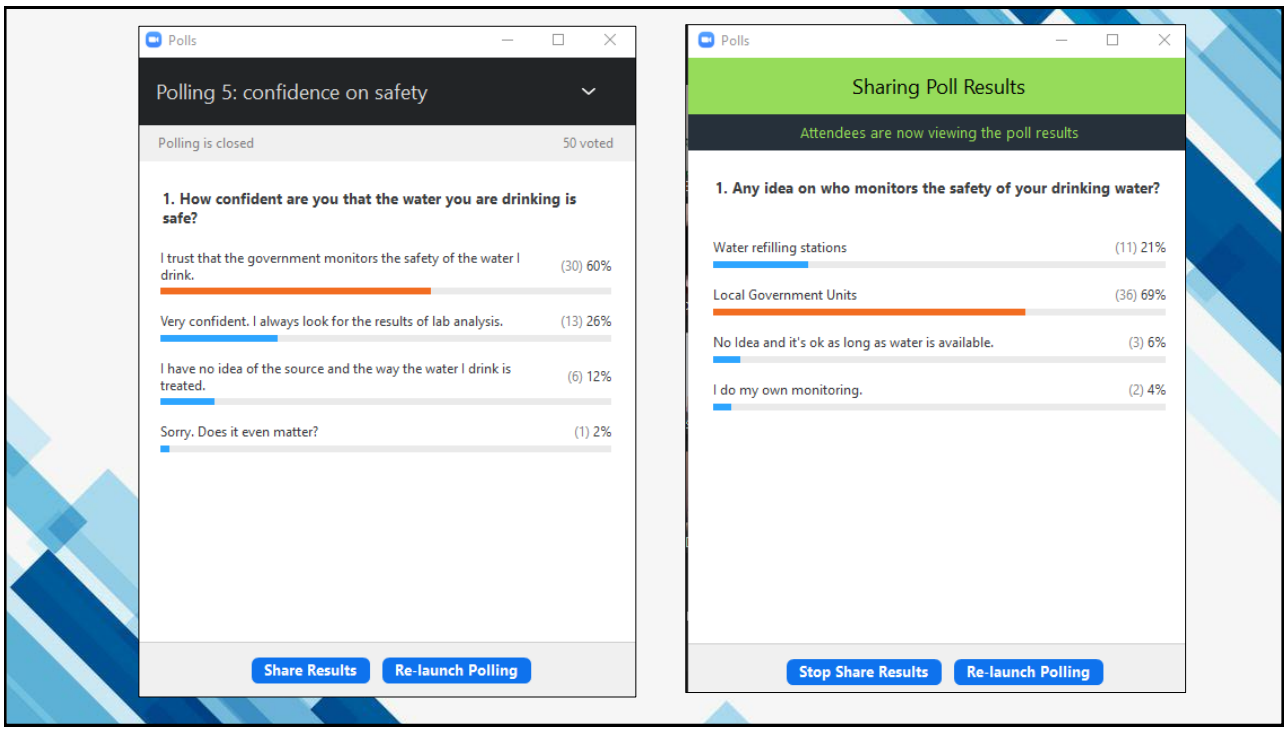
PhilMSTQ
Philippine Metrology, Standards, Testing and Quality, Inc.

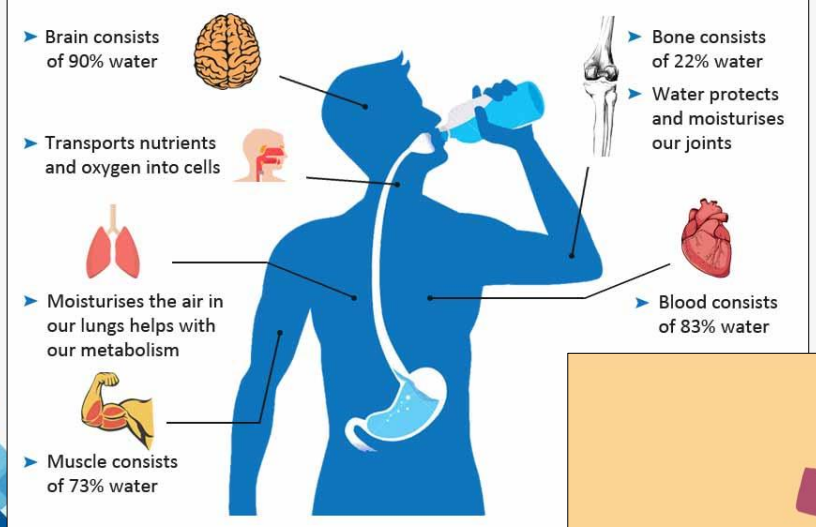
Outline of the Webinar LIVE

PhilMSTQ
Philippine Metrology, Standards, Testing and Quality, Inc.

1. Importance of Drinking Water
2. Drinking Water Regulations
3. Drinking Water Quality Testing and Competence of Laboratories
4. Our Responsibilities as Consumers
5. Open Forum


Polls
Polling 3: Source of drinking h20
Polling is closed
51 voted
1. What is the main source of your drinking water at home?
Purchased from Water Refilling Station (33) 65%
Tap water (9) 18%
Deepwell, with treatment (2) 4%
Deepewell, no treatment (2) 4%
Other (5) 10%
Share Results
Re-launch Polling
Polls
Polling 4: Glasses
Polling is closed
52 voted
1. How many glasses of water do you drink everyday
8 (15) 29%
more than 8 (27) 52%
less than 8 (10) 19%
Share Results
Re-launch Polling


Polls
Polling 5: confidence on safety
Polling is closed
50 voted
1. How confident are you that the water you are drinking is safe?
I trust that the government monitors the safety of the water I drink. (30) 60%
Very confident. I always look for the results of lab analysis. (13) 26%
I have no idea of the source and the way the water I drink is treated. (6) 12%
Sorry. Does it even matter? (1) 2%
Share Results
Re-launch Polling
Polls
Sharing Poll Results
Attendees are now viewing the poll results
1. Any idea on who monitors the safety of your drinking water?
Water refilling stations (11) 21%
Local Government Units (36) 69%
No Idea and it's ok as long as water is available. (3) 6%
I do my own monitoring. (2) 4%
Stop Share Results
Re-launch Polling

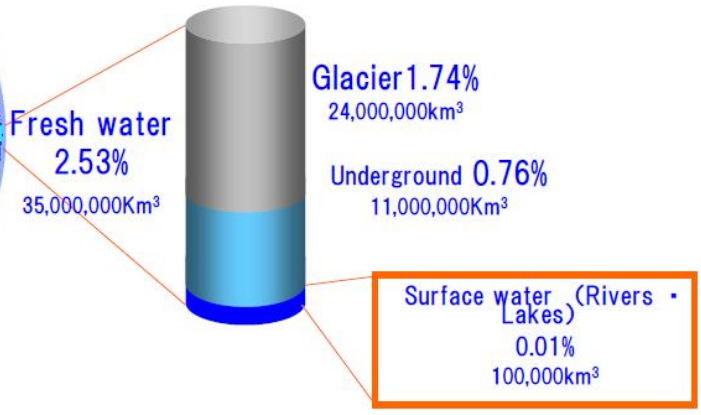


https://theladiescue.com/elkali-water/

How important is Drinking Water to us?

How much water can we use?

Usable fresh water: **0.01%** (100,000 km^3)



出典)I.A. Shiklomanov and John C. Rodda, World Water Resources at the Beginning of the Twenty-First Century, Cambridge University Press, 2004, p. 13

Philippine National Action Plan on Environmental Health

NATIONAL ENVIRONMENTAL HEALTH ACTION PLAN
Philippines 2017-2022

The Philippine government implements the National Environmental Health Action Plan and the Sustainable Development Goals

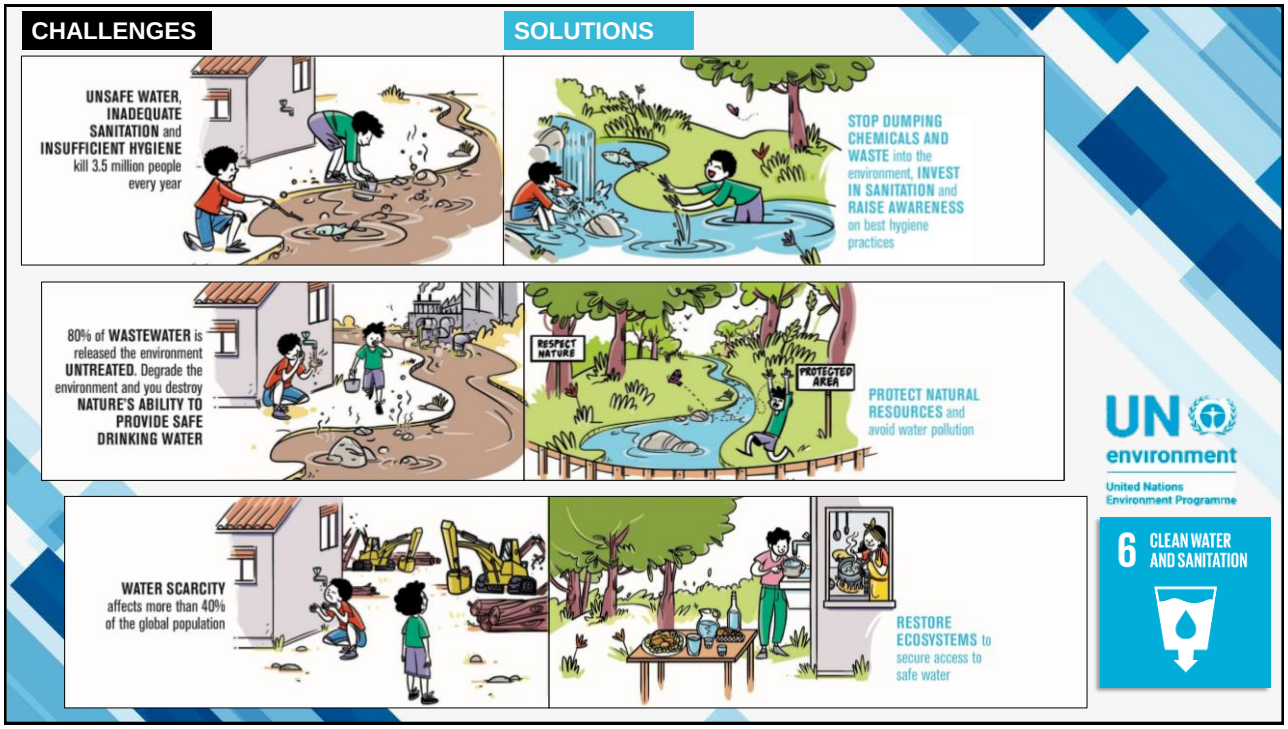
SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD

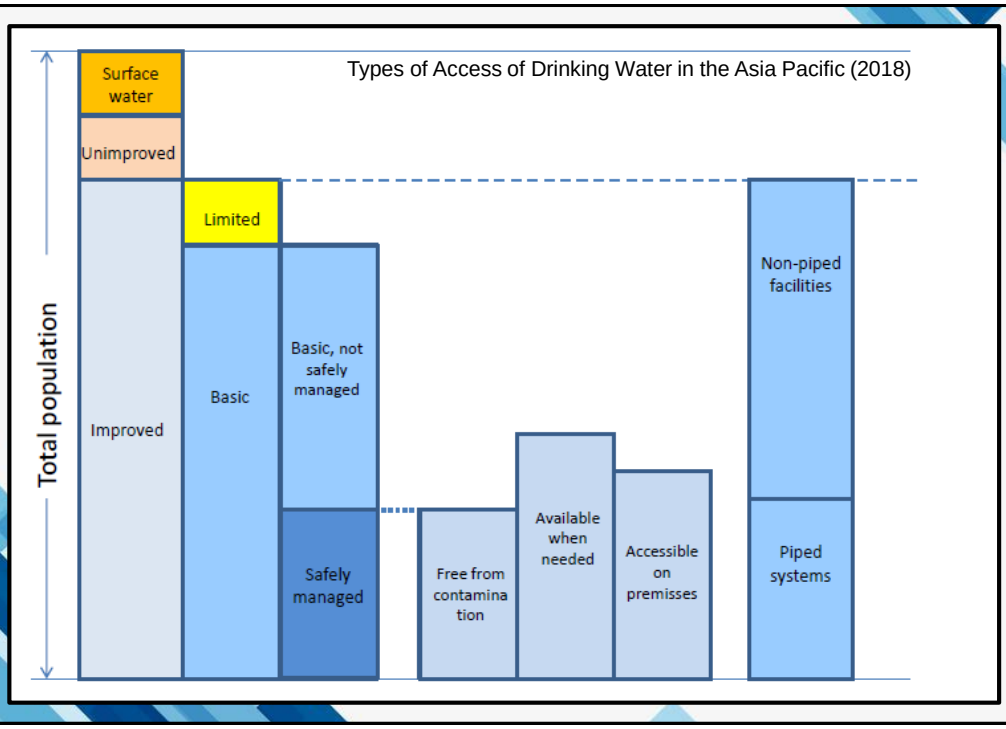
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH AND WELL-BEING
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND

The Philippine government implements the United Nations Sustainable Development Goals

8 SDGs related to Health and Environment


CHALLENGES
SOLUTIONS
UNSAFE WATER, INADEQUATE SANITATION and INSUFFICIENT HYGIENE kill 3.5 million people every year
STOP DUMPING CHEMICALS AND WASTE into the environment, INVEST IN SANITATION and RAISE AWARENESS on best hygiene practices
80% of WASTEWATER is released the environment UNTREATED. Degrade the environment and you destroy NATURE'S ABILITY TO PROVIDE SAFE DRINKING WATER
RESPECT NATURE
PROTECTED AREA
PROTECT NATURAL RESOURCES and avoid water pollution
WATER SCARCITY affects more than 40% of the global population
RESTORE ECOSYSTEMS to secure access to safe water
UN environment
United Nations Environment Programme
6 CLEAN WATER AND SANITATION


Types of Access of Drinking Water in the Asia Pacific (2018)
Total population
Surface water
Unimproved
Improved
Limited
Basic
Basic, not safely managed
Safely managed
Free from contamination
Available when needed
Accessible on premisses
Non-piped facilities
Piped systems
World Health Organization

Types of Access of Drinking Water in the Asia Pacific (2018)

Type of access	Definition	Type of access	Definition
Basic services	Drinking-water from an improved source*, provided collection time is not more than 30 minutes for a round trip, including queuing.	Safely managed	Drinking-water from an improved source, provided collection time is not more than 30 minutes for a round trip, including queuing, that is located on premises, available when needed and free from faecal and priority chemical contamination.
		Basic, not safely managed	Drinking-water from an improved source, provided collection time is not more than 30 minutes for a round trip, including queuing, that is not located on premises, or available when needed or free from faecal and priority chemical contamination.
Limited			Drinking-water from an improved source for which collection time exceeds 30 minutes for a round trip, including queuing.
Unimproved			Drinking-water from an unprotected dug well or unprotected spring.
Surface water			Drinking-water directly from a river, dam, lake, pond, stream, canal or irrigation canal.

World Health Organization

Classification of Drinking Water Technologies

World Health Organization
Western Pacific Region

First level classification	Second level classification	Improved	Unimproved
Tap water	Piped water into dwelling, yard/plot	X	
	Public tap, standpipe	X	
	Other	X	
Ground water	Tubewell, borehole	X	
	Protected well	X	
	Protected spring	X	
	Unprotected well		X
	Unprotected spring		X
Rainwater	Covered cistern/tank	X	
	Uncovered cistern/tank	X	
Packaged water*	Bottled water	X	
	Sachet water	X	
Delivered water*	Cart with small tank/ drum	X	
	Tanker truck provided	X	
Surface water	River, lake, open reservoir (dam), pond, stream, irrigation channel		X
Other	Other improved	X	
	Other unimproved		X

World Health Organization
Western Pacific Region

6 CLEAN WATER AND SANITATION

Target 6.1 of the SDG

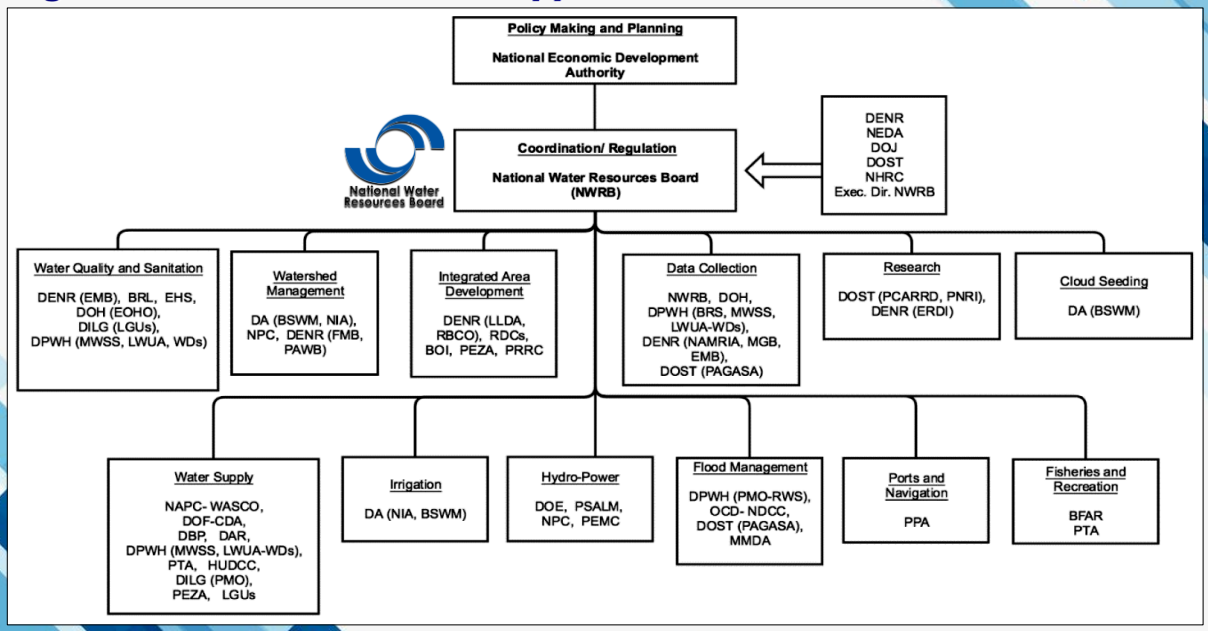
By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.1.1: Population using safely managed drinking water services

Population using an improved drinking water source which is:

- **Located on premises**
- **Available when needed**
- **Free of faecal and priority chemical contamination**

Agencies involved in the Philippine Water Sector



Source: ARANGKADA, A Policy Brief on the Philippine Water Sector

PHILIPPINE REGULATORY AGENCIES

National and Regional Agencies preparing the regulations and implementation is cascaded to the regional offices and the Local Government Units

NATIONAL AGENCIES

DOH DENR FDA DPWH DILG NWRB

REGIONAL AGENCIES

MMDA MWSS LWUA LLDA

MANILA WATER CARE IN EVERY DROP

Maynilad

Responsibilities

Department of Health (DOH)

- ✓ Develop systems and procedures to operationalize the AO.
- ✓ Ensure compliance of all drinking-water service providers and operators to the AO.
- ✓ Perform independent surveillance of drinking water service providers.
- ✓ Provide technical assistance to the LGUs, drinking water service providers and to the general public.
- ✓ Accredit water laboratories, certify training providers and water sampling personnel.

Local Government Units (LGUs)

- ✓ Enforce the provisions of the AO.
- ✓ Develop and implement drinking water quality surveillance program.
- ✓ Establish a local drinking water quality monitoring committee.
- ✓ Advocate and create awareness to general population on the importance of drinking water quality standards, impact of water contamination on health, and control measures on addressing water quality issues and problems.

Responsibilities

Water Laboratory

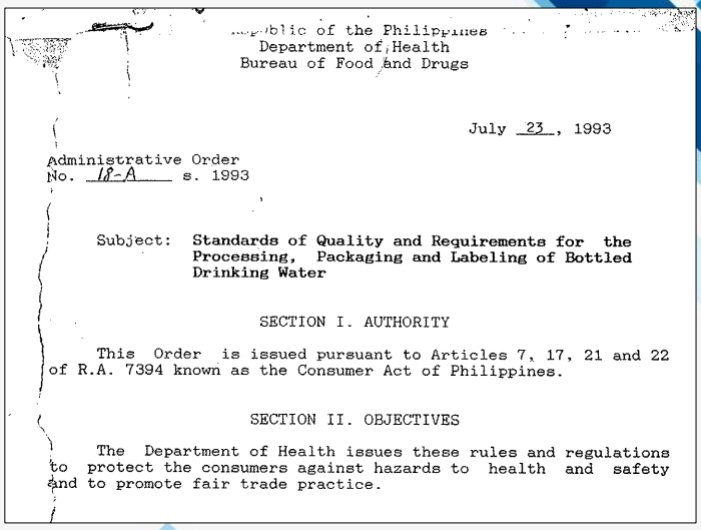
- ✓ Comply with the provisions of this AO.
- ✓ Secure accreditation from the Department of Health.
- ✓ Implement Quality System and develop a manual of operations describing the laboratory's policies and plans for ensuring the quality of their work provided to the public.

Drinking Water Service Provider / Operator of Establishment and Building

- ✓ Comply with the provisions of the AO.
- ✓ Develop and implement Water Safety Plan.
- ✓ Institute corrective actions for any unsatisfactory results of water sampling.
- ✓ Submit to the accredited laboratories water samples for examination in a manner and at such intervals prescribed under the AO.
- ✓ Submit results of water quality testing to the local health authority.
- ✓ Educate consumers on how to keep drinking water safe at all times.

What government agency regulates the water we drink?

Standards of Quality and Requirements for the Processing, Packaging and Labeling of **Bottled Drinking Water**



Republic of the Philippines
Department of Health
Bureau of Food and Drugs

July 23, 1993

Administrative Order
No. 18-A s. 1993

Subject: **Standards of Quality and Requirements for the Processing, Packaging and Labeling of Bottled Drinking Water**

SECTION I. AUTHORITY

This Order is issued pursuant to Articles 7, 17, 21 and 22 of R.A. 7394 known as the Consumer Act of Philippines.

SECTION II. OBJECTIVES

The Department of Health issues these rules and regulations to protect the consumers against hazards to health and safety and to promote fair trade practice.

Standards of Quality and Requirements for the Processing, Packaging and Labeling of **Bottled Drinking Water**

Contaminants Undesirable in excessive amounts for aesthetic/organoleptic considerations and potential health significance

	Guide Level	Maximum Acceptable Level (MAL)
Nitrates	25	45
Nitrites	not detected	0.1
Iron	0.3	1.0
Manganese	0.05	0.1
Copper	0.1	1
Zinc	0.5	5
Aluminum	0.05	0.2
Fluoride	> 0.8(fluoridated water)	2
Organic matter (mg O_2/L)	2	5
Surfactants (as lauryl sulfate)	not detected	2

Standards of Quality and Requirements for the Processing, Packaging and Labeling of **Bottled Drinking Water**

Toxic Contaminants

	Maximum Acceptable Level (MAL)
Arsenic	0.05
Cadmium	0.01
Cyanide	0.01
Chromium	0.05
Lead	0.05
Mercury	0.001
Selenium	0.01
Phenolic substances	0.001
Volatile organic compounds	
Carbon tetrachloride	0.005
Benzene	0.005
Trihalomethanes	0.01
Pesticides & related substances	
carbamates, organochlorines, organophosphates	0.1 ppb
herbicides, fungicides, PCB	0.5 ppb
Radionuclides	
gross alpha activity	0.1 Bq/L
gross beta activity	1.0 Bq/L

Philippine National Standards for Drinking Water of 2017

Republic of the Philippines
Department of Health
OFFICE OF THE SECRETARY

JUN 23 2017

ADMINISTRATIVE ORDER
No. 2017 - 0010

SUBJECT: **Philippine National Standards for Drinking Water of 2017**

I. RATIONALE

The history of the Philippine National Standards for Drinking Water (PNSDW) started in the year 1963. It was based on the 1958 World Health Organization International Standard for Drinking Water and the 1962 United States Public Health Service Standards. The 1963 PNSDW edition was subsequently revised in 1978, 1993 and 2007.

PNSDW 2017 Mandatory Parameters

- ✓ Mandatory parameters are **legally enforceable**.
- ✓ These core parameters shall be **required for examination by all drinking-water service providers**.
- ✓ The **criteria** used for selection of mandatory core parameters are:
  - ➢ parameters that directly affect health through acute or chronic exposure and/or will render the water unacceptable for drinking;
  - ➢ indicate the possible presence of other contaminants;
  - ➢ exceed tolerable values/standards based on local monitoring data of the previous years;
  - ➢ have wide spatial distribution across the Philippines based on local monitoring data;
  - ➢ and viable indicators for general quality and stability of water supply.

Philippine Mandatory Drinking-Water Quality Parameters

(DOH-AO No. 2017-0010)

No.	Parameter	Maximum Allowable Level	Sampling Location
1	**Thermotolerant Coliform** *E. Coli*	**MTFT: < 1.1 MPN/100 mL; EST: Absent or < 1 MPN/100 mL; MFT: < 1 thermotolerant coliform colonies/100 mL**	Treatment Plant Outlet / Source and Consumer's Taps
2	**Arsenic (As)**	**0.01 mg/L**	Treatment Plant Outlet / Source
3	**Cadmium (Cd)**	**0.003 mg/L**	Consumer's Taps
4	**Lead (Pb)**	**0.01 mg/L**	Consumer's Taps
5	**Nitrate (NO_3^-)**	**50.00 mg/L**	Treatment Plant Outlet / Source
6	**Color (Apparent)**	**10 CU**	Treatment Plant Outlet / Source and Consumer's Taps
7	**Turbidity**	**5 NTU**	Consumer's Taps
8	**pH**	**6.5 – 8.5**	Treatment Plant Outlet / Source and Consumer's Taps
9	**Total Dissolved Solids**	**600 mg/L**	Treatment Plant Outlet / Source and Consumer's Taps
10	**Disinfectant Residual**	**0.3 min and 1.5 max (mg/L) – Chlorine Residual; 0.2 min and 0.4 max – Chlorine Dioxide Residual**	Treatment Plant Outlet / Source and Consumer's Taps

Philippine Mandatory Drinking-Water Quality Parameters

(DOH-AO No. 2017-0010)

2. Thermotolerant Coliform/*E.coli*	**MTFT:** < 1.1 MPN/ 100 mL	• *9221 Multiple Tube Fermentation Technique* • *9221 E1 Thermotolerant Coliform Test (EC medium)* • *9221 E2 Thermotolerant Coliform Test (A-1 medium)**	• Point sources • Consumer's taps • Water treatment works • Water refilling stations • Water vending machines • Mobile treatment devices • Point of use treatment devices • Water haulers • Bulk Water • Food Establishments • All buildings • Ice Plants
	EST: Absent or <1 MPN/100 mL	• *9223 Enzyme Substrate Coliform Test**	
	MFT: < 1 thermotolerant coliform colonies / 100 mL	• *9222B Standard Total Coliform Membrane Filter Technique*	

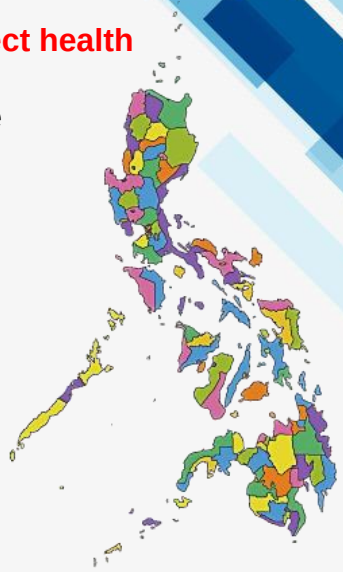
Philippine Mandatory Drinking-Water Quality Parameters

(DOH-AO No. 2017-0010)

Parameter	Chemical Abstracts Service (CAS) No.	Maximum Allowable Level (MAL)	Methods of Analysis
5. Cadmium (Cd)	7440-43-9	0.003 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 F. Nitric Acid-Hydrochloric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3113 B. Electrothermal Atomic Absorption Spectrometric · 3120 B. Inductively Coupled Plasma Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method

PNSDW 2017 Primary Parameters

- ✓ Primary parameters are **site-specific**.
- ✓ These are chemical impurities in water that **directly affect health** through acute or chronic exposure.
- ✓ Primary parameters can also be adopted as enforceable parameters, in addition to the mandatory parameters.



PNSDW 2017 Primary Parameters

No.	Parameter	No.	Parameter
1	1,2-Dibromo-3-chloropropane (DBCP)	29	Dibromochloromethane (DBCM)
2	1,2-Dichlorobenzene	30	Dibromoacetonitrile
3	1,2-Dichloroethane	31	Dichloroacetate
4	1,2-Dichloroethene	32	Dichloroacetonitrile
5	1,4-Dichlorobenzene	33	Dichlorodiphenyltrichloroethane (DDT)
6	2,4,6-Trichlorophenol	34	Dichloromethane
7	Acrylamide	35	Endrin
8	Aldrin and Dieldrin	36	Epichlorohydrin
9	Alpha Particles	37	Ethylbenzene
10	Atrazine	38	Ethylene Dibromide
11	Antimony	39	Fluoride
12	Barium	40	Glyphosate
13	Benzene	41	Lindane
14	~~Benzo(a)pyrene (PAHs)~~	42	Manganese
15	Beta Particles	43	Mercury (Total)
16	Boron	44	Monochloroacetate
17	Bromate	45	Nickel
18	Bromodichloromethane (BDCM)	46	Nitrite
19	Bromoform	47	Pendimethalin
20	Carbon Tetrachloride	48	Radon
21	Carbofuran	49	Sulfate
22	Chlorate	50	Selenium
23	Chlordane	51	Styrene
24	Chlorite	52	Tetrachloroethene
25	Chloroform	53	Trichloroacetate
26	Chromium (Total)	54	Toluene
27	Cyanide (Total)	55	Total Trihalomethane (THM)
28	Di(2-ethylhexyl)phthalate	56	Vinyl chloride

PNSDW 2017 Primary Parameters

11. Mercury, Total (Hg)	7439-97-6	0.001 mg/L	**A. Sample Preparation** · 3030 E. Nitric Acid Digestion · 3030 G. Nitric Acid-Sulfuric Acid Digestion · 3030 K. Microwave-Assisted Digestion **B. Instrumentation** · 3112 B. Cold-Vapor Atomic Absorption Spectrometric Method · 3125 B. Inductively Coupled Plasma-Mass Spectrometry Method · EPA 245.7 / BS EN 13506 Atomic Fluorescence Spectrometric Method · EPA 7473 Thermal Decomposition, Amalgamation, Atomic Absorption Spectrometric Method

PNSDW 2017 Secondary Parameters

- ✓ Secondary parameters are those that render the water **unacceptable** for drinking.
- ✓ These include **operational parameters** which affect the efficiency of the treatment process.

PNSDW 2017 Secondary Parameters

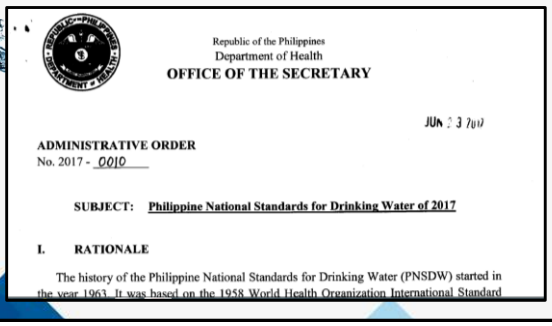
No.	Parameter	No.	Parameter
1	Aluminum	7	Manganese
2	Chloride	8	Odor
3	Copper	9	Sodium
4	Hardness	10	Taste
5	Hydrogen Sulfide	11	Xylenes (total)
6	Iron	12	Zinc

Arsenic Maximum Allowable Level (mg/L)

2017 PNS	2011 WHO*	US EPA	2011 ADWG*
0.01 (10 µg/L)	0.01 (10 µg/L)	ND[A] 0.01[B] (10 µg/L)	0.01 (10 µg/L)

*Just GUIDELINE VALUES

[A]MCLG. [B]MCL



Republic of the Philippines
Department of Health
OFFICE OF THE SECRETARY

JUN 23 2017

ADMINISTRATIVE ORDER
No. 2017 - 0010

SUBJECT: Philippine National Standards for Drinking Water of 2017

I. RATIONALE

The history of the Philippine National Standards for Drinking Water (PNSDW) started in the year 1963. It was based on the 1958 World Health Organization International Standard

No.	Parameter
1	Thermotolerant Coliform *E. Coli*
2	Arsenic (As)
3	Cadmium (Cd)
4	Lead (Pb)
5	Nitrate (NO_3^-)
6	Color (Apparent)
7	Turbidity
8	pH
9	Total Dissolved Solids
10	Disinfectant Residual

Philippine Mandatory Drinking-Water Quality Parameters
(DOH-AO No. 2017-0010)

AN ELEMENTAL CONCERN: ARSENIC IN DRINKING WATER

Source: www.circleofblue.org

circle of blue

33 As 74.92

Arsenic is a toxic element that is both naturally occurring in Earth's crust and artificially produced during agricultural and industrial processes. Most arsenic compounds have no color, smell, or taste—making the chemical dangerously difficult to recognize. In diverse climates and geographies, arsenic contaminates prominent groundwater sources. Exposure to arsenic, especially in the last few decades, has caused illness and death in societies from the United States to Bangladesh, where one in five deaths can be attributed to arsenic poisoning.

Arsenic can enter the air through rock erosion, mining activity, volcanic eruptions, or forest fires.

The main source of arsenic in drinking water (usually from wells) is arsenic-rich rocks through which the water has been filtered.

When contaminated groundwater is used to irrigate fields, the element accumulates in soil and crops, particularly rice.

Arsenic can enter surface water through runoff from certain agricultural and industrial activities.

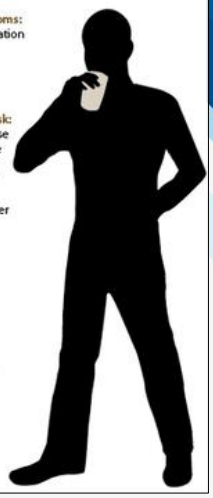
In communities where residents cook with and drink from the same contaminated well, arsenic intake multiplies.

ARSENIC POISONING

Inorganic arsenic has been declared a known human carcinogen by the International Agency for Research on Cancer, the U.S. Environmental Protection Agency, and the Department of Health & Human Services.

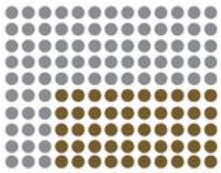
Early Symptoms:
Skin discoloration
Skin lesions
Nausea
Vomiting
Diarrhea

Increased Risk:
Kidney disease
Heart disease
Liver disease
Lung cancer
Skin cancer
Bladder cancer
Diabetes
Paralysis



ARSENIC BY THE NUMBERS

10 ppb
(Ten parts per billion) – Arsenic standard for drinking water enforced by the EPA and recommended by the World Health Organization. Equivalent to a few drops of ink in an Olympic-sized swimming pool.



130 million
People across the world are exposed to levels of arsenic in drinking water that exceed the 10 ppb limit.

50 million
People have been exposed to arsenic levels exceeding 50 ppb, or five times the recommended limit.

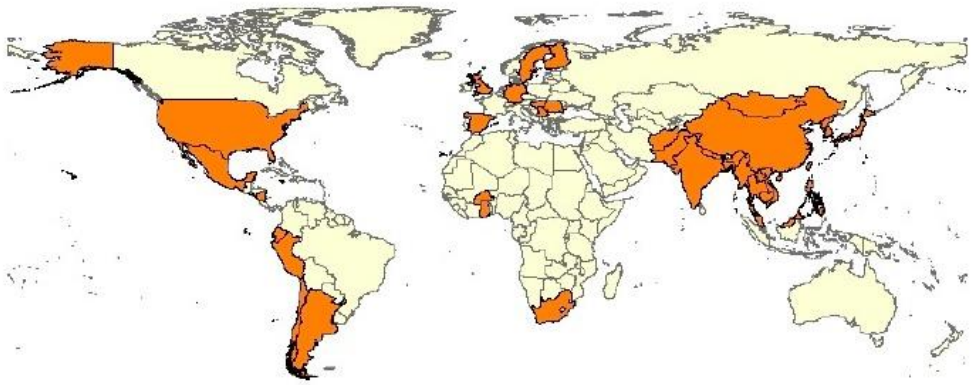
1 in 100
Estimated rate of people who routinely drink water containing at least 50 ppb of arsenic who will die from cancers. For each death, many others will live with painful, chronic disease.

90%
Amount of those known to have had high water arsenic exposures (>50 ppb) living in Asia.

Many Asians are vulnerable to both poisoning due to malnutrition and overexposure because of their reliance on rice crops.

Countries Known to be Affected by Arsenic in their Drinking Water (2005)

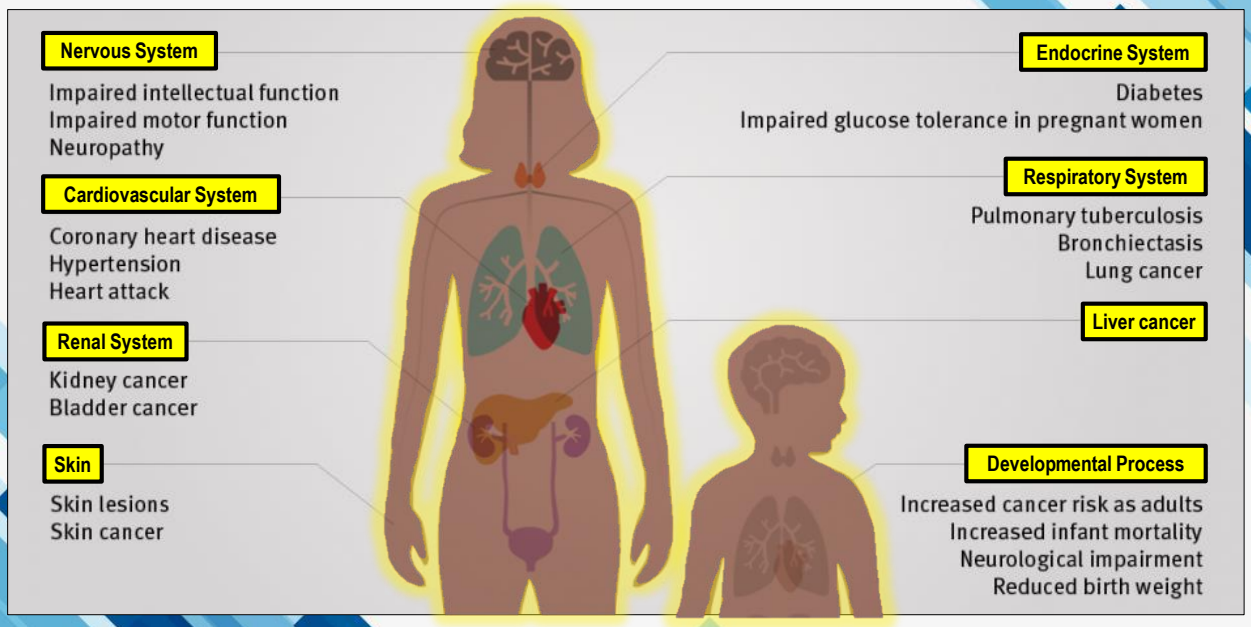
Zheng Gong, MIT department of Civil and Environmental Engineering, August 2005



Over 30 countries in the world is affected by arsenic in drinking water

Arsenic Effects on the Human Body

Source: **Nepotism and Neglect**
The Failing Response to Arsenic in the Drinking Water of Bangladesh's Rural Poor. Human Rights Watch, 2016.



Water Supply Provider

- Turbidity, pH – Online
- Mn, NH_3, P, N - Manual
- pH - Online
- DO, pH , Free Cl - Online

Maynilad

Water Supply Source

Level I (or point source) – a protected well or developed spring with an outlet but without distribution system, generally adaptable for rural areas where the houses are thinly scattered. A level I facility normally serves up to 15 to 25 households and its outreach must not be more than 250 meters from the farthest user..

Level II (communal faucet system or stand posts) – a system composed of a source, reservoir, piped distribution network and communal faucets, located no more than 25 meters from the farthest house. The system is designed to deliver 40 to 80 liters per capita per day to an average of 100 households, with one faucet per 4 to 6 households. It is generally suitable for rural and urban areas where houses are clustered densely to justify a simple pipe system.

Level III (waterworks system or individual house connections) – a system with a source, a reservoir, a piped distribution network and household taps. It is generally suited for densely populated areas. This level of facility requires a minimum treatment of disinfection.

Frequency – Sampling for Microbiological

Source and Mode of Supply	Population Served	Minimum Frequency of Sampling for Total Coliform and Thermotolerant coliform/*E.coli**	Minimum Frequency of Sampling for Heterotrophic Plate Count (HPC)*	Point of Compliance
1. Level I	-	1 sample every three (3) months	Not required	Point source
2. Level II	-	1 sample every other month	1 sample every other month *(required if treated)*	Communal faucet
3. Level III	Less than 5,000	2 samples monthly	2 samples monthly	Consumer's tap
	5,000 – 100,000	1 sample per 5,000 population + 2 additional samples monthly	1 sample per 5,000 population + 2 additional samples monthly	Consumer's tap
	More than 100,000	1 sample per 10,000 population, plus 12 additional samples monthly *Collection of samples should be spread out within a month* *Compliance to total coliform: At least 95% of standard samples taken in each month from each reservoir and distribution point is total coliform negative, provided that thermotolerant coliform is absent* *Compliance to thermotolerant coliform: No samples should test positive for thermotolerant coliform*	Required, at least 40% of the sampling points	Consumer's tap

Frequency – Sampling for Microbiological

Source and Mode of Supply	Population Served	Minimum Frequency of Sampling for Total Coliform and Thermotolerant coliform/*E.coli**	Minimum Frequency of Sampling for Heterotrophic Plate Count (HPC)*	Point of Compliance
4. All buildings (*i.e.* residential, commercial, industrial and institutional buildings)	Less than or equal to 600	1 sample every other month	1 sample every other month	Consumer's tap
	More than 600	1 sample monthly	Once a month	Consumer's tap
5. Food Establishments	-	1 sample every other month	1 sample every other month	Consumer's tap
6. Ice Plants	-	Once a month	Once a month	Product ice

Frequency – Sampling for Mandatory Physical and Chemical Parameters

Source and Mode of Supply	Population Served Per Supply System	Number of Samples/Frequency of Sampling	Sampling Location
1. **Level I (Point Source)**	-	One sample per year	Point Source
2. **Level II (Communal Faucet)**	-	One sample per year	*Refer to Table B-1*
3. **Level III**	49,999 and below	One sample per year	
	50,000 and above	One sample for every 250,000 population served per year	
4. **All buildings** (*i.e.* residential, industrial, commercial, and institutional buildings)	-	One sample per year Parameters to be tested: • *Water from main utilities:* Lead, color, odor, turbidity, pH, TDS • *With own source of water:* All mandatory parameters • *Water from main utilities and own source:* All mandatory parameters	Consumers' taps
5. **Food Establishments**			
6. **Ice Plants**			

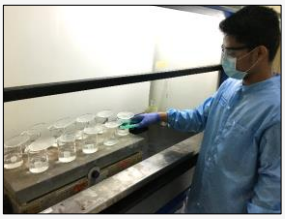
Frequency – Sampling for Radiological Parameters

Type	Frequency
Initial	Four (4) consecutive quarters for one year
Periodic	Once every three (3) years

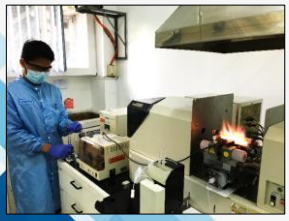
Frequency – Other Modes of Distribution of Drinking Water

Source	Parameter	Minimum Frequency of Sampling
Water Refilling Station and Water Vending Machines	Total Coliform	One sample per month
	Thermotolerant coliform/*E. coli*	One sample per month
	Heterotrophic Plate Count	One sample per month
	All mandatory physico-chemical parameters	Two samples per year
Mobile Water Tank and Bulk Water Supply	Microbiological (total coliform, E. coli and HPC)	Once a month
	All mandatory physico-chemical	Once a year
Water Refilling Station, Water Vending Machines, Mobile Water Tank, Bulk Water Supply	Other parameters identified by the LDWQMC	One sample per year or as may be required by the LDWQMC

Standard Test Method for Arsenic in Water



Digestion Procedure:
SMEWW 3030 E / G
HNO_3, H_2SO_4 – HNO_3



Instrumentation Procedure:
SMEWW 3114 C
HVG-AAS

Sample Preparation:
100.00 mL sample
1.00 mL 1+1 H_2SO_4 and 2.00 mL Conc. HNO_3

↓

Reduction of As (V) to As (III) (25.00 mL Soln):
2.50 mL 5% KI + 5% Ascorbic Acid
2.50 mL Conc. HCl

↓

Time of Reaction: at least 45 minutes

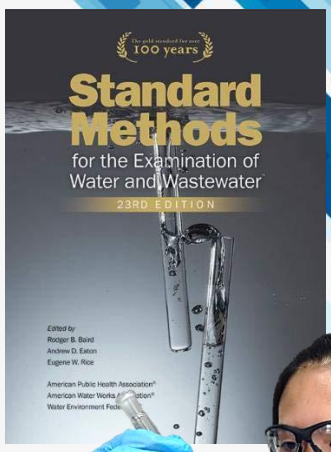
↓

Instrumentation:
Reductant = 0.2% $NaBH_4$ in 0.05% NaOH Soln
Acid = 10% HCl
Sample = diluted to mark (25.00 mL) after reaction time

↓

Data Processing

$$6\ BH_4^- + As^{3+} + 3\ H^+ \rightarrow$$
$$3\ B_2H_6 + 3\ H_{2(g)} + AsH_{3(g)}$$



Methods for the Determination of Total Arsenic in Drinking Water

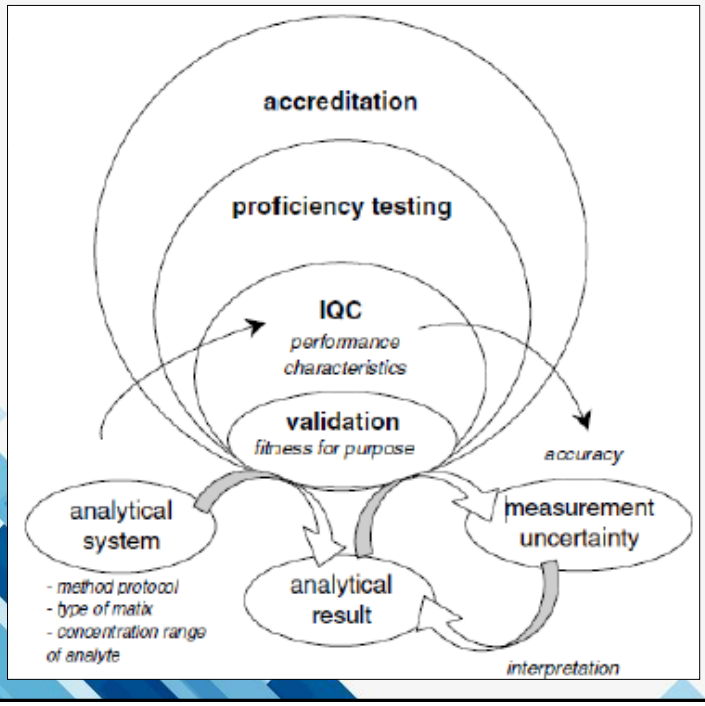
Method	Detection Limit		Instrument cost,	Operator	Applicable Arsenic Limit			
	Absolute	Concentration	$ x 10-3	Skill Level	50 µg/L	20 µg/L	2 µg/L	2 ng/L
Hydride Generation								
Colorimetric[a]	1 µg	10 µg/L (100 mL)	5	Low	Yes	No	No	No
Thermal conductivity		10 µg/L	40	High	Yes	Yes	Yes	No
Atomic fluorescence		20 ng/L	20	High	Yes	Yes	Yes	No
Graphite furnace AAS	0.2 ng	2 ng (100 mL)	60	High	Yes	Yes	Yes	No
Quartz-tube AAS	0.5 ng	32 ng/L (15 mL)	60	High	Yes	Yes	Yes	No
Helium discharge	0.1 ng	1 ng/L (100 mL)	20	High	Yes	Yes	Yes	No
Microwave plasma	20 pg	1.4 ng/L (15 mL)	20	High	Yes	Yes	Yes	No
DC-plasma	0.4 µg	4 µg/L (100 mL)	60	Very high	Yes	Yes	No	No
ICP emission	2 ng	20 ng/L (100 mL)	80	Very high	Yes	Yes	Yes	No
ICP-MS	10 pg	0.1 ng/L (100 mL)	200	Very high	Yes	Yes	Yes	No

Source: Arsenic in Drinking Water. National Research Council (US) Subcommittee on Arsenic in Drinking Water. Washington (DC): 1999.

Methods for the Determination of Total Arsenic in Drinking Water

Method	Detection Limit		Instrument cost,	Operator	Applicable Arsenic Limit			
	Absolute	Concentration	$ x 10-3	Skill Level	50 µg/L	20 µg/L	2 µg/L	2 ng/L
Electrochemical								
Differential pulse polarography	20 ng	1 µg/L (20 mL)	20	High	Yes	Yes	No	No
Anodic stripping voltammetry	6 pg	0.3 ng/L (20 mL)	30	High	Yes	Yes	Yes	Yes
Spectroscopic								
Flame atomic absorption		1 mg/L	20	Low	No	No	No	No
Graphite furnace AAS		1 µg/L	80	High	Yes	Yes	No	No
DCP or ICP-AES		10 µg/L	80	Very high	Yes	Yes	No	No
ICP-MS		0.05 µg/L	200	Very high	Yes	Yes	Yes	No

Source: Arsenic in Drinking Water. National Research Council (US) Subcommittee on Arsenic in Drinking Water. Washington (DC): 1999.



METHOD VALIDATION

Crucial in the "Quality Assurance" Picture of the Lab

Eurachem
A Focus for Analytical Chemistry in Europe

Performance Characteristics Commonly Evaluated during Method Validation of Labs

Performance characteristic
Selectivity
Limit of detection (LOD) and limit of quantification (LOQ)
Working range
Analytical sensitivity
Trueness • bias, recovery
Precision • repeatability, intermediate precision and reproducibility
Measurement uncertainty[a]
Ruggedness (robustness)

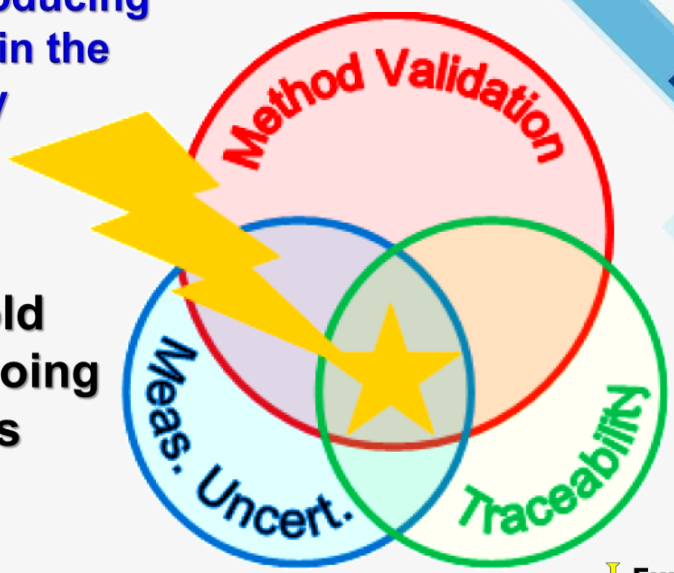
[a] Strictly, measurement uncertainty is not a performance characteristic of a particular measurement procedure but a property of the results obtained using that measurement procedure.

Accuracy

Eurachem
A Focus for Analytical Chemistry in Europe

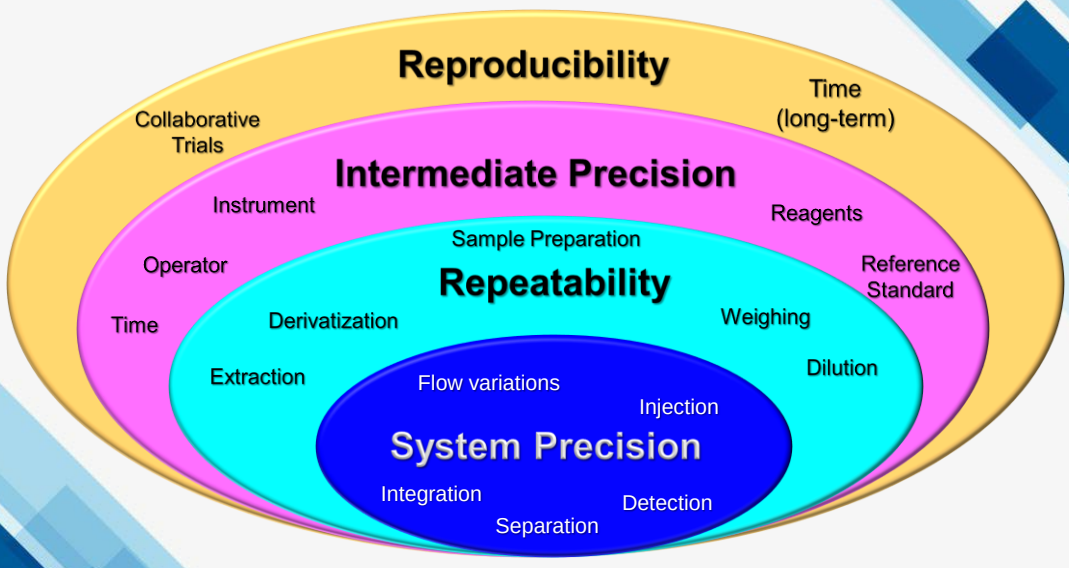
The BASIS for producing reliable results in the Laboratory

The 3-Fold Basis for Doing Analysis



Eurachem
A Focus for Analytical Chemistry in Europe

The Levels of Uncertainty in the Laboratory



Source: Ermer & Miller (ed.): "Meth. Val. In Pharmaceutical Analysis"

Philippine National Standard for Drinking Water

Department of Health (DOH) A.O. No 10, 2017

REPUBLIC OF THE PHILIPPINES * DEPARTMENT OF HEALTH *

0.01 mg/L for Lead (Pb)

Maximum Level

Result released by the laboratory: < MDL (MDL = 0.02 mg/L)

FAAS Method Detection Limit (0.02 mg/L)

Regulation Level (0.01 mg/L)

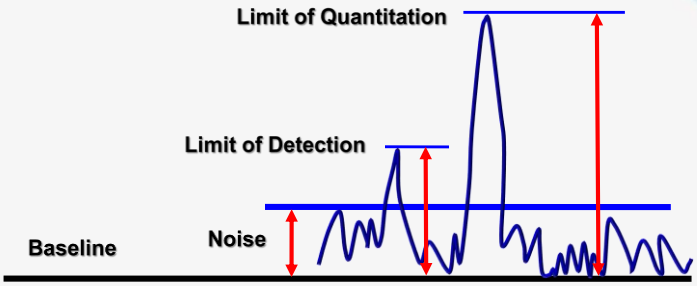
Limit of Detection (LoD) or Method Detection Limit (MDL)

The the lowest concentration of the measurand that can be detected at a specified level of confidence.

Limit of Quantitation (LoQ) or Method Quantitation Limit (MQL)

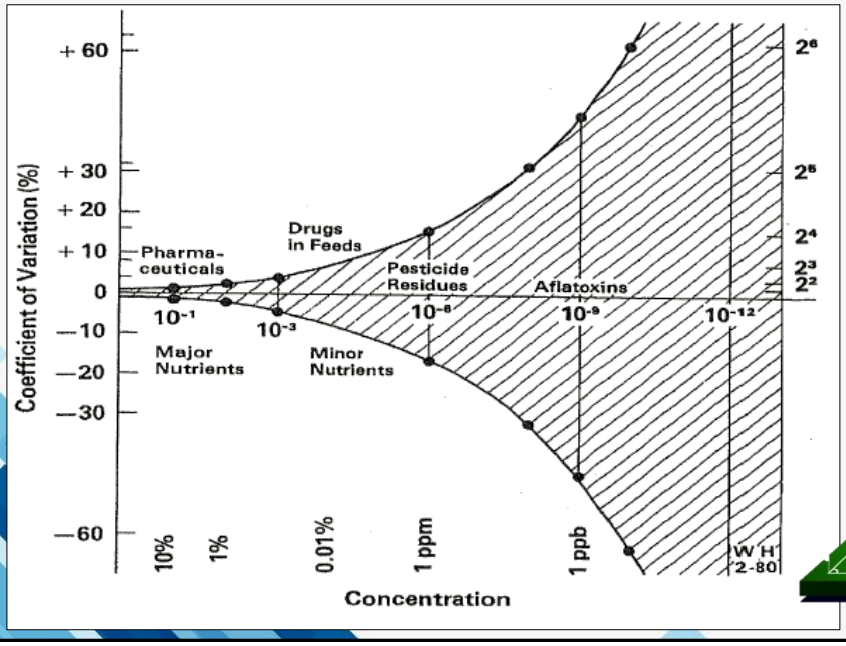
The the lowest concentration at which the performance of a method or measurement system is acceptable for a specified use.

VIM and Eurachem Definitions



The Horwitz Trumpet

https://nanopdf.com/download/horwitz-ratio-horrat-collaborative-trials_pdf



Proficiency Testing Participation

US ERA Proficiency Testing Scheme Round 247

Water Supply for Drinking Water

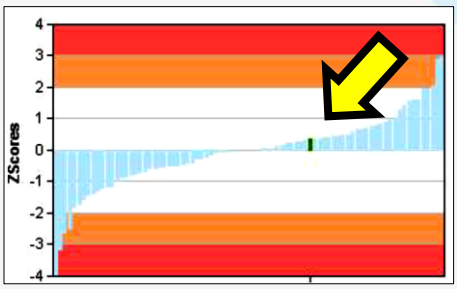
Group Summary	
Your Reported PT Result	**42.0**
Your z Score	**0.377**
Your Performance Evaluation	**Satisfactory**
Relative Recovery	**101 %**
Reported Method	SM3114B
Formulation/Certified Value	41.4 µg/L
Uncertainty of Certified Value	0.407 %
Assigned Value (X)	41.0
Robust Mean	41.0
SDPA	2.57
Satisfactory Range	35.9 - 46.2
Average Relative Recovery	99.1 %
Relative Standard Deviation	6.27 %
Percent Acceptable	97.6 %
Number of Data Points	84

Lab Reported PT Result

Assigned Value By Formulation or Robust Mean

$$z = (x-X) / SDPA$$

Std Dev for Proficiency Assessment



Laboratory Accreditation

PHILIPPINE ACCREDITATION BUREAU (PAB) - DTI

Department of Health (DOH)
Health Facilities and Services Regulatory Bureau (HFSRB)

A Recognition of Technical Competence

- ✓ to perform specific types of testing
- ✓ provides formal recognition to competent laboratories
- ✓ provides ready means for customers to identify and select reliable testing services able to meet needs

A Recognition of Technical Competence

- ✓ laboratories re-evaluated periodically by accreditation body to maintain the recognition
- ✓ participate in relevant proficiency testing programs
- ✓ issue test bearing accreditation body's logo or endorsement
- ✓ scope of accreditation helps find appropriate laboratory or testing service
- ✓ directory of accredited laboratories

A Benchmark for Performance

- ✓ determine whether labs are performing work correctly and to appropriate standards
- ✓ provides benchmark for maintaining competence
- ✓ regular assessment by accreditation body of all aspects of labs operations to check for consistent issuance of accurate and reliable data

MMDWQMC Advisories

2010

MMDWQMC Regular Update No. 2010-11
December 23, 2010

MEMBER AGENCIES

DOH - CHD-MM

DOH - EHFP, DOH-NAMC-HRL

MWSS Regulatory Office

Environmental Management Bureau

National Water Resources Board

Manila Water Company, Inc.

Maynilad

LGU Water Laboratories
- Manila Health Department-Public Health Laboratory
- Marikina Clean Food Laboratory-Marikina Health Department
- Makati City Water Laboratory - Makati Health Department
- Muntinlupa City Health Dept. Water Laboratory

LGU Health Departments
- Caloocan City Health Dept.
- Valenzuela City Health Dept.
- Malabon City Health Dept.
- Navotas Health Dept.
- Quezon City Health Dept.
- Taguig City Health Dept.
- Pasig City Health Dept.
- Pateros Health Dept.
- San Juan Health Dept.
- Mandaluyong City Health Dept.
- Las Pinas City Health Dept.
- Parañaque City Health Dept.
- Pasay City Health Dept.

FOR THE MONTH OF NOVEMBER 2010

East Zone (Manila Water)		West Zone (Maynilad Water)
Areas Covered: Part of City of Manila, Part of Quezon City, Mandaluyong City, Most part of Makati City, Pasig City, San Juan City, Marikina City, Taguig City and Municipality of Pateros.		*Areas Covered:* Most part of City of Manila, Part of Quezon City, Caloocan City, Malabon City, Navotas City, Valenzuela City, Muntinlupa City, Las Pinas City, Part of Makati City, Parañaque City and Pasay City.
BACTERIOLOGICAL EXAMINATION		
624*	No. of Samples Examined:	827*
624	No. of Potable Samples	827
0	No. found to be unsatisfactory*	0
100%	Satisfactory Compliance	100.00%
0.77 ppm	Residual Chlorine	0.84 ppm
The PNSDW requires at least 0.3 ppm. residual chlorine from the farthest point of the distribution system		
PHYSICAL & CHEMICAL EXAMINATION		
Within PNSDW Standards	Taste, color, odor, turbidity, aluminum, chlorides, copper, hardness, residual chlorine, iron, manganese, pH, sodium, sulfates, TDS, zinc, conductivity, hydrogen sulfide, arsenic, barium, boron, cadmium, chromium (total), cyanide (total), fluoride, lead, mercury (total), nickel, nitrates, nitrites, selenium, antimony and pesticides.	Within PNSDW Standards

*NOTE: * - Philippine National Standards for Drinking Water requires that Total Coliform must not be detectable in any 100 ml sample. In case of large quantities where sufficient samples are examined, it must not be present in 95% of samples taken throughout any 12-month period. Taken from regular sampling points.*

Based on the above findings, the Committee pronounced that drinking water in the MWCI and MWSI distribution system was of ***SANITARY QUALITY*** with adequate residual chlorine.

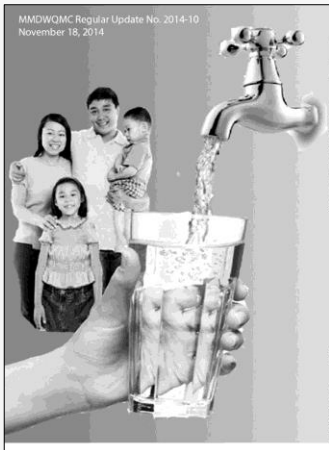
IRMA L. ASUNCION, MD, MHA, CEO VI
OIC, Director IV
Chairman, Metro Manila Drinking Water Quality Monitoring Committee (MMDWQMC)

Metro water is your concern too!
Give us feedback/report on quality of water.
Email us at mmdwqmc@yahoo.com
Call us at: DOH-CHD-MM: **5354521**
MWCI: **9175900 / Hotline 1627**
MAYNILAD: **4302928 / Hotline 1626**
MWSS-RO: **9256617**

Metro Water Is Safe

2014

MMDWQMC Regular Update No. 2014-10
November 18, 2014



METRO WATER IS SAFE TO DRINK

The **Metro Manila Drinking Water Quality Monitoring Committee (MMDWQMC)** in its November 14, 2014 meeting pronounced that the water supplied by **Manila Water** and **Maynilad** at the time of sampling fully complied with the 2007 Philippine National Standards for Drinking Water (PNSDW) based on the microbiological and physico-chemical examination done on water samples collected at strategically designated Regulatory Sampling Points in their respective distribution system in the month of October 2014. In addition, both Manila Water and Maynilad also met and even surpassed the minimum sampling frequency requirement of the 2007 PNSDW for both microbiological and physico-chemical quality.

Water supplied by Manila Water and Maynilad in October 2014 is:

√ **100% Free from disease-causing coliforms**

√ **100% compliant with physical and chemical standards based on examination done on 569 samples taken from East Zone (Manila Water) and 864 samples from West Zone (Maynilad)**

Based on the above findings, the Committee pronounced that drinking water in the Manila Water and Maynilad distribution system was of **Sanitary Quality** with adequate residual chlorine.

The committee further announced that out of 2,398 Water Refilling Stations monitored in Metro Manila for the month of October 2014, **only 2,376 passed** the standards set by PNSDW. Consumers are advised to look for the monthly microbiological quality and semi-annual physico-chemical results POSTED in their 'suki' or 'selected' refilling stations to ensure that the water they buy is SAFE and POTABLE.

METRO WATER IS YOUR CONCERN TOO!
Give us feedback/report on quality of water
Email us at mmdwqmc@yahoo.com
Call us at: DOH-CHD-MM: 535 4521•MWSS-RO: 925 6619
Manila Water Nos.: 9175900 / Hotline 1627 • Maynilad Nos.: 4302199 loc. 201 / Hotline 1626

Caloocan • Malabon • Navotas • Valenzuela • Pasig • Pateros • Marikina • Taguig • Quezon City • Makati • Manila • Mandaluyong • San Juan • Muntinlupa • Parañaque • Las Piñas • Pasay

ARIEL I. VALENCIA, MD, MPH, CESO III
Director IV
Chairman, MMDWQMC

MMDWQMC Advisories

2015

10 The Philippine STAR NEWS FRIDAY, JANUARY 30, 2015

MMDWQMC Regular Update No. 2014-12
January 30, 2015

METRO WATER IS SAFE TO DRINK

The **Metro Manila Drinking Water Quality Monitoring Committee (MMDWQMC)** in its January 08, 2015 meeting pronounced that the water supplied by **Manila Water** and **Maynilad** at the time of sampling fully complied with the 2007 Philippine National Standards for Drinking Water (PNSDW) based on the microbiological and physico-chemical examination done on water samples collected at strategically designated Regulatory Sampling Points in their respective distribution system in the month of December 2014. In addition, both Manila Water and Maynilad also met and even surpassed the minimum sampling frequency requirement of the 2007 PNSDW for both microbiological and physico-chemical quality.

Water supplied by Manila Water and Maynilad in December 2014 is:

√ **100% Free from disease-causing coliforms**

√ **100% compliant with physical and chemical standards based on examination done on 569 samples taken from East Zone (Manila Water) and 866 samples from West Zone (Maynilad)**

Based on the above findings, the Committee pronounced that drinking water in the Manila Water and Maynilad distribution system was of **Sanitary Quality** with adequate residual chlorine.

The committee further announced that out of 2,874 Water Refilling Stations monitored in Metro Manila for the month of December 2014, **only 2,860 passed** the standards set by PNSDW. Consumers are advised to look for the monthly microbiological quality and semi-annual physico-chemical results POSTED in their 'suki' or 'selected' refilling stations to ensure that the water they buy is SAFE and POTABLE.

METRO WATER IS YOUR CONCERN TOO!
Give us feedback/report on quality of water

ARIEL I. VALENCIA, MD, MPH, CESO III
Director IV
Chairman, MMDWQMC

2019

MMDWQMC Regular Update No. 2019-10
October 29, 2019

METRO WATER IS SAFE TO DRINK

The **Metro Manila Drinking Water Quality Monitoring Committee (MMDWQMC)** in its October 29, 2019 meeting pronounced that the water supplied by **Manila Water** and **Maynilad** at the time of sampling **done on 590 samples taken from East Zone (Manila Water) and 961 samples from West Zone (Maynilad)** fully complied with 2017 Philippine National Standards for Drinking Water (PNSDW) based on the microbiological and physico-chemical examination done on water samples collected at strategically designated Regulatory Sampling Points in their respective distribution system in the month of September 2019. In addition, both Manila Water and Maynilad also met the minimum sampling frequency requirement of the 2017 PNSDW for both microbiological and physico-chemical quality.

Water supplied by Manila Water and Maynilad based on the monthly monitoring is:

√ **100% Free from thermotolerant coliforms**

√ **Generally compliant with physical and chemical standards based on examination conducted.**

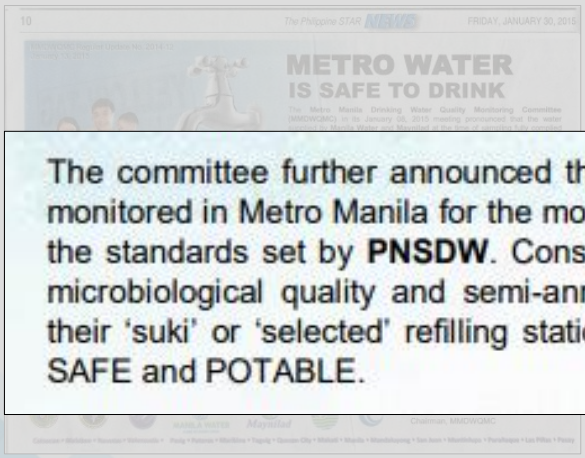
Based on the above findings, the Committee pronounced that drinking water in the Manila Water and Maynilad distribution system is **SAFE TO DRINK.**

The committee further announced that **out of 3,003 Water Refilling Stations** monitored in Metro Manila for the month of September 2019, **only 2,979** passed the standards set by **PNSDW**. Consumers are advised to look for the monthly microbiological quality and semi-annual physico-chemical results POSTED in their 'suki' or 'selected' refilling stations to ensure that the water they buy is SAFE and POTABLE.

METRO WATER IS YOUR CONCERN TOO!
Give us feedback/report on quality of water
Email us at mmdwqmc@gmail.com
Call us at: DOH-NCRO: 531 0037 • MWSS-RO: 925 6619
Manila Water Nos.: 9175900 / Hotline 1627
Maynilad Nos.: 4303199 loc. 201/ Hotline 1626

CORAZON I. FLORES, MD, MPH, CESO IV
OIC- Director IV
Chairman, MMDWQMC

Caloocan • Malabon • Navotas • Valenzuela • Pasig • Pateros • Marikina • Taguig • Quezon City • Makati • Manila • Mandaluyong • San Juan • Muntinlupa • Parañaque • Las Piñas • Pasay



2015

The committee further announced that **out of 3,003 Water Refilling Stations** monitored in Metro Manila for the month of September 2019, **only 2,979** passed the standards set by **PNSDW**. Consumers are advised to look for the monthly microbiological quality and semi-annual physico-chemical results POSTED in their 'suki' or 'selected' refilling stations to ensure that the water they buy is SAFE and POTABLE.

24 Water Refilling Stations had failed lab results!

2019

Do we check if the bottled water we drink are safe?

FDA Food and Drug Administration PHILIPPINES

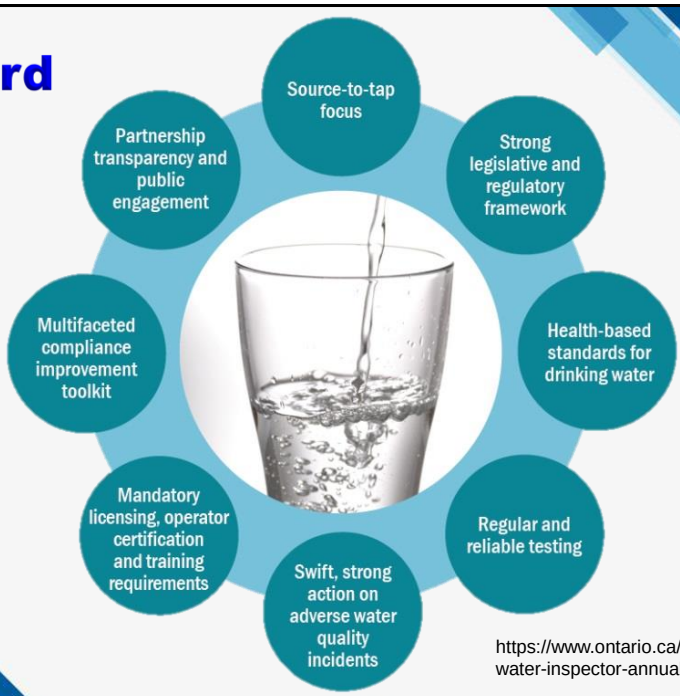
FDA Advisory No. 431 Series of 2019

Public Health Warning Against the Purchase and Consumption of the following Unregistered Food Products:

What are our responsibilities?

- ✓ Require certificate of analysis from water refilling stations where we buy refilled water
- ✓ Check the label of bottled water and beverages (e.g. FDA registered?
- ✓ Promote awareness of drinking water quality standards
- ✓ Check analyses done if relevant to the regulation needs (fitness for purpose)
- ✓ Be responsible in efficient use of water

Way Forward



https://www.ontario.ca/page/chief-drinking-water-inspector-annual-report-2015-2016

Way Forward

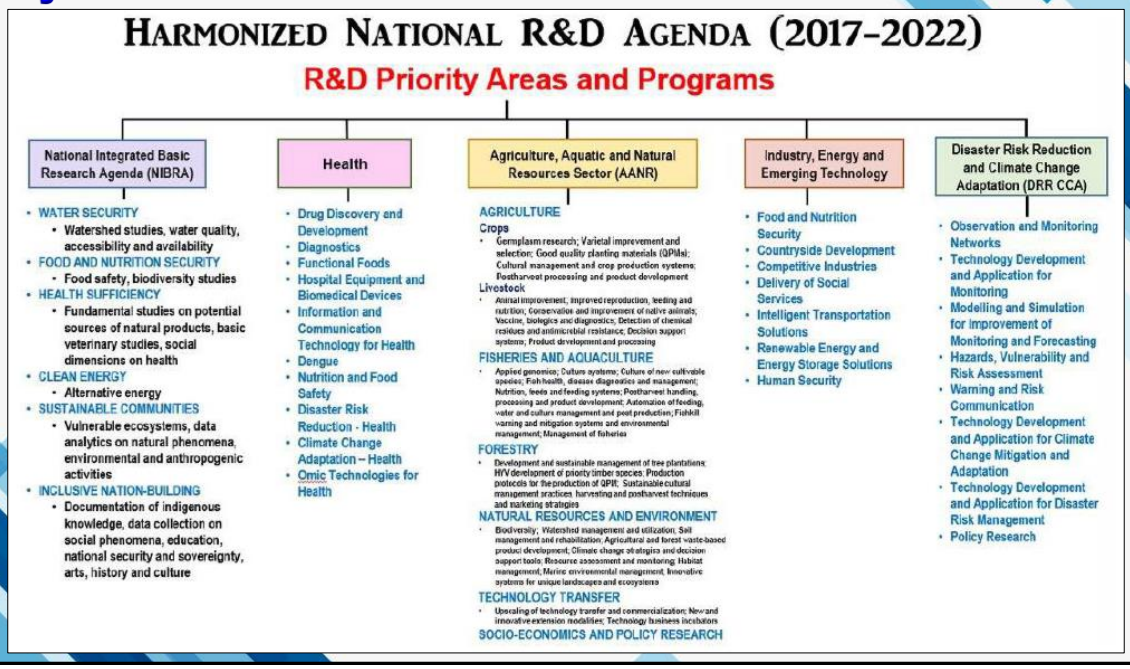
PCIEERD-DOST Sectoral Road Map for Research and Development

Environment, Climate Change Adaptation, and Disaster Risk Reduction

Research Area	Program Objectives	Specific technologies/topics	Sectoral Assessment
Environment			

Water	• Development of cleaner and safer technologies that will respond to critical concerns on industrial wastewater, waste management, safe and potable drinking water, use of biotechnological approaches for biodiversity conservation and other pressing environmental problems
	
	• Field-testing/application of cleaner technologies for the benefit of the industry, domestic households and general public
		• R&D on the following areas:
		  • Water use management (pollution prevention)
		  • Effluent treatment (point and non-point sources)
		  • Water resources and water environment
		  • Water supply (potable/clean drinking water)
			• Nano-photocatalytic treatment of organic waste water and gasoues formaldehyde
			• Techno-demo on Prevention and Control of Water Pollution/Tech verification of water technologies for SMEs
			• Pilot demonstration of treatment / rehabilitation /remediation technologies

Way Forward



Way Forward

WATER SECURITY

Harmonized National R&D Agenda (2017-2022)

TUBIG Program (*Tubig ay Buhayin at Ingatan*)

1. **Watershed Studies**
   a) Biological, chemical and physical characterization
   b) Water supply stress index

2. **Water Quality, Accessibility and Availability**
   a) Pollutants/contaminants (surface and ground waters)
   b) Analysis of historical flows, sediment and toxicity loads of lakes and rivers
   c) Weather modification for increasing water supplies in special localized areas

Way Forward for PNSDW (Own Opinion)

Frequency of Revision is every 10 years (next: 2027)

- ✓ **Presence of resistant microbes**
- ✓ **Presence of antiobiotics**
- ✓ **Speciation of metals (e.g. Arsenic and Mercury)**
- ✓ **Microplastics**
- ✓ **Nanomaterials**
- ✓ **Upgrading of laboratories (advanced instrumentation)**
- ✓ **Pool of experts to develop the updated standards**
- ✓ **New technologies on water treatment**
- ✓ **Water recharge, challenges on global warming**

Thank you for your attention!

OneLab
One Laboratory. Worldwide.

STANDARDS AND TESTING DIVISION

Industrial Technology Development Institute

Quality life and products through testing

std@itdi.dost.gov.ph
(+632) 8837-2071 loc 2188/2189

DRINKING WATER

Regulations, Testing and Consumer Responsibility

23 July 2020
Zoom Webinar

Admer Rey C. Dablio, RCh
Senior Science Research Specialist
Chemistry Laboratory
Standards and Testing Division,
Industrial Technology Development Institute
Department of Science and Technology
PHILIPPINES

PhilMSTQ
Philippine Metrology, Standards, Testing and Quality, Inc.