

# Fluoride

Fluoride accounts for about 0.3 g/kg of the Earth's crust and exists in the form of fluorides in a number of minerals. The most important source of fluoride in drinking water is when water comes in contact with geological strata rich in fluorides. Inorganic fluoride-containing minerals are used widely in industry for a wide range of purposes, including aluminium production. Fluorides can be released to the environment from the phosphate-containing rock used to produce phosphate fertilizers; these phosphate deposits contain about 4% fluorine. Fluorosilicic acid, sodium hexafluorosilicate and sodium fluoride are used in municipal water fluoridation schemes. Daily exposure to fluoride depends mainly on the geographical area.

## Effects on Environment and Human Health

Fluoride ions may be present either naturally or artificially in drinking water and are absorbed to some degree in the bone structure of the body and tooth enamel. Fluoride at extremely high levels can cause mottling (discoloration) of the teeth. Some fluoride compounds may also cause corrosion of piping and other water treatment equipment. Natural fluorides occur in rocks in some areas. Another source of fluorides in streams and reservoirs is releases from sewage treatment plants, since most public water supplies add fluoride to drinking water to reduce dental decay. Fluoride has beneficial effects on teeth at low concentrations in drinking water, but excessive exposure to fluoride in drinking water, or in combination with exposure to fluoride from other sources, can give rise to a number of adverse effects. High level of fluoride will also leads to soft tissue fluorosis, gastrointestinal manifestations, neurological manifestations, urinary tract manifestations, hormonal disorders, etc.

## Remedial Measures

Most people are aware that there is a controversy surrounding public fluoridation of drinking water. There are few ways to obtain drinking water without fluoride like,

- ❖ Reverse Osmosis Filtration: Reverse osmosis systems at community level would be feasible.
- ❖ Distillation Filtration: There are household distillations filters can be used to remove fluoride from water.



Fluorosis due to high amount of Fluoride



Skeletal Fluorosis due to high amount of Nitrates

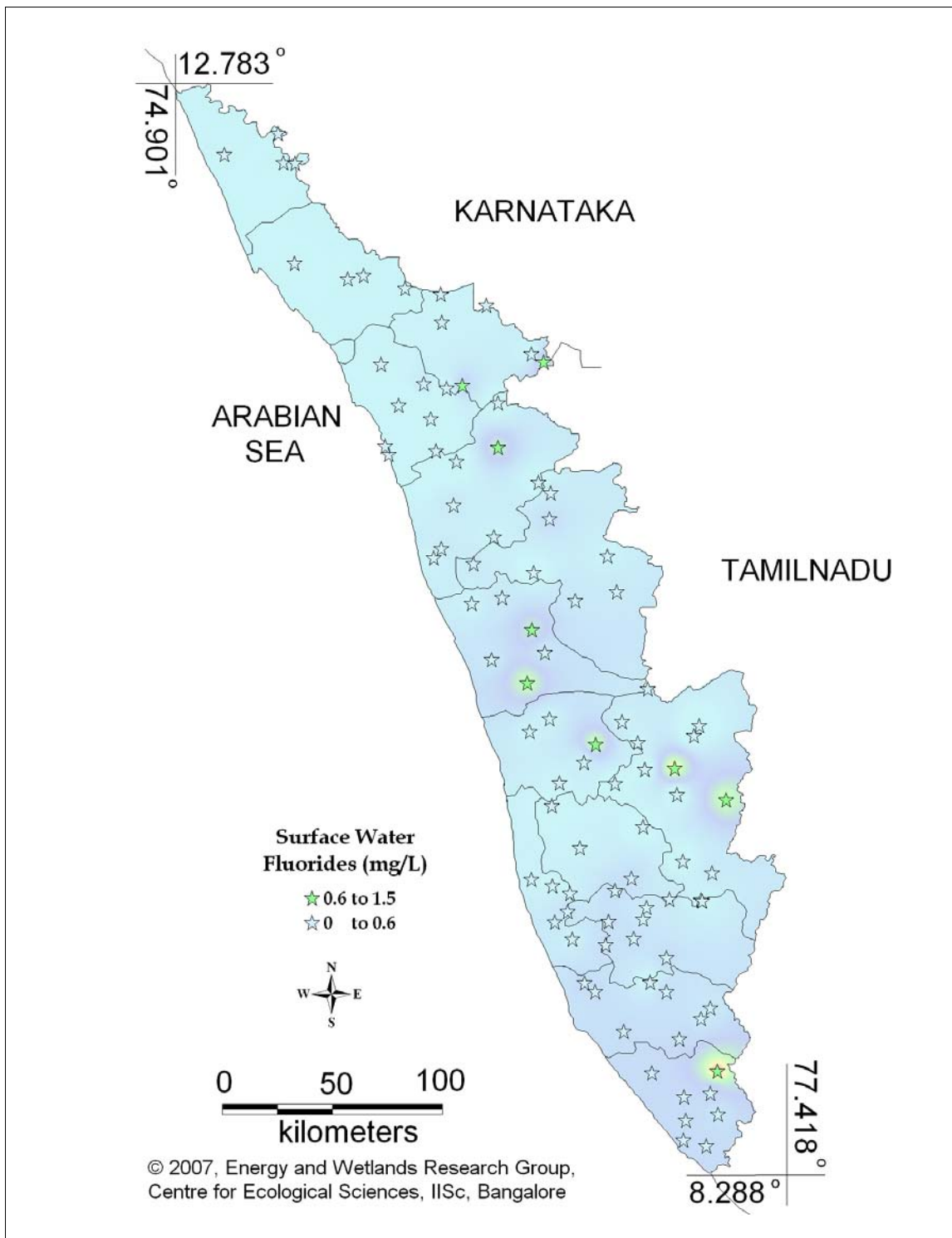
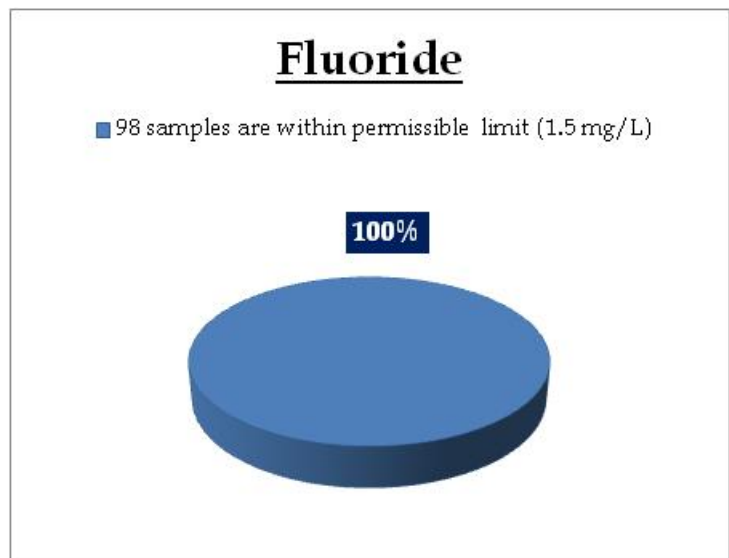


Figure 11.1: Spatial variation of fluoride in surface water

# Surface water - Fluoride

Tolerance limit for inland surface waters subject to pollution

Permissible Limit: 1.5 mg/L



## Remarks

All the 98 surface water samples collected from rivers, streams and lakes spread over in Kerala are under the inland surface water standard.

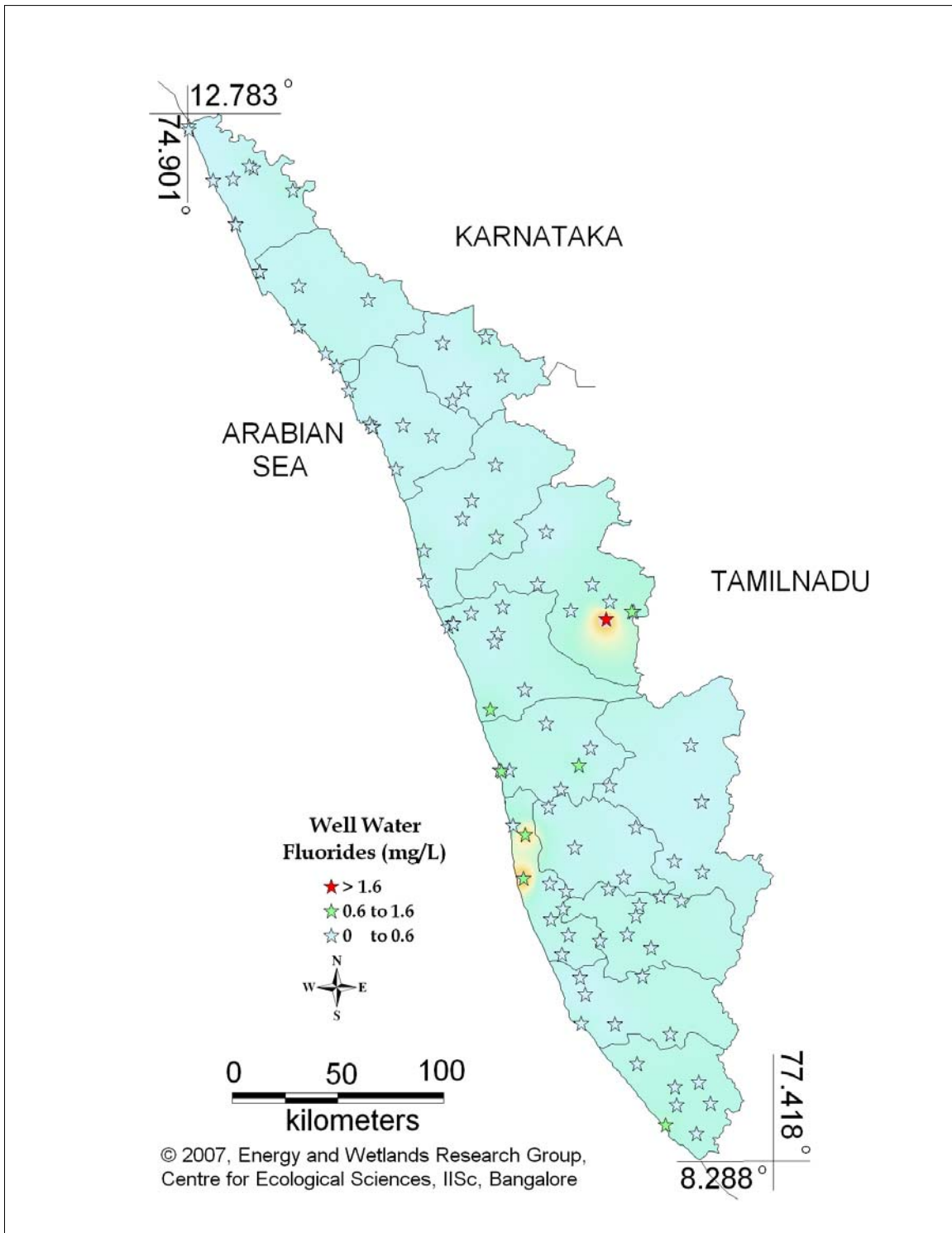


Figure 11.2: Spatial variation of fluoride in well water

# Well water - Fluoride

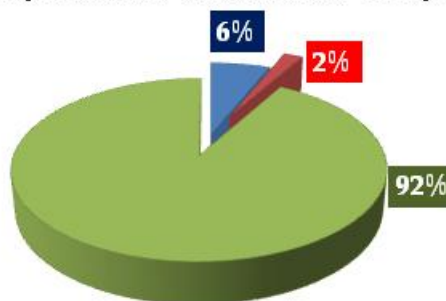
Standard for Drinking Water (BIS 105000)

Desirable Limit: 0.6 - 1.2 mg/L

Values below and above the standard limit cause bone related diseases.

## Fluoride

- 6 samples are within desirable range (0.6-1.2 mg/L)
- 2 samples are above desirable limit (>1.2 mg/L)
- 90 samples are below desirable limit (<0.6 mg/L)



### Remarks

Sampling sites above desirable limit and below desirable limits are listed in Tables 12.1 and 12.2 respectively

Table 12.1: Locations of wells - fluorides above desirable limits

Location	Value	District
Mullackal	1.4	Alappuzha
Kollengode	1.6	Palakkad

Table 12.2: Sampling sites below desirable limit of fluorides

Location	Value	District
Kallummootilkadavu	0.2	Kollam
Pazhayidam	0.2	Kottayam
Vettikattumukku	0.2	Kottayam
Peeramedu	0.2	Idukki
Mannarkkad	0.2	Palakkad
Malappuram-Kottakunne	0.2	Malapuram
Kalpetta - Rattakoli	0.2	Wayanad
Poorot	0.2	Kasarkod
Bovikanam	0.2	Kasarkod
Koyilandy	0.2	Kozhikode
Koyilandy-Kothamangalam	0.2	Kozhikode

Kattachal	0.3	Kollam
Malumelkadavu	0.3	Kollam
Thuruthelpalam	0.3	Kottayam
Poovathummu	0.3	Kottayam
Adukkam	0.3	Kottayam
Thannimoodu	0.3	Idukki
Old Munnar	0.3	Idukki
Thodupuzha	0.3	Idukki
Kavalam	0.3	Alappuzha
Kothamangalam	0.3	Ernakulam
Thrissur	0.3	Thrissur
Ponnani	0.3	Palakkad
Vaithiri	0.3	Wayanad
Chatakadavu	0.3	Wayanad
Chemnad	0.3	Kasarkod
Kanhangad	0.3	Kasarkod
Payyanoor	0.3	Kannur
Vallakadavu	0.4	Idukki
Veeyapuram	0.4	Alappuzha
Kayamkulam	0.4	Alappuzha
Onakkoor-Piravam	0.4	Ernakulam
Ernakulam	0.4	Ernakulam
Kaladi	0.4	Ernakulam
Chalaky	0.4	Thrisuur
Guruvayoor	0.4	Thrissur
Guruvayoor	0.4	Thrissur
Cherananllur	0.4	Thrissur
Wadakancheery	0.4	Thrissur
Thrissur	0.4	Thrissur
Puzhapalam	0.4	Palakkad
Ottapalam	0.4	Palakkad
Nilambur	0.4	Malapuram
Manjeri	0.4	Malapuram
Karingalmanna	0.4	Kozhikode
Balusserry - Vaikundam	0.4	Kozhikode
Kottooli	0.4	Kozhikode
Sulthan Bathery	0.4	Wayanad
Hosabettu - Manjeshwar	0.4	Kasarkod
Adhur	0.4	Kasarkod
Payyanoor	0.4	Kannur
Karimbam-Taliparamba	0.4	Kasarkod
Kannur	0.4	Kannur
Irriti	0.4	Kannur

Mahe	0.4	Puduchery
Vadakara	0.4	Kozhikode
Koyilandy	0.4	Kozhikode
Chitara Estate	0.5	Kollam
Pidavoor	0.5	Kollam
Athikayam	0.5	Pathinamthita
Attathodu East	0.5	Pathinamthita
Pampa Valley	0.5	Pathinamthita
Vadaserikara	0.5	Pathinamthita
Kallely Check Post	0.5	Pathinamthita
Pandalam	0.5	Pathinamthita
Kallarakadvu	0.5	Pathinamthita
Chenkulathukavu	0.5	Kottayam
Kulathurmozhi	0.5	Kottayam
Neyyathinkara	0.5	Tiruvanthapuram
Neyyar Dam	0.5	Tiruvanthapuram
Kulasekaram	0.5	Tiruvanthapuram
Boudermukku	0.5	Tiruvanthapuram
Nedumangadu	0.5	Tiruvanthapuram
Avananvancherri	0.5	Tiruvanthapuram
Kochupilammood	0.5	Kollam
Kandiyoor	0.5	Alappuzha
Vettakkal Junction	0.5	Alappuzha
Fort Cochin	0.5	Ernakulam
Aluva	0.5	Ernakulam
Chavakkad	0.5	Thrissur
Thondikulam Agraharam	0.5	Palakkad
Placimada	0.5	Palakkad
Alathur	0.5	Palakkad
Tirur	0.5	Malappuram
Perinthalmanna	0.5	Malappuram
Alathoor -WYD	0.5	Wyanad
Bengathadka	0.5	Kasarkod
Panathur	0.5	Kasarkod
Aaviyal	0.5	Kasarkod
Thalassery	0.5	Kannur

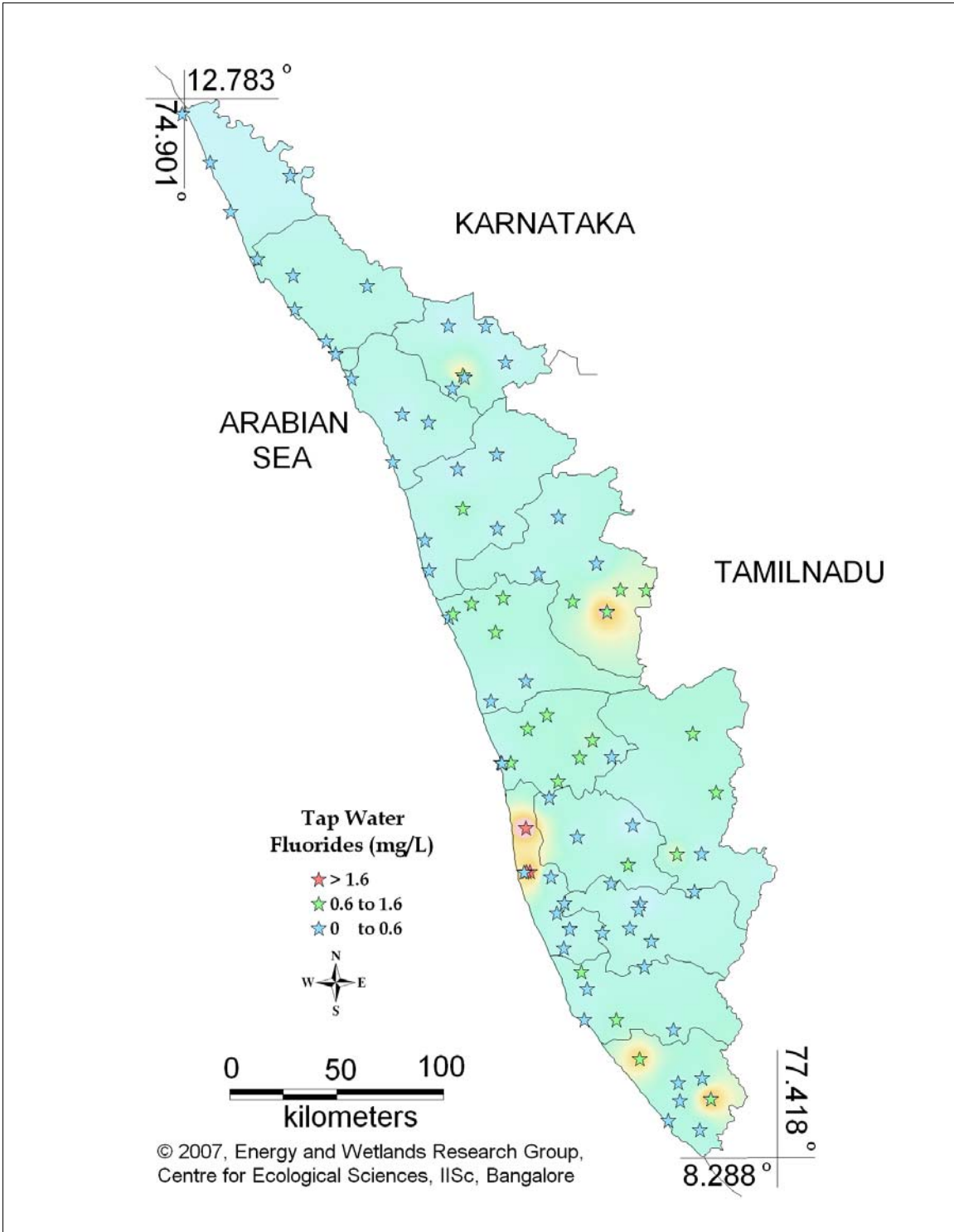


Figure 11.3: Spatial variation of fluoride in tap water

# Tap water - Fluoride

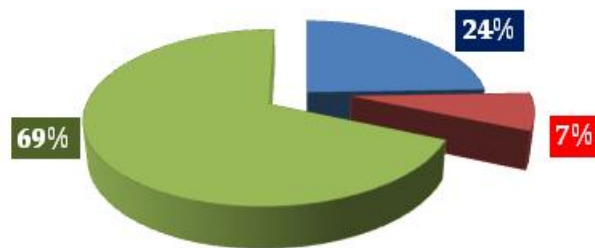
Standard for Drinking Water (BIS 105000)

Desirable Limit: 0.6 - 1.2 mg/L

Values below and above the standard limit cause bone related diseases.

## Fluoride

- 21 samples are within desirable range (0.6-1.2 mg/L)
- 6 samples are above desirable limit (>1.2 mg/L)
- 59 samples are below desirable limit (<0.6 mg/L)



### Remarks

Sampling sites above desirable limit and below desirable limit are listed in Table 12.3 and Table 12.4 respectively.

Table 12.3: Tap waters with fluoride above desirable limit

Location	Value	District
Kalikadu	1.4	Thiruvananthapuram
Kollengode-Vellanara	1.4	Palakkad
Kalpetta	1.4	Wayanad
Thathampally	1.6	Alappuzha
Kuppapuram	1.6	Alappuzha
Kalikulam Junction	1.6	Alappuzha

Table 12.4: Tap waters with fluoride below desirable limit

Location	Value	District
Adithippuzha	0	Pathinamthita
Fort Cochin	0.2	Ernakulam
Kavalam-Kuttanadu	0.2	Alappuzha
Theekoy	0.2	Kottayam
Alathoor -WYD	0.3	Wayanad
Balusserry - Vaikundam	0.3	Kozhikode
Kanhangod	0.3	Kasaragod

Kasargod	0.3	Kasaragod
Kilikkallungal	0.3	Malapuram
Kondayangadi- Mananthavadi	0.3	Wayanad
Pokki-Manjeshwar	0.3	Kasaragod
Ponathur	0.3	Kasaragod
Sultan Battery	0.3	Wayanad
Akathethara	0.4	palakkad
Chalakudy	0.4	Thrissur
Chavakkad	0.4	Thirssur
Cholomkunnu	0.4	Malapuram
Kakki Junction	0.4	Alapuzhala
Kallummooottilkadavu	0.4	Kollam
Kalpetta - Rattakoli	0.4	Wayanad
Kandiyoor	0.4	Alapuzha
Kayamkulam	0.4	Alappuzha
Kollam Beach	0.4	Kollam
Koodungalur	0.4	Thrissur
Nilambur	0.4	Malapuram
Ottapalam	0.4	palakkad
Parayilkaling	0.4	Kottayam
Pazhavangadi Jn- Aazhapuzha	0.4	Alappuzha
Perror	0.4	Kottayam
Ponnani	0.4	Malapuram
Shastiparambu	0.4	Ernakulam
South Beach - Calicut	0.4	Kozhikode
Thenkara	0.4	palakkad
Thodupuzha	0.4	Idukki
Tirur	0.4	Malapuram
Vaithiri	0.4	Wayanad
Veeyapuram	0.4	Alapuzhala
Boundermukku	0.5	Thiruvananthapuram
Chenkulathukavu	0.5	Kottayam
Chitara Estate	0.5	Thirssur
Iriti	0.5	Kannur
Kallarakadvu	0.5	Pathinamthita
Kallely	0.5	Pathinamthita
Kulasekaram	0.5	Thiruvananthapuram
Kulathurmozhi	0.5	Kottayam
Mahe	0.5	Puducherry
Nedumangadu	0.5	Thiruvananthapuram
Neyyathinkara	0.5	Thiruvananthapuram

Pallikunnu - Kannur	0.5	Kannur
Pamba-Triveni	0.5	Pathinamthita
Pandalam	0.5	Pathinamthita
Pathanapuram pump house	0.5	Pathinamthita
Payyanoor	0.5	Kannur
Talipparamba	0.5	Kannur
Thalassery	0.5	Kannur
Thamarassery	0.5	Kozhikode
Thiruvallam	0.5	Thiruvananthapuram
Vadakara	0.5	Kozhikode
Vadaserikara	0.5	Pathinamthita