



GOVERNMENT OF TAMIL NADU WATER RESOURCES DEPARTMENT

INCIDENCE OF FLUORIDE in Tamil nadu (AS ON JANUARY 2008)

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INCIDENCE OF FLUORIDE IN TAMIL NADU

(As on January 2008)

INTRODUCTION

Tamil Nadu is an agrarian state with a geographical area of about 1,30,069 sq.km. Administratively this state has been divided into 31 districts which are further sub-divided into taluks and blocks. Based on the drainage pattern of the rivers, this state has been divided into 17 major river basins.

Generally a sub-tropical climate prevails throughout the state, and the maximum temperature ranges from 37 °C to 43°C and the minimum temperature varies from 12 °C to 17 °C. The average annual rainfall for this state is 925 mm.

Geologically this state has been divided into two zones namely the hard rock and the sedimentary terrains. 73% of the state is covered by hard rocks. The major rock types are charnockite, gneiss and granite. The remaining 23% is sedimentary formation consists of coastal sandy zones, river alluvial formations, sandstones, shale, clay etc.

In this state water quality is being monitored in 1222 observation wells and in 852 piezometers during pre and post monsoon period (ie during July and January every year).

SOURCES OF FLUORIDE

Fluoride exists naturally in water sources and is derived from fluorine, the thirteenth most common element in the Earth's crust. In case of natural waters, the variation in the fluoride content from region to region is dependent upon factors such as the source of water, type of geological formation and the amount of rainfall. Surface water generally has low fluoride while ground water may has high concentrations of fluoride as has been found in many parts of the world.

Element Fluorine is of Halogen group with molecular weight 19 and atomic number 9 and it is the most electro negative of all elements. This fluorine exists as a diatomic molecule with remarkably low dissociation energy (38 K cal/mole). As a result it is highly reactive and has strong affinity to combine with other elements to produce compounds known as Fluoride.

The origin of fluoride in groundwater is through weathering of alkali, igneous and sedimentary rocks. The common fluoride bearing minerals are

- i. Fluorspar (CaF_2)
- ii. Cryolite (Na_3AlF_6)
- iii. Fluor-apatite ($\text{Ca}_{10}\text{F}_2(\text{PO}_4)_6$)
- iv. Amphiboles such as hornblende, tremolite
- v. Volcanic and fumarolic gases

Fluoride may also be introduced to the environment due to burning of coal and during manufacturing process of aluminium, steel, bricks. In the phosphatic fertilizers used in the agricultural activities, fluoride is an impurity which results in high fluoride concentration in the soils. Accumulation of fluoride in the soils eventually results in leaching by percolation into the groundwater aquifer and thereby increases the concentration of fluoride level.

EFFECT OF FLUORIDE ON HUMAN HEALTH

Fluoride is the most exclusive bone seeking anion owing to its affinity for calcium phosphate, up to 99% of the body burden of fluoride is found in bone.

Presence of fluoride in drinking water is both beneficial and detrimental to the consumer. Low levels of fluoride in drinking water results in incorporation of fluoride into teeth during the formative years of children, which makes the teeth resistant to decay and development of dental caries. However, mottling of teeth may occur when the concentration increases more than 2 mg/L. Long term intake of water containing

excessive concentration in the range of 5 to 10 mg/L causes skeletal fluorosis, in which the bone structure is affected causing bone deformation and crippling.

To a certain extent (as per WHO standards 0.6 mg/L and as per BIS 1.0 mg/L) fluoride ingestion is useful for bone and teeth development, but excessive ingestion causes a disease known as Fluorosis. While the WHO standards 1.0 mg/L and BIS:10500-1991 permit only 1.5 mg/l as a maximum permissible limit of fluoride (in the absence of alternate source) in drinking water for human consumption. People in several districts in Rajasthan are consuming water with fluoride concentrations of up to 24 mg/l.

Fluorosis continues to be an endemic problem. More and more areas are being discovered regularly that are affected by fluorosis in different parts of the country. Children in the age group of 0 to 12 years are most prone to fluorosis as their body tissues are in formative / growth stage during this period. Expectant mothers are also to be protected, as there is growing concern about effects of fluoride on fetus

Fluorosis, which was considered to be a problem related to teeth, only, has now, turned up to be a serious health hazard. It seriously affects bones and problems like joint pain, muscular pains etc. are its well-known manifestations. It not only affects the body of a person but also renders them socially and culturally crippled. In spite of the progressive spread of disease so far no established data exists to determine the extent of disease, no specialized water testing facilities are available and even in the hospitals itself do not have specific orientation to correlate the disease with specific symptoms. In these areas the response of the people is reactive rather than pro-active.

Dental fluorosis occurs because of the excessive intake of fluoride either through fluoride in the water supply, naturally occurring or added to it; or through other sources. The damage in tooth development occurs between the ages of 6 months to 5 years, from the overexposure to fluoride. Teeth are generally composed of hydroxyapatite and carbonated hydroxyapatite; when fluoride is present, fluorapatite is created. Excessive fluoride can cause yellowing of teeth, white spots, and pitting or mottling of enamel.



Mild case of fluorosis.
Notice the faint white mottling



Intermediate case of fluorosis.
Notice the red spot



Severe case
of
fluorosis

Different stages of dental fluorosis

Skeletal fluorosis is a bone disease exclusively caused by excessive consumption of fluoride. In advanced cases, skeletal fluorosis causes pain and damage to bones and joints. Advanced cases usually involve about ten times the normal amount of fluoride. Common causes of fluorosis include inhalation of fluoride dusts/fumes by workers in industry, use of coal as an indoor fuel source (a common practice in China), consumption of fluoride from drinking water, tea, particularly brick tea. In India, the most common cause of fluorosis is fluoride-laden water derived from deep bore wells



Osteofluorosis – Skeletal changes

The highest fluoride concentration of 28.9 mg/L was reported from India. The fluoride content of seawater varies from 0.8 to 1.4 mg/L, which explains why the fluoride content of diet rises when sea foods are consumed. Among beverages tea has an exceptionally high fluoride content which varies in different brands from 122-260 mg/L or more. Each cup of tea may supply 0.3-0.5 mg of fluoride. Bottled beverages, which are increasingly being consumed around the world, have a variable and some have high content of fluoride and should be considered as additional sources of fluoride.

The fluoride intake dependent upon consumption of drinking water and beverages is determined by factors such as body size, physical activity, food habits and

variations in atmospheric temperature and humidity. That is why in tropical countries like India, the daily fluoride intake is very high. Farm laborers drink lot of water from wells and naturally have high fluoride intake and are at risk of developing fluorosis.

If the fluoride is absent or below 0.3 mg/L fluoridation of water supply may be practiced, 1 mg/L is generally considered as a desirable level as per BIS.

METHODOLOGY

The groundwater sampling was carried out systematically from 855 nos. of open shallow dug wells and from 726 piezometers (Bore wells) constructed under Hydrology Project Phase – I, consists of varying depth ranges from 30 – 100 mbgl during post monsoon period (ie. During January 2008). The samples were subjected to chemical analysis and the analyses are being carried out as per standard analytical procedures.

RESULTS AND DISCUSSION

The fluoride values are grouped into shallow open dug wells and piezometers separately for each district of entire state of Tamil Nadu and are appended herewith for reference.

The fluoride value ranges from 0.02 – 2.50 mg/L in open dug wells and ranges from 0.02 – 2.20 mg/L in piezometers in the entire state of Tamil Nadu. Districtwise range and the % distribution of fluoride in each category is given in the table for reference.

Fluoride distribution has been classified into three (3) categories Viz. Good having the fluoride value less than 1.00 mg/L, Moderate having the fluoride value between 1.01 and 1.50 and Poor having the fluoride value greater than 1.50 mg/L.

Percentage distributionwise there is not much variation in open dug wells and in piezometers. This has been seen in the table and pie chart given below.

Good quality water with fluoride value less than 1.00 mg/L in open dug well is available in 12 districts, viz. Ariyalur, Chennai, Coimbatore, Cuddalore, Namakkal, Nilgiris, Salem, Sivagangai, Thanjavur, Theni, Tiruvarur and in Villupuram districts in the state of Tamil Nadu.

Good quality and Moderate quality water with fluoride value upto 1.50 mg/L in open dug well is available in 14 districts, viz. Dharmapuri, Dindigul, Kancheepuram, Kanyakumari, Madurai, Nagapattinam, Perambalur, Pudukkottai, Ramanathapuram, Trichy, Thoothukudi, Tirunelveli, Tiruvallur and in Tiruvannamalai districts in the state of Tamil Nadu.

Apart from the Good, Moderate quality of water, Poor quality water with fluoride value greater than 1.50 mg/L in open dug well is available in the remaining 5 districts of Tamil Nadu, viz. Erode, Karur, Krishnagiri, Vellore and in Virudhunagar.

Poor quality due to the presence of fluoride value more than 1.50 mg/L in the open dug wells in the above districts may be due to the geological formations and the chemicals used for dyeing industries situated in Erode and Karur districts, Tannery and Chemical industries in Vellore district and fireworks in Virudhunagar district. In Krishnagiri district geological formation plays an important role in the distribution of fluoride.

Likewise Good quality water with fluoride value less than 1.00 mg/L in piezometer is available in 8 districts, viz. Chennai, Coimbatore, Dindigul, Nagapattinam, Nilgiris, Salem, Sivagangai and in Tiruvarur districts in the state of Tamil Nadu.

Good quality and Moderate quality water with fluoride value upto 1.50 mg/L in piezometers is available in 19 districts, viz. Ariyalur, Cuddalore, Dharmapuri, Kancheepuram, Kanyakumari, Krishnagiri, Madurai, Namakkal, Perambalur, Pudukkottai, Ramanathapuram, Thanjavur, Theni, Thoothukudi, Tirunelveli, Tiruvallur, Tiruvannamalai, Villupuram and in Virudhunagar districts in the state of Tamil Nadu.

Apart from the Good, Moderate quality of water, Poor quality water with fluoride value greater than 1.50 mg/L in piezometers is available in the remaining 4 districts of Tamil Nadu, viz. Erode, Karur, Trichy, and in Vellore.

Poor quality due to the presence of fluoride value more than 1.50 mg/L in the piezometers in the above districts may be due to the geological formations and the chemicals used for dyeing industries situated in Erode and Karur districts, Tannery and Chemical industries in Vellore districts. In Trichy district geological formation plays an important role in the distribution of fluoride.

CONCLUSION

1. There is no fluoride contamination in the open dug wells in the district of Ariyalur, Chennai, Coimbatore, Cuddalore, Namakkal, Nilgiris, Salem, Sivagangai, Thanjavur, Theni, Tiruvarur and Villupuram with Fluoride value of less than 1.00 mg/L
2. Similarly in the piezometers there is no fluoride contamination in the districts of Chennai, Coimbatore, Dindigul, Nagapattinam, Nilgiris, Salem, Sivagangai and Tiruvarur with fluoride value of less than 1.00 mg/L
3. Moderate quality of water with fluoride concentration 1.00 – 1.50 mg/L in open dug wells and in piezometers noted in the districts of Dharmapuri, Erode, Kancheepuram, Kanyakumari, Karur, Krishnagiri, Madurai, Perambalur, Pudukottai, Ramanathapuram, Trichy, Thoothukudi, Tirunelveli, Tiruvallur, Tiruvannamalai, Vellore and Virudhunagar.
4. However in addition to this the moderate quality of water of with fluoride is noted in the piezometes in the districts of Ariyalur, Cuddalore, Namakkal, Thanjavur, Theni and Villupuram, and in open dug wells in the districts of Dindigul, and Nagapattinam.

5. The poor quality in respect of fluoride more than 1.50 mg/L is noted both in open dug wells and piezometers in the districts of Erode, Karur, Vellore.

6. However in addition to the above, the poor quality in open dug wells is noted in Krishnagiri and Virudhunagar and in piezometers in the district of Trichy. The actual value of fluoride ranges from 1.60 to 2.50 mg/L in open dug wells and 1.51 to 2.20 mg/L in the piezometers.

DISTRICTWISE DISTRIBUTION OF FLUORIDE IN DUG WELLS						
S.No	District	No. of wells	Range of Fluoride mg/L	% of Fluoride Distribution		
				Good < 0.50 mg/L	Moderate 1.00 - 1.50 mg/L	Poor > 1.50 mg/L
1	Ariyalur	15	0.10 - 0.80	100	--	--
2	Chennai	7	0.17 - 1.00	100	--	--
3	Coimbatore	36	0.35 - 1.00	100	--	--
4	Cuddalore	15	0.02 - 0.78	100	--	--
5	Dharmapuri	28	0.40 - 1.50	71	29	--
6	Dindigul	35	0.13 - 1.50	86	14	--
7	Erode	78	0.80 - 2.50	19	67	14
8	Kancheepuram	45	0.15 - 1.45	96	4	--
9	Kanyakumari	22	0.17 - 1.40	91	9	--
10	Karur	15	0.35 - 1.58	73	20	7
11	Krishnagiri	13	0.40 - 1.80	46	46	8
12	Madurai	14	0.09 - 1.10	86	14	--
13	Nagapattinam	17	0.06 - 1.08	94	6	--
14	Namakkal	29	0.32 - 1.00	100	--	--
15	Nilgiris	9	0.54 - 0.74	100	--	--
16	Perambalur	12	0.39 - 1.08	92	8	--
17	Pudukkottai	17	0.06 - 1.03	94	6	--
18	Ramanathapuram	28	0.14 - 1.50	86	14	--
19	Salem	37	0.53 - 0.97	100	--	--
20	Sivagangai	29	0.17 - 0.89	100	--	--
21	Thanjavur	18	0.05 - 0.13	100	--	--
22	Theni	9	0.13 - 1.00	100	--	--
23	Thiruchirapalli	21	0.34 - 1.38	67	33	--
24	Thoothukudi	23	0.05 - 1.30	96	4	--
25	Tirunelveli	61	0.05 - 1.40	97	3	--
26	Tiruvallur	34	0.11 - 1.28	94	6	--
27	Tiruvannamalai	63	0.02 - 1.50	92	8	--
28	Tiruvarur	14	0.05 - 0.83	100	--	--
29	Vellore	39	0.02 - 1.70	69	21	10
30	Villupuram	24	0.02 - 0.80	100	--	--
31	Virudhunagar	48	0.07 - 2.50	75	19	6
	Tamil Nadu	855	0.02 - 2.50	84	14	2

DISTRICTWISE DISTRIBUTION OF FLUORIDE IN BORE WELLS						
S.No	District	No. of wells	Range of Fluoride mg/L	% of Fluoride Distribution		
				Good < 0.50 mg/L	Moderate 1.00 - 1.50 mg/L	Poor > 1.50 mg/L
1	Ariyalur	12	0.16 - 1.28	83	17	--
2	Chennai	2	0.41 - 0.72	100	--	--
3	Coimbatore	32	0.36 - 0.96	100	--	--
4	Cuddalore	26	0.02 - 1.16	92	8	--
5	Dharmapuri	12	0.50 - 1.10	92	8	--
6	Dindigul	36	0.05 - 0.80	100	--	--
7	Erode	37	0.90 - 2.20	16	70	14
8	Kancheepuram	37	0.02 - 1.50	92	8	--
9	Kanyakumari	12	0.05 - 1.25	92	8	--
10	Karur	20	0.27 - 1.51	30	60	10
11	Krishnagiri	9	0.30 - 1.20	89	11	--
12	Madurai	33	0.21 - 1.50	67	33	--
13	Nagapattinam	10	0.29 - 0.84	100	--	--
14	Namakkal	15	0.37 - 1.10	93	7	--
15	Nilgiris	3	0.53 - 0.64	100	--	--
16	Perambalur	8	0.20 - 1.38	63	38	--
17	Pudukkottai	46	0.05 - 1.42	89	11	--
18	Ramanathapuram	12	0.17 - 1.30	92	8	--
19	Salem	25	0.24 - 0.94	100	--	--
20	Sivagangai	23	0.09 - 0.68	100	--	--
21	Thanjavur	25	0.05 - 1.08	96	4	--
22	Theni	15	0.17 - 1.30	93	7	--
23	Thiruchirapalli	39	0.38 - 1.63	51	38	10
24	Thoothukudi	29	0.11 - 1.50	93	7	--
25	Tirunelveli	46	0.05 - 1.50	89	11	--
26	Tiruvallur	16	0.16 - 1.15	81	19	--
27	Tiruvannamalai	33	0.02 - 1.22	94	6	--
28	Tiruvarur	10	0.10 - 0.56	100	--	--
29	Vellore	38	0.05 - 1.74	71	16	13
30	Villupuram	36	0.15 - 1.50	89	11	--
31	Virudhunagar	29	0.05 - 1.50	86	14	--
	Tamil Nadu	726	0.02 - 2.20	82	16	2

Districtwise distribution of moderate quality water in open dug well

S.No	District	Taluk	Well No	Village	F mg/L
1	Dharmapuri	Dharmapuri	53003	Thoppur	1.10
2		Harur	53001	Kombur	1.50
3			53006	K.Vetrapatti	1.10
4			53036	Kadathur	1.20
5			53037	Kambainallur	1.20
6			53059	Sunkarahalli	1.10
7		Pappireddipatti	53036A	Kadathur	1.10
8		Uthangarai	53011A	Singarapettai	1.10
9	Dindigul	Dindigul	83521	Sukkampatti	1.30
10		Nilakkottai	83100A	Keelakovilpatti	1.30
11		Palani	83527A	Erumainaickanpatti	1.20
12			83540	T.M.G.Valasu	1.20
13		Vedasandur	83040A	Viduthalaipatti	1.50
14	Erode	Bhavani	63103	Nallagoundanpudur	1.50
15			63104	Kaundapadi	1.40
16			63106	Poolapalayam	1.50
17			63107	Thottypalayam	1.30
18			63108	Bhavani	1.20
19			63117	Kammagoundanpudur	1.50
20			63121	Vellithirupur	1.10
21			63125	Surigampet	1.20
22			63127	Nerinjipet	1.50
23			63128	Chennampatti	1.40
24		Dharapuram	63502	Dasarapatty	1.40
25			63506	Dharapuram	1.30
26			63508	Koneripatti	1.30
27			63509	Ponnivadi	1.50
28			63513	Rangampalayam	1.50
29			63518	S.K.Palayam	1.50
30			63520	Polarai	1.30
31			63525	Kannivadi	1.40
32			63528	Karilingampalayam	1.20
33			63532	Uthiyur	1.50
34			63533	Sinukinari	1.40
35			63534	Anaipudur	1.20
36		Erode	63202	Perymalkoilpudur	1.50
37			63203	Kodumudi	1.20
38			63216	Unjalur	1.20
39			63227	Elamathur	1.10
40			63229	Solengapalayam	1.30

S.No	District	Taluk	Well No	Village	F mg/L
41	Erode	Erode	63230	Punjaikolanalli	1.10
42			63237	Veppampalayam	1.40
43			63241	Kollampalayam	1.20
44			63245	Nasiyanur	1.10
45		Gobichettipalayam	63011	Munampalli	1.10
46			63014	Kummikanikku	1.50
47			63023	Alukuli	1.20
48			63025	Sanarpalayam	1.20
49			63031	Vaniputhur	1.20
50			63032	Bungalowpudur	1.10
51			63034	Sanandapur	1.30
52		Kangeyam	63535	Andipalayam	1.20
53			63538	Punjathalaiyur	1.30
54			63542	Vellakoil	1.20
55		Perundurai	63224	Maladi	1.30
56			63225	Vadamuga Vellodu	1.20
57			63243	Nallampatty	1.30
58			63244	Kanjikoil	1.40
59		Sathyamangalam	63017	Muddukandurai	1.30
60			63019	Vinnapalli	1.10
61			63020	Shenbagapudur	1.10
62			63028	Chikkarasampalayam	1.10
63			63030	Kembanaickenpalayam	1.10
64			63038	Tignarai	1.20
65			63041	Mallankuli	1.50
66	Kancheepuram	Sriperumbudur	13158	Maduramangalam	1.06
67		Thirukazhukkuntram	U23089	Sadras	1.45
68	Kanyakumari	Agastheeswaram	93043	Variyur	1.40
69		Kalkulam	93048	Kattathurai	1.05
70	Karur	Aravakurichi	73082	Nagampalli	1.21
71			73083	Thirumanickkampatti	1.07
72		Karur	73084	Jellippatti	1.04
73	Krishnagiri	Denkanikottai	53041	Andevanapalli	1.50
74		Krishnagiri	53017A	Sandur	1.10
75			53067	Agaram	1.20
76			53070	Gollanagamangalam	1.20
77			53071	Chinnamuthur	1.20
78		Pochampalli	53013	Anandur	1.50
79	Madurai	Peraiyur	83051	Karaikeni	1.10
80		Thirumangalam	83049	Peikulam	1.09
81	Nagapattinam	Mayiladuthurai	43048	Kuttalam	1.08

S.No	District	Taluk	Well No	Village	F mg/L
82	Perambalur	Veppanthattai	73002	Pasumbalur	1.08
83	Pudukkottai	Pudukkottai	43081	Vellayakkonpatti	1.03
84	Ramanathapuram	Mudukulathur	83287A	Mattiyarendal	1.50
85			83290A	Ervadi	1.30
86		Paramakudi	83277	Viravanendal	1.50
87		Ramanathapuram	83283	Idayarvalasai	1.20
88	Thiruchirapalli	Manapparai	73107	Ponnakkavundanpatti	1.12
89			73127	Alagakkavundanpatti	1.20
90			73129	Vannarapatti	1.04
91			73147	Tettur	1.37
92		Mannachanallur	73043	Maniyankurichchi	1.38
93		Thottiyam	73055	Unniyur	1.08
94		Turaiyur	73025A	Angiyam	1.06
95	Thoothukudi	Vilathikulam	93137	Kaluhachalapuram	1.30
96	Tirunelveli	Radhapuram	93065	Samugarengapuram	1.02
97		Tirunelveli	93019A	Gangaikondan	1.40
98	Tiruvallur	Ponneri	U13014A	Nandiyambakkam	1.21
99		Tiruvallur	13104	Karikalavakkam	1.28
100	Tiruvannamalai	Arani	23067	Thatchur	1.50
101		Chengam	23117	Sennasamudram	1.01
102		Cheyyar	23060	Moranam	1.20
103		Vandavasi	23013	Desur	1.16
104			23014	Thennangur	1.17
105	Vellore	Arcot	23090	Kaniyamur	1.07
106		Thiruppathur	23011	Thoranampathi	1.41
107		Vaniyambadi	23023	Vaniyambadi	1.11
108			23027A	Ambur	1.41
109			23044	Andiappanur	1.41
110		Vellore	23072	Karadikudi	1.40
111			23079	Asanampet	1.05
112		Walajapet	23082	Ponnai	1.20
113	Virudhunagar	Rajapalayam	83104A	Sethur	1.30
114			83105A	Ayyanarkoil	1.50
115			83169A	Vadakarai	1.50
116			83170B	A.Salapuram	1.10
117		Sattur	83201A	Pulvoypatti	1.20
118		Srivilliputhur	83180	Nathampatti	1.40
119			83182	Pillaiyarnatham	1.30
120			83176	Khansahibpuram	1.40
121		Virudhunagar	83199	Ettunaikenpatti	1.50

Districtwise distribution of poor quality water in open dug well

S.No	District	Taluk	Well No	Village	F mg/L
1	Erode	Dharapuram	63501	Munduelampatty	1.90
2			63505	Dalavaypattinam	1.80
3			63511	Marudur	2.20
4			63512	Sadayapalayam	2.50
5			63517	Kulathupalayam	2.00
6			63519	Peranium	1.90
7			63522	Mulanur	2.20
8			63526	Nanjaikalipalayam	1.70
9			63527	Malamedu	1.60
10			63531	Dayampalayam	1.60
11		Kangayam	63537	Muthunaickken Valasu	1.90
12	Karur	Krishnarayapuram	73072	Valayakaranputhur	1.58
13	Krishnagiri	Uthangarai	53012	Uthangarai	1.80
14	Vellore	Arcot	23092	Ayilam	1.70
15		Gudiyatham	23052	K. Mottur	1.68
16		Katpadi	23031	Arumparuthi	1.70
17		Walajapet	2402	Ranipet water works	1.70
18	Virudhunagar	Sattur	83115	Vembakottai	2.50
19			83116	Alankulam	2.00
20			83194	Chekkiahpuram	1.60

Districtwise distribution of moderate quality water in Piezometers

S.No	District	Taluk	Well No	Village	F mg/L
1	Ariyalur	Udayarpalayam	13010D	Ambappur	1.25
2			13016	Edayathangudi	1.28
3	Cuddalore	Chidambaram	HP31546	Puduchathiram	1.16
4		Virudhachalam	HP31540	Vilambavur	1.01
5	Dharmapuri	Dharmapuri	HP17001	Solaihattai	1.10
6	Erode	Bhavani	HP1E01	Boothapadi	1.10
7			HP1E02	Andhiyur	1.20
8			HP1E03	Pudupalayam	1.10
9			HP2E04	Kesaripalayam	1.20
10			HP2E05	Jambai	1.20
11		Dharapuram	HP2E21	Uthiyur	1.20
12			HP2E22	Periakumarapalayam	1.50
13			HP2E26	Ponnivadi	1.20
14			HP2E27	Thoorampadi	1.30
15			HP2E28	Orathupalayam	1.20
16		Erode	HP1E08	Modakurichi	1.40
17			HP1E09	Vengambur	1.30
18			HP2E03	Kandasampalayam	1.20
19		Gobichettipalayam	HP1E15	Ayalur	1.20
20			HP2E18	Kadathur	1.50
21			HP2E19	Kondayampalayam	1.40
22			HP2E20	Vemandampalayam	1.40
23		Kangeyam	HP2E11	Kanjeerapalayam	1.30
24			HP2E12	Rasathavalasu	1.50
25			HP1E10	Vellakoil	1.20
26		Perundurai	HP1E11	Timmanaickanpalayam	1.10
27			HP2E07	Vedamugamvellodu	1.20
28			HP2E08	Orathupalayam	1.20
29		Sathyamangalam	HP2E14	Ayyampalayam	1.30
30			HP2E16	Ukkaram	1.40
31			HP2E17	Thadapalligramam	1.40
32	Kancheepuram	Cheyur	HP11915	Chittampur	1.07
33		Kancheepuram	HP11937	Walajabad	1.50
34		Sriperumbudur	HP11931	Madampakkam	1.21
35	Kanyakumari	Thovala	29003D	Aralvoimozhi	1.25
36	Karur	Aravakurichi	14007D	Kodanthur	1.14
37			14009D	Esanatham	1.20
38			14010	Santhapadi	1.25
39			14015D	Vettamangalam	1.49
40			14021	Venjamangudalur	1.48
41			14022	Chinna Darapuram	1.07
42	Karur	Karur	14012D	Kakkavadi	1.30
43			14013D	Puliyur	1.14
44		Krishnarayapuram	14016	Vayaloor	1.15
45			14018D	Manjanaikanpatti	1.17

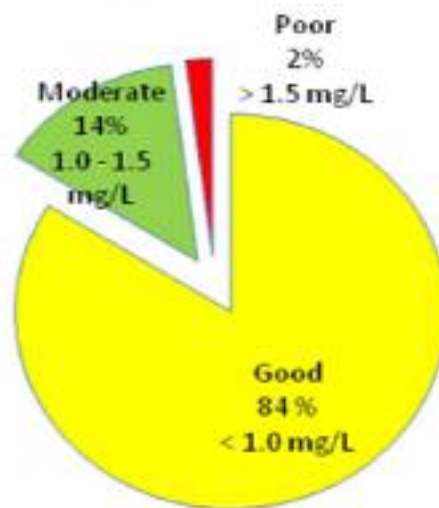
S.No	District	Taluk	Well No	Village	F mg/L
46		Kulithalai	14003D	Pillaikodangippatti	1.35
47			14004D	Nallur	1.07
48	Krishnagiri	Denkanikottai	HP17039	Salivaram	1.20
49	Madurai	Madurai North	21025D	Varichiyur	1.20
50		Madurai South	21001D	Thiruparankundram	1.40
51			21008D	Melamathur	1.10
52		Melur	21022D	Pulipatti	1.30
53		Peraiyur	21011D	Mallapuram	1.20
54			21015D	Peraiyur	1.10
55		Thirumangalam	21002D	Chokkanathapuram	1.10
56			21004D	Chinna Ulagani	1.20
57			21007D	Kallikudi	1.40
58			21012D	Kurayur	1.50
59		Usilampatti	21033D	Usilampatti	1.40
60	Namakkal	Thiruchengodu	HP2S06	Odapalli	1.10
61	Perambalur	Kunnam	13005D	Sirumathur	1.38
62		Perambalur	13023	Ladapuram	1.31
63		Veppanthattai	13002D	Mettupalayam	1.09
64	Pudukkottai	Kulathur	12001D	Mandaiyur	1.16
65			12003D	Settippatti	1.14
66			12005	Thirunallur	1.17
67			12014D	Kodumbalure	1.42
68		Thirumayam	12012D	Karanapatti	1.28
69	Ramanathapuram	Paramakudi	26006	Parthibanur	1.30
70	Thanjavur	Thanjavur	08007D	Cholagampatti	1.08
71	Theni	Theni	23010D	Seelayampatti	1.30
72	Thiruchirapalli	Manapparai	11007D	Aniyapur	1.34
73			11008D	Nadupatti	1.24
74			11010D	Pudupatti	1.03
75			11012D	Sithanatham	1.42
76			11032	Poygaippatti	1.17
77		Mannachanallur	11030	Konalai	1.06
78		Musiri	11017D	Pulivalam	1.33
79			11020	Kidaram	1.50
80			11022D	Sittalarai	1.12
81		Srirangam	11015	Kulumani	1.46
82		Thuraiyur	11041	Thuraiyur	1.40
83			11025	Pachchiperumalpatti	1.21
84			11026D	Thalugai	1.05
85	Thiruchirapalli	Thuraiyur	11027D	Nagayanallur	1.49
86			11033D	Perumalpalaiyam	1.29
87	Thoothukudi	Kovilpatti	28003D	Kayathar	1.50
88		Vilathikulam	28004D	T.Duraisampuram	1.17
89	Tirunelveli	Ambasamudram	27046D	Venkatarangapuram	1.05
90		Palayamkottai	27033D	Ponnakudi	1.50
91		Radhapuram	27017D	Vijayapathi	1.49

S.No	District	Taluk	Well No	Village	F mg/L
92			27039D	Soundaralingapuram	1.08
93		Sankarankovil	27016D	Velayuthapuram	1.50
94	Tiruvallur	Ponneri	HP11944	Kalpakkam	1.15
95		Poonamalli	HP11941	Avadi	1.10
96		Tiruthani	HP11925	Arcot Kuppam	1.12
97	Tiruvannamalai	Thiruvannamalai	HP21516	Thandarai	1.22
98			HP21568	Keekalur	1.10
99	Vellore	Gudiyatham	HP21548	Nalanganallur	1.20
100		Thiruppathur	HP21551	Kurusilapattu	1.30
101		Vaniyambadi	HP21544	Thekkupattu	1.49
102			HP21550	Kommeswaram	1.10
103		Vellore	HP21502	Guruvarajapalayam	1.24
104			HP21558	Usur	1.21
105	Villupuram	Chenji	HP31527	Thiruvathikunnam	1.07
106		Tindivanam	HP31529	Saram	1.50
107		Villupuram	HP31533	Athanurvinayagapuram	1.40
108			HP31556	Kandamangalam	1.10
109	Virudhunagar	Aruppukottai	25030	P.Pudupatti	1.50
110		Rajapalayam	25011D	Kovilur	1.20
111		Sattur	25022D	Sattur	1.40
112			25024D	Mulliseval	1.20

Districtwise distribution of poor quality water in Piezometers

S.No	District	Taluk	Well No	Village	F mg/L
1	Erode	Dharapuram	HP2E29	Velampoondi	1.60
2		Erode	HP3E01	B.P.agraharam	1.80
3		Sathyamangalam	HP1E16	Rajannagar	1.90
4			HP1E17	Hasanur	2.20
5			HP1E18	Thalavadi	2.10
6	Karur	Krishnarayapuram	14019	Devarmalai	1.51
7			14023	Keranur	1.51
8	Thiruchirapalli	Lalgudi	11031D	Tachchankurichchi	1.51
9		Manapparai	11011D	Karuppur	1.54
10			11036	Amayapuram	1.63
11		Turaiyur	11006	Sangampatti	1.54
12	Vellore	Thiruppathur	HP21542	Kothur	1.63
13			HP21545	Mallapalli	1.54
14		Vaniyambadi	HP21526	Vellakuttai	1.74
15			HP21533	veppampattu	1.72
16			HP21549	Kadavalam	1.70

Distribution of Fluoride in Dug wells in Tamil Nadu



Distribution of Fluoride in Bore wells in Tamil Nadu

