National Water Forum 2014

Water Quality and Pollution Control

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(TWG4)

Introduction

Water Quality and Pollution Control

Comparing the two, more has been done on Water Quality than that of Pollution Control.

Water Quality

First, I would like to present the state of the water quality as tested and analysed from samples collected from selected areas in the country in 2002. It has been almost a 1-1/2 decades ago. But to date, I believe that it was the only comprehensive study conducted on drinking water covering a total of 10 states and divisions.

The task, namely, “Analysis and Assessment of Drinking Water Quality in Selected area of Myanmar” was undertaken by Water Resources Utilization Department(WRUD), Ministry of Agriculture and Irrigation in collaboration with UNICEF in March, 2001.

1. Objectives

Primary objective: To check the presence and level of Arsenic contamination in various types of source with particular attention given to shallow tube wells and dug wells.

Secondary objective: To check the bacteriological quality and some chemical parameters that have direct significance to health.

To check some chemical and physical qualities that are liable to raise complaints from consumers and those that are supportive in the analysis.

To check the physical conditions at the sources and assess the possibility of pollution.

2. Region covered: (4) States, (6) Divisions

States	Divisions
1. Chin	1. Sagaing
2. Kayah	2. Mandalay
3. Shan (S)	3. Magway
4. Rahkhine	4. Bago
	5. Ayeyarwaddy
	6. Yangon

Total townships: (97 townships)

3. Types of Sources

Abbreviation

STW = Shallow Tube Well

DTW = Deep Tube Well

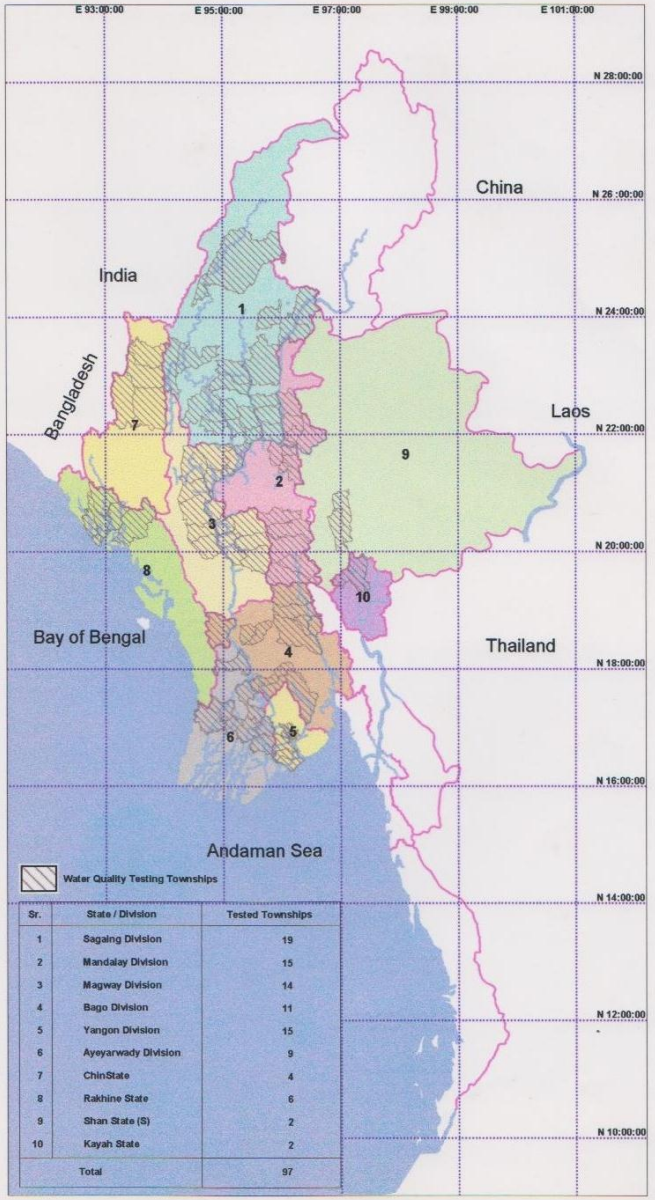
DW = Dug Well

SW(R,C,C) = Surface Water (rivers, canals, creeks)

P, L & R = Ponds, lakes and reservoirs

GF = Gravity Flow

Map - 1 Water Quality Testing Townships in Myanmar



Sr.	State / Division	Tested Townships
1	Sagaing Division	19
2	Mandalay Division	15
3	Magway Division	14
4	Bago Division	11
5	Yangon Division	15
6	Ayeyarwady Division	9
7	ChinState	4
8	Rakhine State	6
9	Shan State (S)	2
10	Kayah State	2
Total		97

4. Samples collected : 4969 samples

5. Standard Referred and Parameters

Proposed National Standards (PNS) for Drinking Water Supply 1990 will be used as a guideline for interpretation and analysis of the results. Proposed National Standards for 10 parameters under surveillance are as follows:

Parameter	Unit	Maximum Allowable Concentration
(1)Faecal Coliform	Number of colonies per 100 ml	0
(2)Turbidity	NTU	20
(3)pH	-	6.5-9.2
(4)Hardness, Total (as CaCO3)	mg/l	500
(5)Electrical Conductivity	µs/cm or µmho/cm	1500
(6)Arsenic	mg/l	0.05
(7)Iron	mg/l	1.5
(8)Chloride	mg/l	600
(9)Nitrate (as N)	mg/l	10
(10) Fluoride	mg/l	1.5

PROPOSED NATIONAL DRINKING WATER QUALITY STANDARDS

(Recommended at the National workshop, January 1990)

Microbiology

Type of water and source	Faecal Coliforms (No./100 ml)	Coliform Organisms (No./100 ml)	Remarks
Treated piped water	0	0	
Untreated piped water	0	0	
Water distribution system	0	0	
Unpiped water supplies	0	10/100 ml	
Bottled drinking water	0	0	
Emergency water supplies	0	3/100 ml	Chlorinated supplies

Inorganic Substances

Constituent	Unit		Remarks
•Arsenic	mg/l	0.05	
•Cadmium	mg/l	0.005	* Tests for these substances will not be included in routine examination, except on special request
•Chromium	mg/l	0.05	
•Cyanide	mg/l	0.05	
Flouride	mg/l	1.5	
•Lead	mg/l	0.05	In lieu of sufficient national records available at present, proposed standards for these parameters are adopted from the WHO-Guidelines for drinking water quality, 1984. These values will be subject to revision whenever found necessary
•Mercury	mg/l	0.001	
Nitrate (as N)	mg/l	10.0	
Nitrite (as N)	mg/l	0.5	
•Selenium	mg/l	0.01	

Pesticides Constituents	Unit	Remarks
Aldrin-dieldrin	mg/l	Standard for these parameters will not be set at present but will be decided in future after further research has been conducted and more information obtained
Chlorodane	mg/l	
2, 4-D	mg/l	
Hexachlobenzene Lindane (Gamma-hexachlorocycle hexane)	mg/l	
Methocychlor	mg/l	
DDT	mg/l	
Aesthetic quality		
Aluminium	mg/l 0.2	
Chloride	mg/l 200-600	* Test for this substance will not be performed for routine test except on special request
Colour (TCU)	Pt-Co 5-50	
Copper *		
Hardness (as CaCO3)	mg/l 500	

Iron	mg/l	0.5-1.5
Manganese	mg/l	0.3
pH	-	6.5-9.2
Sodium	mg/l	200
Sulphates	mg/l	400
Taste & odour	mg/l	inoffensive
Total dissolved solids	mg/l	1000
Turbidity (NTU)	mg/l	20
Zinc	mg/l	5-15
Calcium (Ca)	mg/l	75-200
Magnesium	mg/l	30-150
Electrical conductivity (EC)	m.mho/1500 cm	

6. Results of Assessment

Areas and sources that are affected are as follows:

Arsenic

Area - Ayeyarwaddy, Rakhine, Bago and Shan (S)
Source - Shallow Tube Wells, Deep Tube Wells and Dug Wells

Fluoride

Area - Bago, Mandalay, Sagaing, Kayah and Ayeyarwaddy
Source - Dug Wells, Shallow Tube Wells, Deep Tube Wells, Ponds, Lakes and Reservoirs

Nitrate

Area - Ayeyarwaddy, Bago, and Sagaing
Source - Shallow Tube Wells and Dug Wells

Faecal Coliform

Area - All States and Divisions surveyed
Source - All sources-Deep Tube Wells are least effected followed by Shallow Tube Wells, Surface Waters, Dug Wells, Ponds, Lakes and Reservoirs and Gravity Flows

Perseutage of Samples Affected

Arsenic

Out of 4969 samples tested:

- 4371 (87.97%) are free from Arsenic
- 519 (10.44%) contain Arsenic within the limit of 0.01 to 0.05 mg/l
- 79 (1.59%) are above the limit of 0.05 mg/l

Fluoride

Out of 4804 samples tested:

- 4615 (96.1%) are within the limit of 1.5 mg/l
- 189 (3.9%) are above the limit of 1.5 mg/l

Nitrate

Out of 4848 samples tested:

- 4842 (99.88%) are within the limit of 10 mg/l
- Only 6 (0.12%) are above the limit of 10 mg/l

Faecal Coliform

Out of 4746 samples tested:

- 3187 (67%) are within the limit of 0/100 ml
- 1559 (33%) are above the limit of 0/100 ml

6.1 Pollutants in Concentration Greater Than The Allowable Limit in State and Divisions

After compiling and evaluating the results of the water quality tests the concentration of health-related pollutants greater than the allowable limit in the water supply source is observed to be present in varying degrees in many States and Divisions. States and Divisions exposed to the specific pollutants are respectively listed in the following tables:

1Arsenic

States/Divisions	% of total sources with Arsenic conc. greater than allowable limit	Max. conc. detected
1Shan (S)	6.1%	0.1 mg/l
2Rakhine	4.3%	< 0.25 mg/l
3Ayeyarwaddy	4.2%	< 0.25 mg/l
4Bago	1.4%	0.25 mg/l
5Mandalay	0.2%	0.25 mg/l
6Chin, Kayah, Magway, Sagaing and Yangon	Nil	

Shan State (S) is the worst region where Arsenic is detected in the highest percentage of its water supply sources. This may be due to the very few number of sources tested as shown in the table on areas covered in water quality surveillance.

2. Fluoride

States/Divisions	% of total sources with Fluoride conc. greater than allowable limit	Max. conc. detected
1Bago	12.13%	< 5.0 mg/l
2Mandalay	7.27%	< 5.0 MG/L
3Sagaing	4.84%	< 5.0 mg/l
4Kayah	2.33%	3.0 mg/l
5Ayeyarwaddy	1.26%	< 5.0 mg/l
6Shan (S)	1.52%	< 5.0 mg/l
7Rakhine	0.26%	3.0 mg/l
8Chin, Magway and Yangon	nil	

3. Nitrate

States/Divisions	% of total sources with Nitrate conc. greater than allowable limit	Max. conc. detected
1Bago	1.0%	20 mg/l
2Ayeyarwaddy	0.3%	< 30 mg/l
3Sagaing	0.1%	30 mg/l
4Chin, Kayah, Magway, Mandalay, Rakhine, Shan (S) and Yangon	nil	

4. **Faecal Coliform**

States/Divisions % of total sources with FC count Max. conc. detected greater than allowable

1Chin 91% <100/100 ml

2Rakhine 78% <100/100 ml

3Kayah 71% 10/100 ml

4Shan (S) 64% <100/100 ml

5Mandalay 47% <100/100 ml

6Magway, Yangon 27% <100/100 ml

7Bago 25% <100/100 ml

8Ayeyarwaddy 23% <100/100 ml

9Sagaing 22% 100/100 ml

5. Sanitary Inspection

States/Divisions % of total sources where Sanitary condition at the source is below acceptable level

1Rakhine 98%
2Bago 93%
3Chin 91%
4Ayeyarwaddy 89%
5Kayah 87%
6Magway, Shan (S) 79%
7Mandalay 77%
1.Sagaing 75.7%
2.Yangon 60%

Remarks

The study on Water Quality has indicated the presence of some chemicals and bacteria which are detrimental to health.

Due consideration should be given to the presence of arsenic in drinking water.

However, since the study covered mostly the rural areas in 97 townships, it could not be considered as representing the whole States and Divisions surveyed.

Nevertheless it should be taken as the need for assessing the state of drinking water quality whereby problems encountered can be addressed in time.

Map - 2 Townships with Arsenic Contaminated Water Sources

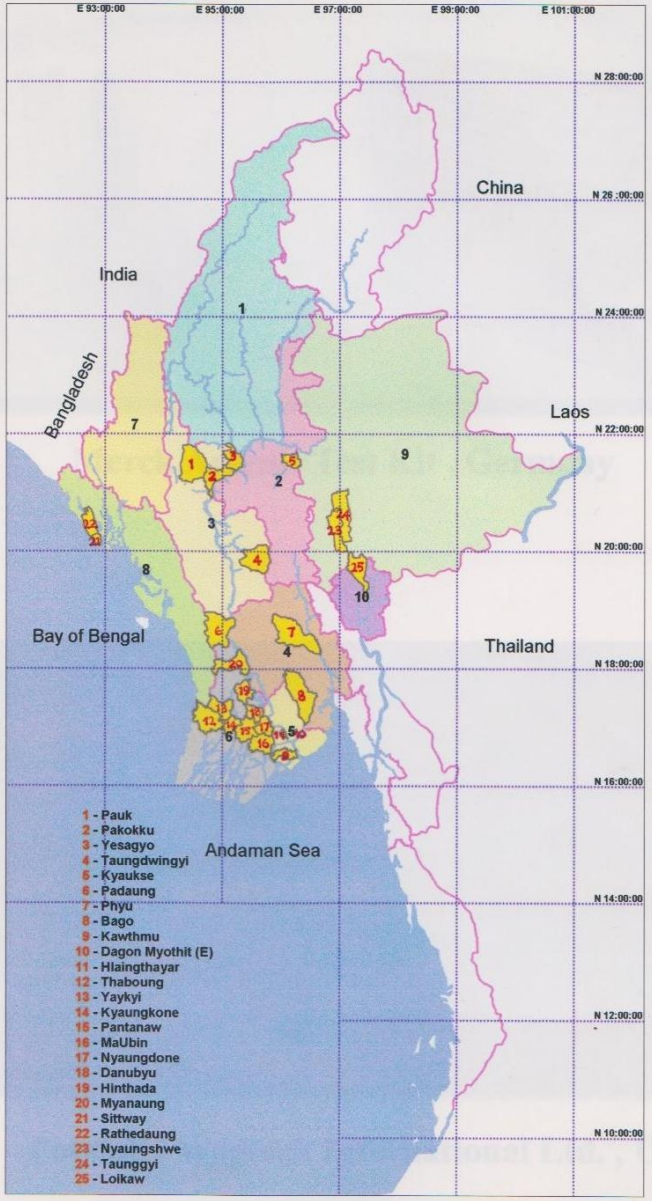


Figure - 1A. Arsenic Contamination by States and Divisions and by Types of Source

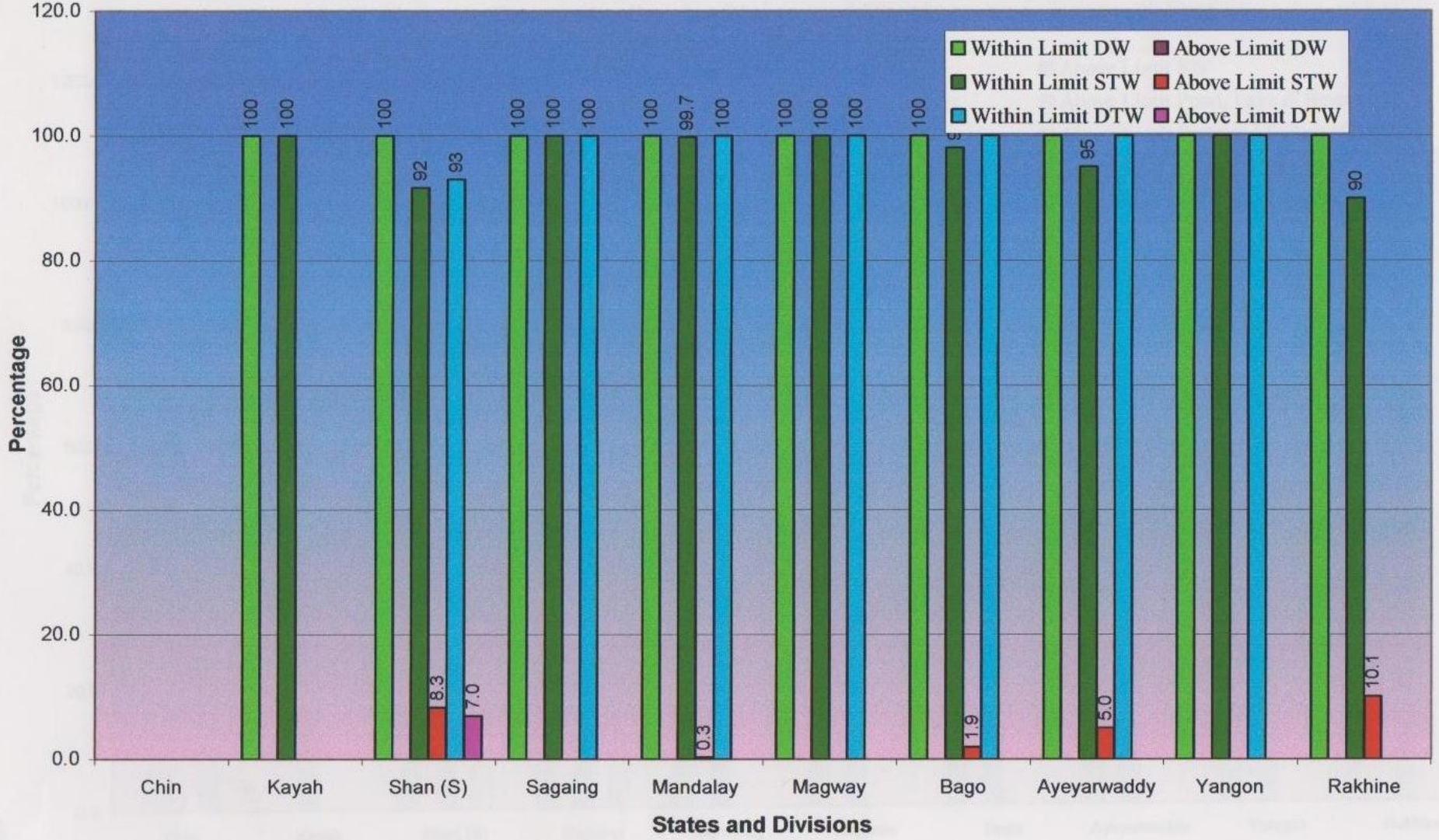


Figure-1B. Arsenic Contamination by States and Divisions and Types of Source

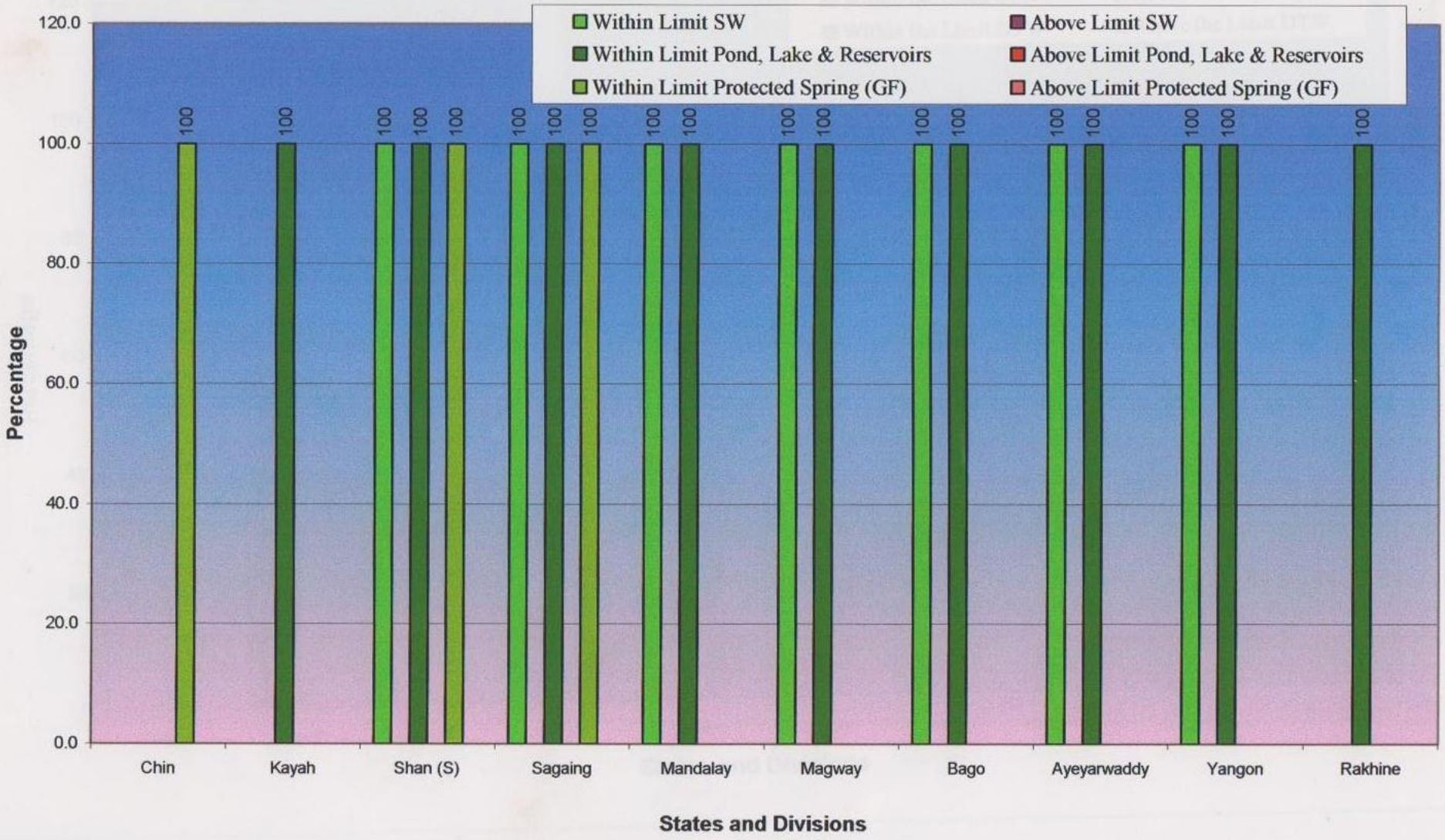


Figure-2 Fluoride Concentration by States and Divisions and Types of Source

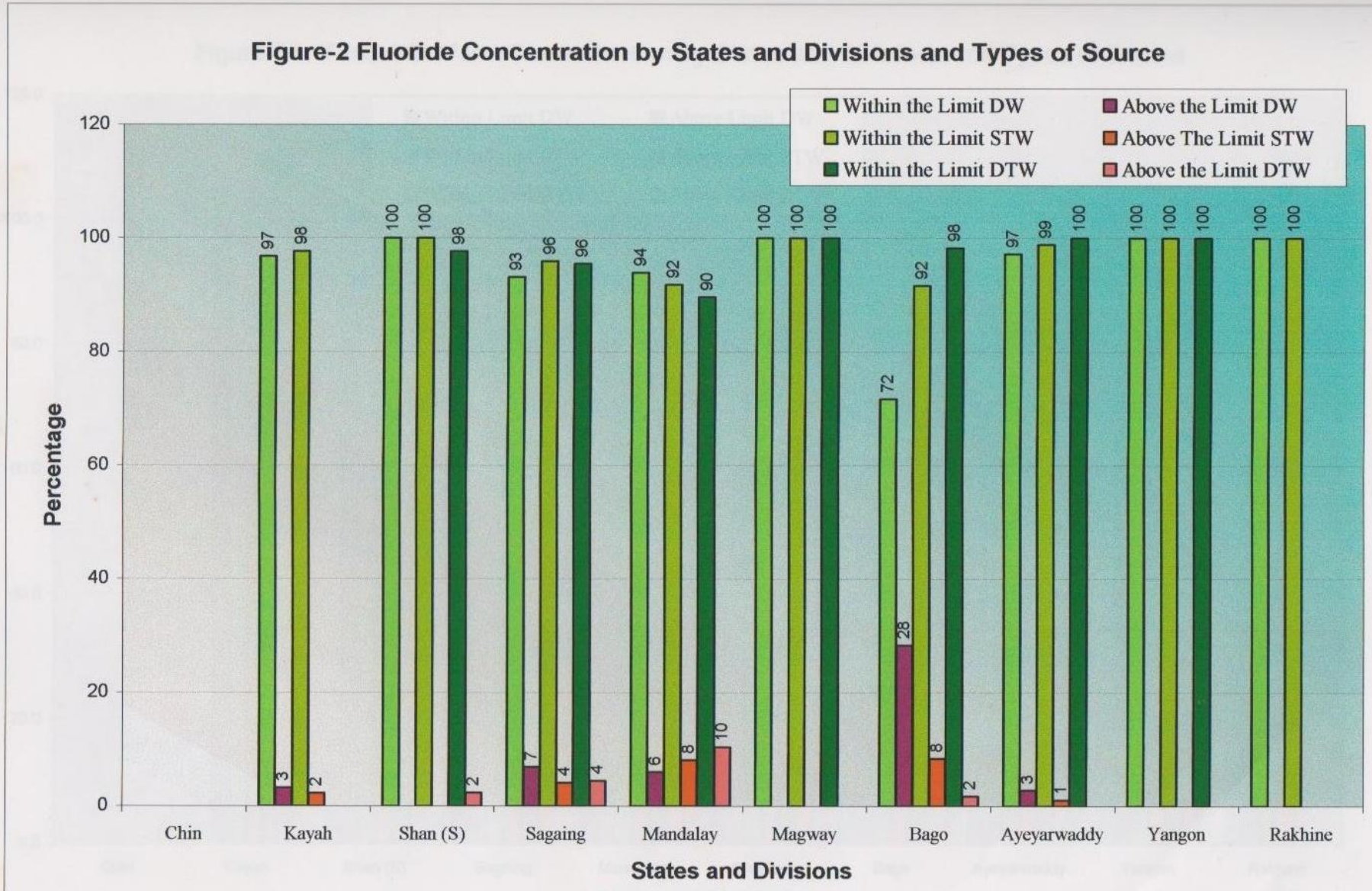
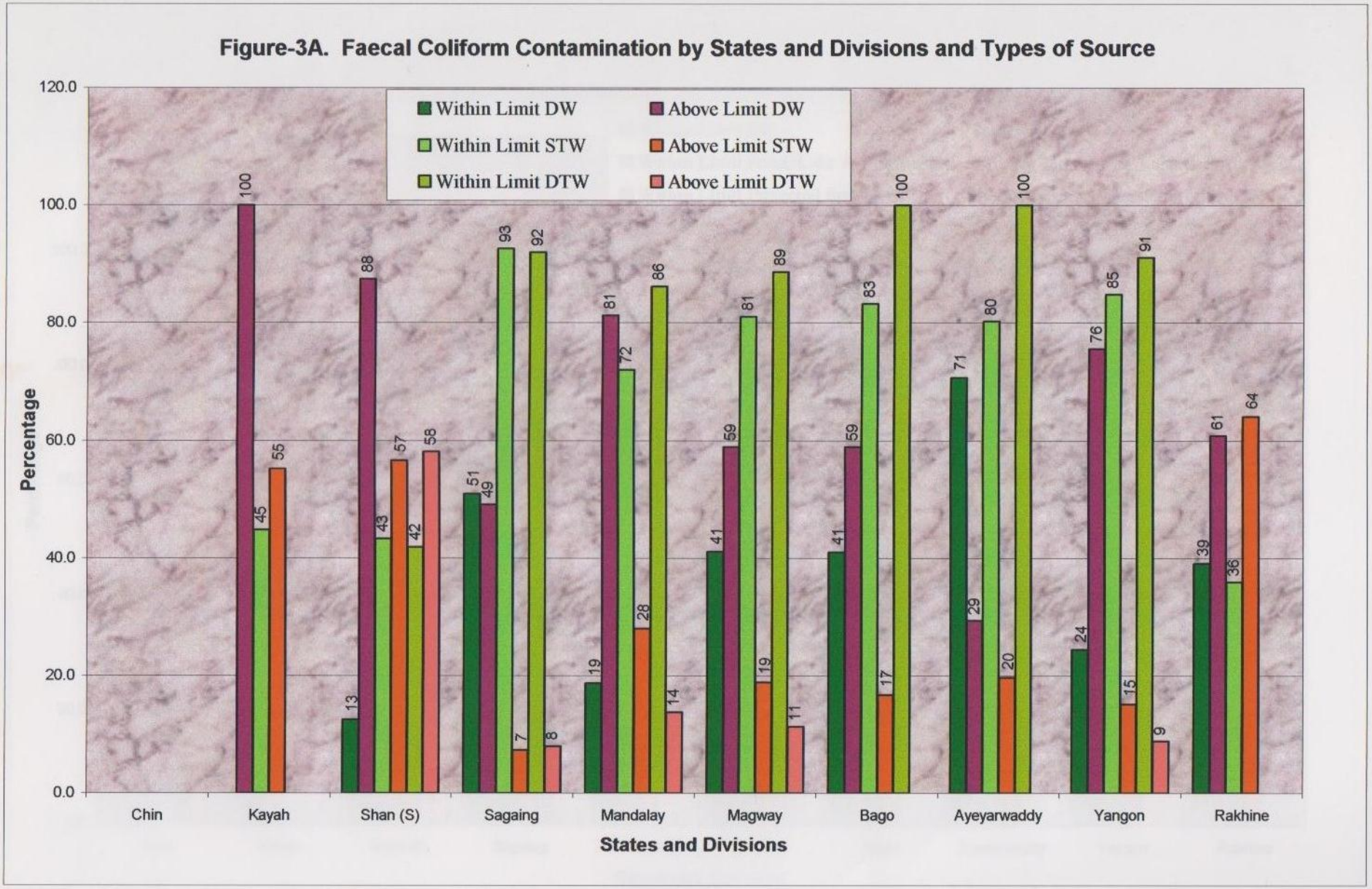


Figure-3A. Faecal Coliform Contamination by States and Divisions and Types of Source



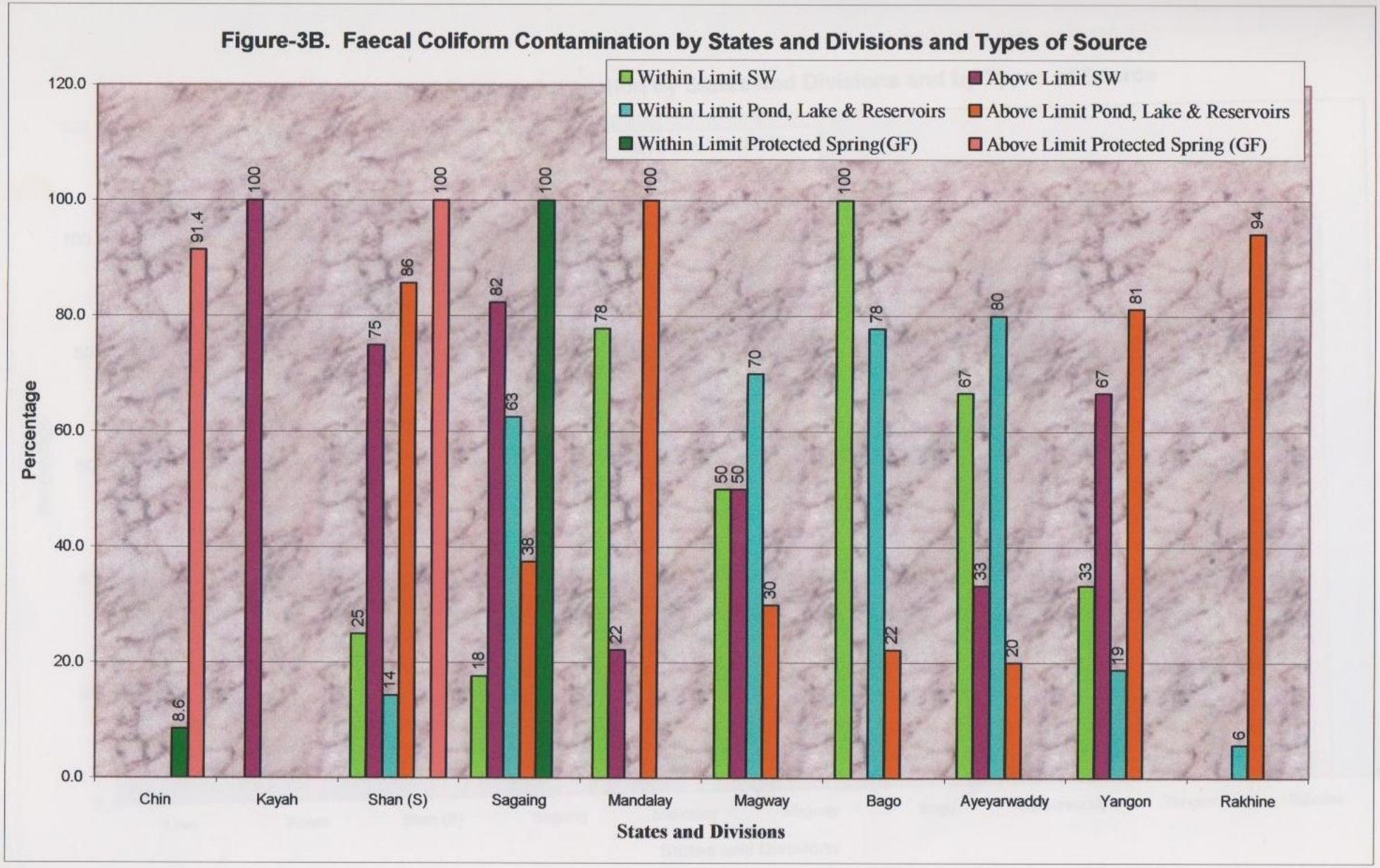


Figure-3B. Faecal Coliform Contamination by States and Divisions and Types of Source
Within Limit SW
Above Limit SW
Within Limit Pond, Lake & Reservoirs
Above Limit Pond, Lake & Reservoirs
Within Limit Protected Spring(GF)
Above Limit Protected Spring (GF)
Percentage
120.0
100.0
80.0
60.0
40.0
20.0
0.0
8.6
91.4
100
25
75
14
86
100
18
82
63
38
100
78
22
100
50
50
70
30
100
100
78
22
67
33
80
20
33
67
19
81
6
94
Chin
Kayah
Shan (S)
Sagaing
Mandalay
Magway
Bago
Ayeyarwaddy
Yangon
Rakhine
States and Divisions

Figure-4A. Result of Sanitary Inspection by States and Divisions and by Types of Source

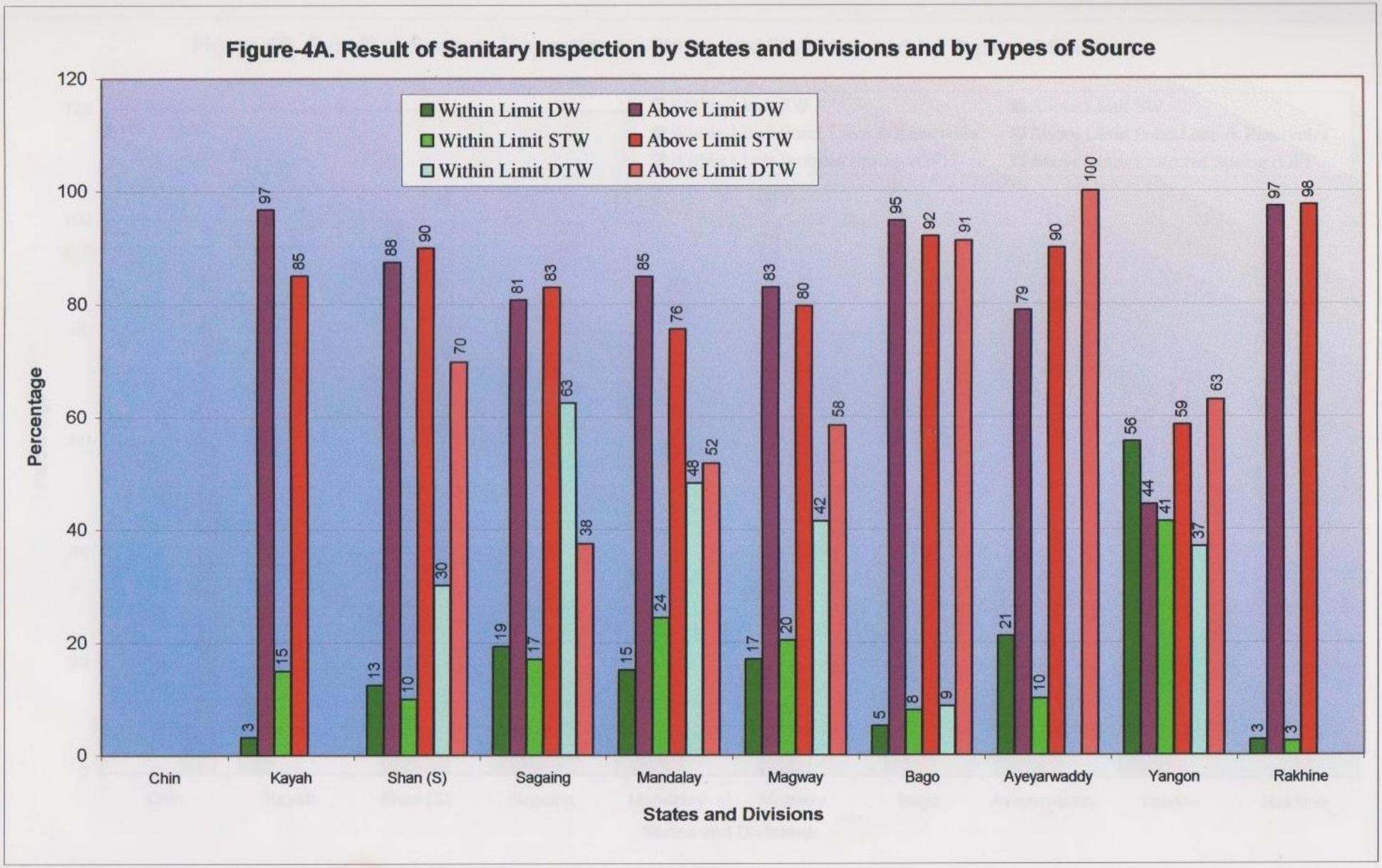
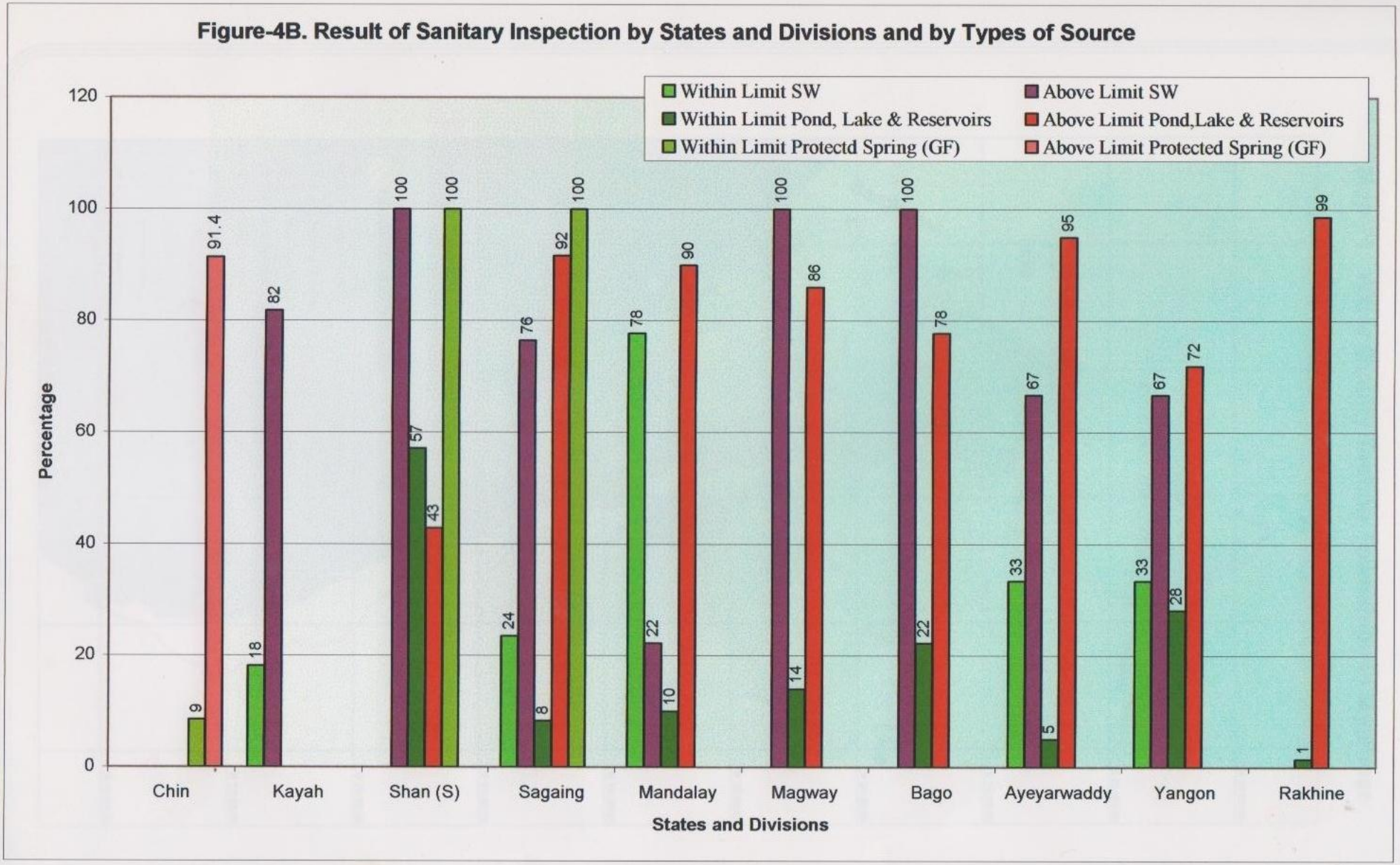
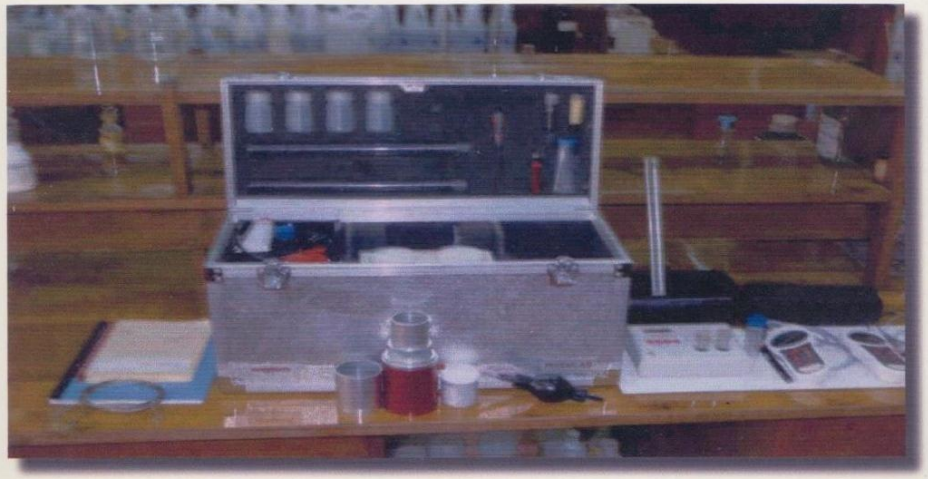


Figure-4B. Result of Sanitary Inspection by States and Divisions and by Types of Source



Merck Arsenic Test Kit , Germany



Potalab , Wagtech International Ltd. , UK

7. Pollution Control

Much has not been done in country-wide Pollution Control yet.

However to safeguard the Yangon River from gross pollution with the increasing discharge of the city.

YCDC (Water and Sanitation Engineering Department) has provisionally stipulated, within its jurisdiction, the following soil water effluent quality which is being currently adopted by CQHP (Committee for Quality Control of High-Rise Building Construction

Projects) in its Sanitary guidelines.

- Soil water shall be treated before being discharged into a water course or public drain.
- The effluent quality of the treated soil water shall conform to the following:

BOD 50 mg/l (maximum)
COD 100 mg/l (maximum)
SS 50 mg/l (maximum)

- Soil water discharged into YCDC sewer shall be treated to the following effluent quality:

BOD 150 mg/l (maximum)
COD 200 mg/l (maximum)
SS 150 mg/l (maximum)

Note: BOD value refers to 5-day incubation period at 20° C.

8. Conclusion

- For the protection and promotion of public health, the supply of safe water for drinking purpose with regular monitoring and surveillance is one of the prerequisites that should be duly practiced.
- To undertake such task a Standard for Drinking Water Quality is high essential for controlling the water quality.
- The importance of a ‘National Standard for Drinking Water’ cannot be over-emphasied as it is closely associated with public health.
- The proposed National Drinking Water Standard is still pending its approval since it has been initiated in 1990. It has been revised and updated a few times. The latest proposal has been submitted to the authority concerned in 2013.
- We are anxiously but hopefully awaiting its approval at the earliest date.

THANK YOU

FOR YOUR TIME & INTEREST