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Status of Water Quality in Afghanistan: An analytical Study

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Abstract: *Water Sector in Afghanistan has not got any clear attention in terms of qualitative parameters. Improvements in water resource management need to be approached in a strategic manner which needs proper planning, guidance as well as quantitative investment. Large numbers of National and International organizations are involved in assessment of current situation so that right strategy for short as well as long term prospects will be developed. Due to lack of data, the unreliability of the existing data and the collapse of institutional setup due to recent wars in Afghanistan make it difficult to understand and assess the current situation. However, present study was conducted to take raw samples of water bodies/water source to determine the qualitative aspects of water to find out options available for future research so that a clear vision for immediate and future development, improvement in water resource management could be achieved for sustainable water management not in terms drinking purposes but also for irrigation as well as its utilization in industrial and agricultural sector can be achieved.*

1. INTRODUCTION

Afghanistan is a land locked country of about 65 million hectares and 20 million people, of which 16.5 million live in rural areas. The topography for the country is the mountainous landscape followed by scattered human settlements. The major occupation is agricultural products and livestock. Majority of rural population is small land holding farmers. Therefore, management of water resources is very significant for the economic growth of the country in general and to meet the people's need for food and fiber in particular. Due to recent war, civil conflict, exploitation and enforced neglect have combined to leave legacy of degraded natural resource including agriculture.

2. METHODOLOGY:

In order to understand the qualitative aspects of water resource a study was conducted to analyze the various parameter of the water quality such as acidity, conductivity, turbidity, temperature as well as chemical characteristics such as Nitrate, Nitrite, Iron, Fluoride, Arsenic, Chloride, Cyanide, Manganese, Phosphorus, Sulphate, Copper, Ammonia, Aluminum, Total dissolve solid and C.O.D. were taken into consideration for this study. Apart from the above parameter Bacteriological character such as E. Coliform and Total Coliform under laboratory condition were analyzed. Water samples were taken from booster pump, well, as well as Logar project site and also from hand pump and also from different source station such as public tap.

The entire tests were carried by physical and chemical methods in year 2013.

3. RESULTS AND DISCURSION

Table 1

Physical character							
N0	**parameters**	**Water source**	**Water source address**	**Result**	**Unit**	**Permissible limit**	**Remark**
1	PH	Well – 1	Logar project	7.20	---	6.5—8.5	
2	Conductivity	//	//	1600	µs/cm	1500 µs/cm	
3	Turbidity	//	//	5>	N.T.U	≤5N.T.U	

4	Temperature	//	//	17.5	Ċ	20c	
Chemicals character							
1	Nitrate (No3)	//	//	8.39	Mg/l	50 mg/l	
2	Nitrite (No2)	//	//	0.016	Mg/l	3 mg/l	
3	Iron (Fe)	//	//	0.01	Mg/l	0.3 mg/l	
4	Fluoride (F)	//	//	0.40	Mg/l	1.5 mg/l	
5	Arsenic(As)	//	//	Zero	Mg/l	o.o1mg/l	
6	Chloride(Cl)	//	//	115	Mg/l	250 mg/l	
7	Cyanide (CN)	//	//	0.004	Mg/l	0.07mg/l	
8	Manganese (Mn)	//	//	0.1	Mg/l	0.5mg/l	
9	Phosphorus(Po4)	//	//	0.18	Mg/l	5mg/l	
10	Sulphate(So4)	//	//	210	Mg/l	250mg/l	
11	Copper(Cu)	//	//	0.05	Mg/l	2mg/l	
12	Ammonia (NH3)	//	//	0.16	Mg/l	1.5mg/l	
13	Aluminum(Al)		//	0.004	Mg/l	0.2mg/l	
14	Total dissolve solid (TDS)	//	//	1118.4	Mg/l	----	
15	C.O.D	//	//	23	Mg/l	40mg/l>C.O.D	
Bacteriological Character							
1	E. Coliform	//	//	Zero	C.F.U/100ml	0 C.F.U/100ml	
2	Total. Coliform	//	//	Zero	C.F.U/100ml	5C.F.U/100ml	C-colonize F-forming ‘ U- UNIT

13Water quality analysis report ; Date: August/06/2013)

Table 2

Physical character							
N0	**parameters**	**Water source**	**Water source address**	**Result**	**Unit**	**Permissible limit**	**Remark**
1	PH	Booster pump	Project logar	7.6	---	6.5—8.5	
2	Conductivity	//	//	1262	µs/cm	1500 µs/cm	
3	Turbidity	//	//	5>	N.T.U	≤5N.T.U	
4	Temperature	//	//	16.5	Ċ	20c	
Chemicals character							
1	Nitrate (No3)	//	//	7.95	Mg/l	50 mg/l	
2	Nitrite (No2)	//	//	0.016	Mg/l	3 mg/l	
3	Iron (Fe)	//	//	0.01	Mg/l	0.3 mg/l	
4	Fluoride (F)	//	//	0.39	Mg/l	1.5 mg/l	
5	Arsenic(As)	//	//	Zero	Mg/l	o.o1mg/l	
6	Chloride(Cl)	//	//	66	Mg/l	250 mg/l	
7	Cyanide (CN)	//	//	0.003	Mg/l	0.07mg/l	
8	Manganese (Mn)	//	//	0.1	Mg/l	0.5mg/l	
9	Phosphorus(Po4)	//	//	0.19	Mg/l	5mg/l	
10	Sulphate(So4)	//	//	145	Mg/l	250mg/l	
11	Copper(Cu)	//	//	0.05	Mg/l	2mg/l	
12	Ammonia (NH3)	//	//	0.25	Mg/l	1.5mg/l	
13	Aluminum(Al)		//	Zero	Mg/l	0.2mg/l	
14	Total dissolve solid (TDS)	//	//	882.13	Mg/l	----	
15	C.O.D	//	//	9	Mg/l	40mg/l>C.O.D	
Bacteriological Character							
1	E. Coliform	//	//	Zero	C.F.U/100ml	0 C.F.U/100ml	
2	Total. Coliform	//	//	Zero	C.F.U/100ml	5C.F.U/100ml	C-colonize F-forming U-UNIT

Note : as we observe above chart we will find ; that all parameters are normal .

2013/8/13 (Water quality analysis report ; Date: August/13/2013)

Table 3

Physical character							
N0	• **parameters**	**Water source**	**Water source address**	**Result**	**Unit**	**Permissible limit**	**Remark**
1	PH	Handle pump	Chaman(lawn) OF Bagramy	7.5	---	6.5—8.5	
2	Conductivity	//	//	1191	µs/cm	1500 µs/cm	
3	Turbidity	//	//	5>	N.T.U	≤5N.T.U	
4	Temperature	//	//	20	Ċ	20c	
Chemicals character							
1	Nitrate (No3)	//	//	7.07	Mg/l	50 mg/l	
2	Nitrite (No2)	//	//	0.492	Mg/l	3 mg/l	
3	Iron (Fe)	//	//	0.06	Mg/l	0.3 mg/l	
4	Fluoride (F)	//	//	0.35	Mg/l	1.5 mg/l	
5	Arsenic(As)	//	//	Zero	Mg/l	o.o1mg/l	
6	Chloride(Cl)	//	//	49.5	Mg/l	250 mg/l	
7	Cyanide (CN)	//	//	0.007	Mg/l	0.07mg/l	
8	Manganese (Mn)	//	//	0.2	Mg/l	0.5mg/l	
9	Phosphorus(Po4)	//	//	0.39	Mg/l	5mg/l	
10	Sulphate(So4)	//	//	120	Mg/l	250mg/l	
11	Copper(Cu)	//	//	0.05	Mg/l	2mg/l	
12	Ammonia (NH3)	//	//	0.024	Mg/l	1.5mg/l	
13	Aluminum(Al)		//	0.038	Mg/l	0.2mg/l	
14	Total dissolve solid (TDS)	//	//	833.208	Mg/l	----	
15	C.O.D	//	//	4	Mg/l	40mg/l>C.O.D	
Bacteriological Character							
1	E. Coliform	//	//	T T C	C.F.U/100ml	0 C.F.U/100ml	C-colonize F-forming U- UNIT
2	Total. Coliform	//	//	T T C	C.F.U/100ml	5C.F.U/100ml	

Note : As we observe above chart we will find Bacteriological contamination very high ; because this well must be disinfected. The other parameters are normal

2013/8/18 (Water quality analysis report ; Date: August/18/2013)

Table 4

Physical character							
N0	**Parameters**	**Water source**	**Water source address**	**Result**	**Unit**	**Permissible limit**	**Remark**
1	PH	Block-4; street:5	Project of Arzanqemat	7.7	---	6.5—8.5	
2	Conductivity	//	//	1247	µs/cm	1500 µs/cm	
3	Turbidity	//	//	5>	N.T.U	≤5N.T.U	
4	Temperature	//	//	23	Ċ	20c	
Chemicals character							
1	Nitrate (No3)	//	//	4.86	Mg/l	50 mg/l	
2	Nitrite (No2)	//	//	0.141	Mg/l	3 mg/l	
3	Iron (Fe)	//	//	0.04	Mg/l	0.3 mg/l	
4	Fluoride (F)	//	//	0.68	Mg/l	1.5 mg/l	
5	Arsenic(As)	//	//	Zero	Mg/l	o.o1mg/l	
6	Chloride(Cl)	//	//	25.5	Mg/l	250 mg/l	
7	Cyanide (CN)	//	//	0.003	Mg/l	0.07mg/l	
8	Manganese (Mn)	//	//	0.2	Mg/l	0.5mg/l	
9	Phosphorus(Po4)	//	//	0.19	Mg/l	5mg/l	
10	Sulphate(So4)	//	//	125	Mg/l	250mg/l	
11	Copper(Cu)	//	//	Zero	Mg/l	2mg/l	
12	Ammonia (NH3)	//	//	0.097	Mg/l	1.5mg/l	

13	Aluminum(Al)		//	0.008	Mg/l	0.2mg/l	
14	Total dissolve solid (TDS)	//	//	871.65	Mg/l	----	
15	C.O.D	//	//	10	Mg/l	40mg/l>C.O.D	
Bacteriological Character							
1	E. Coliform	//	//	Zero	C.F.U/100ml	0 C.F.U/100ml	
2	Total. Coliform	//	//	Zero	C.F.U/100ml	5C.F.U/100ml	

Note : As we observe above chart we will find that all parameters are normal .

2013/8/21 (Water quality analysis report ; Date: August/21/2013)

Table 5

Physical character							
N0	**Parameters**	**Water source**	**Water source address**	**Result**	**Unit**	**Permissible limit**	**Remark**
1	PH	Public tap in qaliezamankhan project	Project of qaliezamankhan	7.7	---	6.5—8.5	
2	Conductivity	//	//	1900	µs/cm	1500 µs/cm	
3	Turbidity	//	//	5>	N.T.U	≤5N.T.U	
4	Temperature	//	//	22	Ċ	20c	
Chemicals character							
1	Nitrate (No3)	//	//	3.53	Mg/l	50 mg/l	
2	Nitrite (No2)	//	//	0.432	Mg/l	3 mg/l	
3	Iron (Fe)	//	//	0.04	Mg/l	0.3 mg/l	
4	Fluoride (F)	//	//	0.98	Mg/l	1.5 mg/l	
5	Arsenic(As)	//	//	Zero	Mg/l	o.o1mg/l	
6	Chloride(Cl)	//	//	80.5	Mg/l	250 mg/l	
7	Cyanide (CN)	//	//	0.007	Mg/l	0.07mg/l	
8	Manganese (Mn)	//	//	0.2	Mg/l	0.5mg/l	
9	Phosphorus(Po4)	//	//	0.11	Mg/l	5mg/l	
10	Sulphate(So4)	//	//	280	Mg/l	250mg/l	
11	Copper(Cu)	//	//	0.02	Mg/l	2mg/l	
12	Ammonia (NH3)	//	//	0.23	Mg/l	1.5mg/l	
13	Aluminum(Al)		//	0.005	Mg/l	0.2mg/l	
14	Total dissolve solid (TDS)	//	//	1328.1	Mg/l	----	
15	C.O.D	//	//	21	Mg/l	40mg/l>C.O.D	
Bacteriological Character							
1	E. Coliform	//	//	Zero	C.F.U/100ml	0 C.F.U/100ml	
2	Total. Coliform	//	//	Zero	C.F.U/100ml	5C.F.U/100ml	F-formiUNIT

Note : As we observe above chart we will find that all parameters are normal without sulphate .the quantity of sulphate about 30mg/l is more than permissible limit. Also the quantity of conductivity is more then permissible limit

2013/8/22 (Water quality analysis report ; Date: /22/2013)

Table 6

Physical character							
N0	Parameters	Water source	Water source address	Result	Unit	Permissible limit	Remark
1	PH	River oflogar	Bridge (pul) of sanganawashta	8	---	6.5—8.5	
2	Conductivity	//	//	1290	µs/cm	1500 µs/cm	
3	Turbidity	//	//	>5	N.T.U	≤5N.T.U	
4	Temperature	//	//	25.5	Ċ	20c	
Chemicals character							
1	Nitrate (No3)	//	//	2.21	Mg/l	50 mg/l	
2	Nitrite (No2)	//	//	0.0328	Mg/l	3 mg/l	

3	Iron (Fe)	//	//	0.05	Mg/l	0.3 mg/l	
4	Fluoride (F)	//	//	0.22	Mg/l	1.5 mg/l	
5	Arsenic(As)	//	//	Zero	Mg/l	o.o1mg/l	
6	Chloride(Cl)	//	//	50.5	Mg/l	250 mg/l	
7	Cyanide (CN)	//	//	0.004	Mg/l	0.07mg/l	
8	Manganese (Mn)	//	//	0.2	Mg/l	0.5mg/l	
9	Phosphorus(Po4)	//	//	0.06	Mg/l	5mg/l	
10	Sulphate(So4)	//	//	40	Mg/l	250mg/l	
11	Copper(Cu)	//	//	0.03	Mg/l	2mg/l	
12	Ammonia (NH3)	//	//	0.24	Mg/l	1.5mg/l	
13	Aluminum(Al)		//	0.001	Mg/l	0.2mg/l	
14	Total dissolve solid (TDS)	//	//	901.71	Mg/l	----	
15	C.O.D	//	//	14	Mg/l	40mg/l>C.O.D	
Bacteriological Character							
1	E. Coliform	//	//	T T C	C.F.U/100ml	0 C.F.U/100ml	
2	Total. Coliform	//	//	T T C	C.F.U/100ml	5C.F.U/100ml	C-colonize

2013/8/25 (Water quality analysis report ; Date: August/25/2013)

Table 7

Physical character							
N0	**parameters**	**Water source**	**Water source address**	**Result**	**Unit**	**Permissible limit**	**Remark**
1	**PH**	**Office fzone-1**	**Street-1 of shashahed**	**7.8**	**---**	**6.5—8.5**	
2	Conductivity	//	//	1282	µs/cm	1500 µs/cm	
3	Turbidity	//	//	5>	N.T.U	≤5N.T.U	
4	Temperature	//	//	24	Ċ	20c	
Chemicals character							
1	Nitrate (No3)	//	//	8.84	Mg/l	50 mg/l	
2	Nitrite (No2)	//	//	0.0164	Mg/l	3 mg/l	
3	Iron (Fe)	//	//	Zero	Mg/l	0.3 mg/l	
4	Fluoride (F)	//	//	0.36	Mg/l	1.5 mg/l	
5	Arsenic(As)	//	//	Zero	Mg/l	o.o1mg/l	
6	Chloride(Cl)	//	//	20.5	Mg/l	250 mg/l	
7	Cyanide (CN)	//	//	0,004	Mg/l	0.07mg/l	
8	Manganese (Mn)	//	//	0.2	Mg/l	0.5mg/l	
9	Phosphorus(Po4)	//	//	0.26	Mg/l	5mg/l	
10	Sulphate(So4)	//	//	I40	Mg/l	250mg/l	
11	Copper(Cu)	//	//	0.02	Mg/l	2mg/l	
12	Ammonia (NH3)	//	//	0.121	Mg/l	1.5mg/l	
13	Aluminum(Al)		//	0.008	Mg/l	0.2mg/l	
14	Total dissolve solid (TDS)	//	//	896.118	Mg/l	----	
15	C.O.D	//	//	13	Mg/l	40mg/l>C.O.D	
Bacteriological Character							
1	E. Coliform	//	//	T T C	C.F.U/100ml	0 C.F.U/100ml	
2	Total. Coliform	//	//	T T C	C.F.U/100ml	5C.F.U/100ml	F-forming ‘ U- UNIT

The result shown in Table No. 1: indicates the conductivity parameter of water sample form water source taken from well-1 is 1600 which is more than permissible limit. However other parameters like Nitrate, Nitrite, Iron, Fluoride content within permissible range. The Sulphate content is table no. 1 seems a bit higher that is 210 mg/l. The Bacteriological character shown in Table No. 1 taken from well-1 has 0 values which good for potable purposes.

The analysis report of water sample taken booster pump indicates the turbidity level is higher than the permissible range.

In table no. 3 C.O.D. value is very less that is 4 which require attention. However in Table No. 1 the C.O.D. level is 23.

In Table No. 4 the normal temperature of water sample taken from block 4, street 5, the temperature of water at sample site was found to be 23 degree which is higher the normal range that is 20 degree Celsius.

In Table No. 5 the conductivity is 1900 which is more than the permissible range of 1500; here the temperature of sample water is 2 degree higher than the normal range.

In Table No. 6 the PH value of the water source taken from river Oflogar is 8 which are alkaline in nature; it seems the river may be carrying many industrial effluents which may be causing water alkaline. The temperature of the sample water is also high that is 25.5 degree Celsius.

In Table No. 7 water taken from street 1 and office zone is also slightly alkaline.
In Afghanistan the water availability for irrigation purposes is mainly a function of effect rain fall and surface as well as ground water sources. This depends in term on the amount and the distribution of precipitation. This could be the reason that the result shown in the above analysis seems that most of the parameters taken into consideration is in the permissible range which is very good sign in terms of health benefit of the individuals. The other reason could be the less industrialization to this country. The topography of entire country is mostly mountainous so that way also the water also gets naturally purified.

4. CONCLUSION

The recent estimate indicates that the country has 75 billion cubic meters of potential water resources of which 55 billion cubic meters is surface water and 20 billion cubic meters is ground water. A qualitative assessment shows that Afghanistan's water resources are still largely under use. Therefore it is high time that a policy should be framed for not only check the qualitative assessment of water resources but also to utilized such resources for various purposes such as in industry, in agriculture irrigation, in developing hydro power plants rationally for maintaining ecological concern as well as economic development.

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