

NITRATE

Nitrate and nitrite are naturally occurring ions that are part of the nitrogen cycle. Nitrate is used mainly in inorganic fertilizers, and sodium nitrite is used as a food preservative, especially in cured meats. Nitrates may occur in both shallow and deep well supplies, but they are most common in water from shallow wells. Nitrate nitrogen can result from the seepage of water through soil containing nitrate-bearing minerals. The nitrate concentration in groundwater and surface water is normally low but can reach high levels as a result of leaching or runoff from agricultural land or contamination from human or animal wastes as a consequence of the oxidation of ammonia and similar sources. Anaerobic conditions may result in the formation and persistence of nitrite. Chlorination may give rise to the formation of nitrite within the distribution system if the formation of chloramine is not sufficiently controlled. The formation of nitrite is as a consequence of microbial activity and may be intermittent. Nitrification in distribution systems can increase nitrite levels, usually by 0.2-1.5 mg/litre.

Effects on Environment and Human Health

The primary health concern regarding nitrate and nitrite is the formation of methaemoglobinaemia, which is also known as "blue-baby syndrome." Nitrate is reduced to nitrite in the stomach of infants, and nitrite is able to oxidize haemoglobin (Hb) to methaemoglobin (metHb), which is unable to transport oxygen around the body. The reduced oxygen transport becomes clinically manifest when metHb concentrations reach 10% or more of normal Hb concentrations; the condition, called methaemoglobinaemia, causes cyanosis and, at higher concentrations, asphyxia. The normal metHb level in infants under 3 months of age is less than 3%. The Hb of young infants is more susceptible to metHb formation than that of older children and adults.

Remedial Measures

The best method for treatment of large nitrate nitrogen concentrations due to human or animal wastes is prevention. Wells should be properly located and constructed in order to prevent sewage contamination. Nitrates can be removed through distillation, deionization, or reverse osmosis. Even though only 95% of ionic nitrates can be removed by reverse osmosis, non-ionic forms of nitrogen will not pass through the membrane.

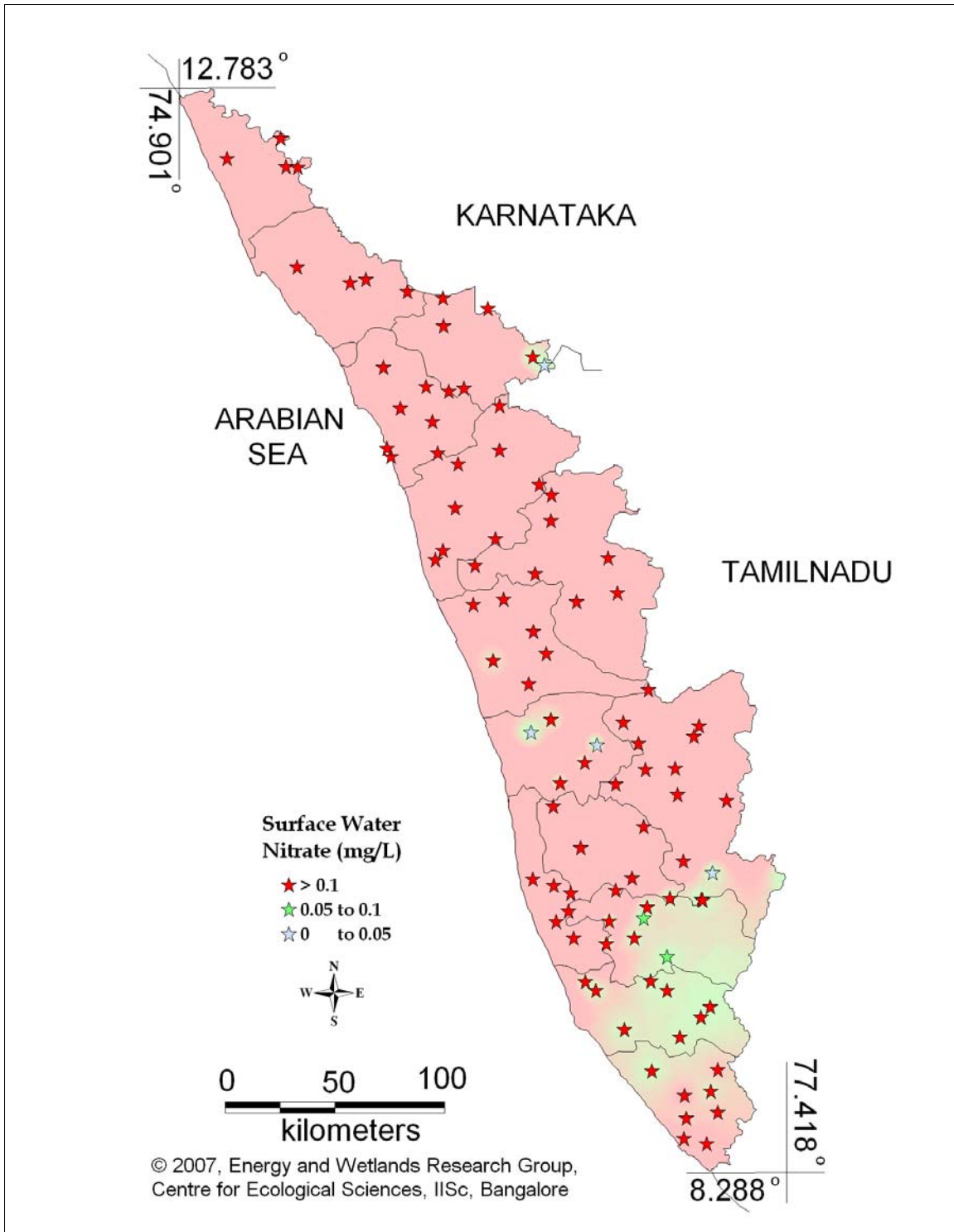
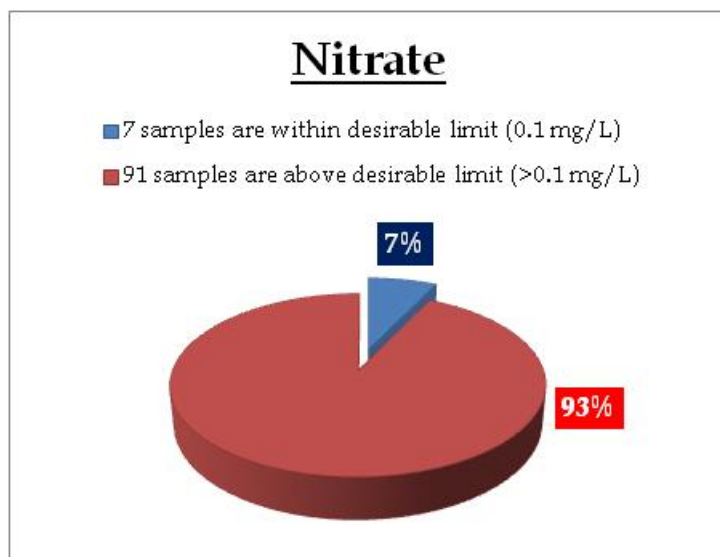


Figure 10.1 : Spatial variation of Nitrate in Kerala surface water

Surface water - Nitrate

Tolerance limit for inland surface waters subject to pollution

Desirable Limit: 0.1 mg/L



Remarks

Sampling sites above desirable limit are listed in Table 11.1

Table 11.1: Locations above desirable limits of Nitrate

Location	Value	District
Aranmula Sathrakadavu	0.11	Pathinamthita
Muthanga	0.11	Wyanad
Athikayam	0.11	Pathinamthita
Azhuta River	0.11	Kottayam
Pidavoor	0.12	Kollam
Kulathurmozhi	0.12	Kottayam
Kazhuthruthy	0.13	Kollam
Pandalam	0.13	Pathinamthita
Avananvancherri	0.14	Thiruvananthapuram
Sasthamkotta Lake	0.14	Kollam
Kallarakadvu	0.15	Pathinamthita
Malumelkadavu	0.16	Kollam
Pamba-Aratukadavu	0.17	Pathinamthita
Neduvannor Kadavu	0.18	Kollam
Chenkulam	0.20	Kollam
Kakkad	0.20	Ernakulam
Kallana aru	0.20	Kollam

Mukkadavu	0.21	Kollam
Pamba-Njunungar	0.23	Pathinamthita
Annakkayathumoola	0.28	Thiruvananthapuram
Kaladi	0.36	Ernakulam
Moonnukalunkutodu	0.37	Idukki
Muvathupuzha	0.37	Ernakulam
Karuvannurpuzha	0.43	Thirssur
Kundamankadavu	0.54	Thiruvananthapuram
Cherananllur	0.61	Thirssur
Kuttampuzha	0.63	Idukki
Kalikadu	0.68	Thiruvananthapuram
Kallar	0.71	Kollam
Chenkulathukavu	0.76	Kottayam
Valikulam-Palapilly	0.76	Thirssur
Peechi Dam	0.81	Thirssur
Perumpara Estate	0.87	Thirssur
Kudapuzha	0.89	Thirssur
Neyyar	0.90	Thiruvananthapuram
Nedumangadu	0.91	Thiruvananthapuram
Sairandri	0.92	Palakkad
Bhoothokallu	0.95	Kannur
Wadakancheery	1.04	Thirssur
Lekkidi-Vythri	1.05	Wyanad
Urukkuzhi	1.07	Kozhikode
Mannarkad-Kunthipuzha	1.27	Palakkad
Tirunelli	1.28	Wyanad
Vellayani	1.34	Thiruvananthapuram
Vettikattumukku	1.50	Kottayam
Changanacherry	1.63	Kottayam
Puthalam	1.65	Malapuram
Manchalmchola	1.72	Malapuram
Azhuta River-Idukki	1.76	Idukki
Koolimadu	1.79	Kozhikode
Koodathi	1.96	Kozhikode
Alathur	2.00	Palakkad
Pazhasii Dam	2.32	Kannur
Kattupara	2.35	Malapuram
Ezhuvathruthy-Nariooarambu	2.35	Malapuram
Ottapalam	2.37	Palakkad
Malampuzha	2.52	Palakkad
Adukkam	2.63	Kottayam
Thamarakulam lake	2.77	Kozhikode
Manjappalam	2.79	Kozhikode

Thirthala	2.98	Palakkad
Cheruthoni	3.61	Idukki
Malapuram-Chamakayam	3.72	Malapuram
Marakadavu	3.72	Wyanad
Mananthavadi	3.73	Wyanad
Pallipadi	3.79	Malapuram
Irriti	4.00	Kannur
Pambala-lower Periyar	4.05	Idukki
Munddari	4.31	Malapuram
Mananchira lake -Calicut	4.37	Kozhikode
Pazhayidam	4.39	Kottayam
Pookod Lake	4.58	Wyanad
Nilambur-Chaliyar	4.65	Malapuram
Vadakara-Koorangottukatavu	4.72	Kozhikode
Karimbam-Taliparamba	4.73	Kannur
Munnar (8th mile)	4.74	Idukki
Panathur	4.75	Kasarkod
Ellukachi-Karika	4.75	Kasarkod
Thannimoodu - Kallar stream	4.80	Idukki
Poovathummuddu	5.23	Kottayam
Thodupuzha	5.23	Idukki
Nallathanni	5.91	Idukki
Bavikara-Chandragiripuzha	6.72	Kasarkod
Puzhapalam - Chitturpuzha	6.79	Palakkad
Veeyapuram	7.22	Alapuzha
Jaloor	8.21	Kasarkod
Thommankuthu-Kaliyar	9.07	Idukki
Kavalam-Kuttanadu	9.14	Alapuzha
Munnar - Marayyr Rd	9.22	Idukki
Kandiyoor	11.30	Alapuzha
Kuppapuram	20.40	Alapuzha

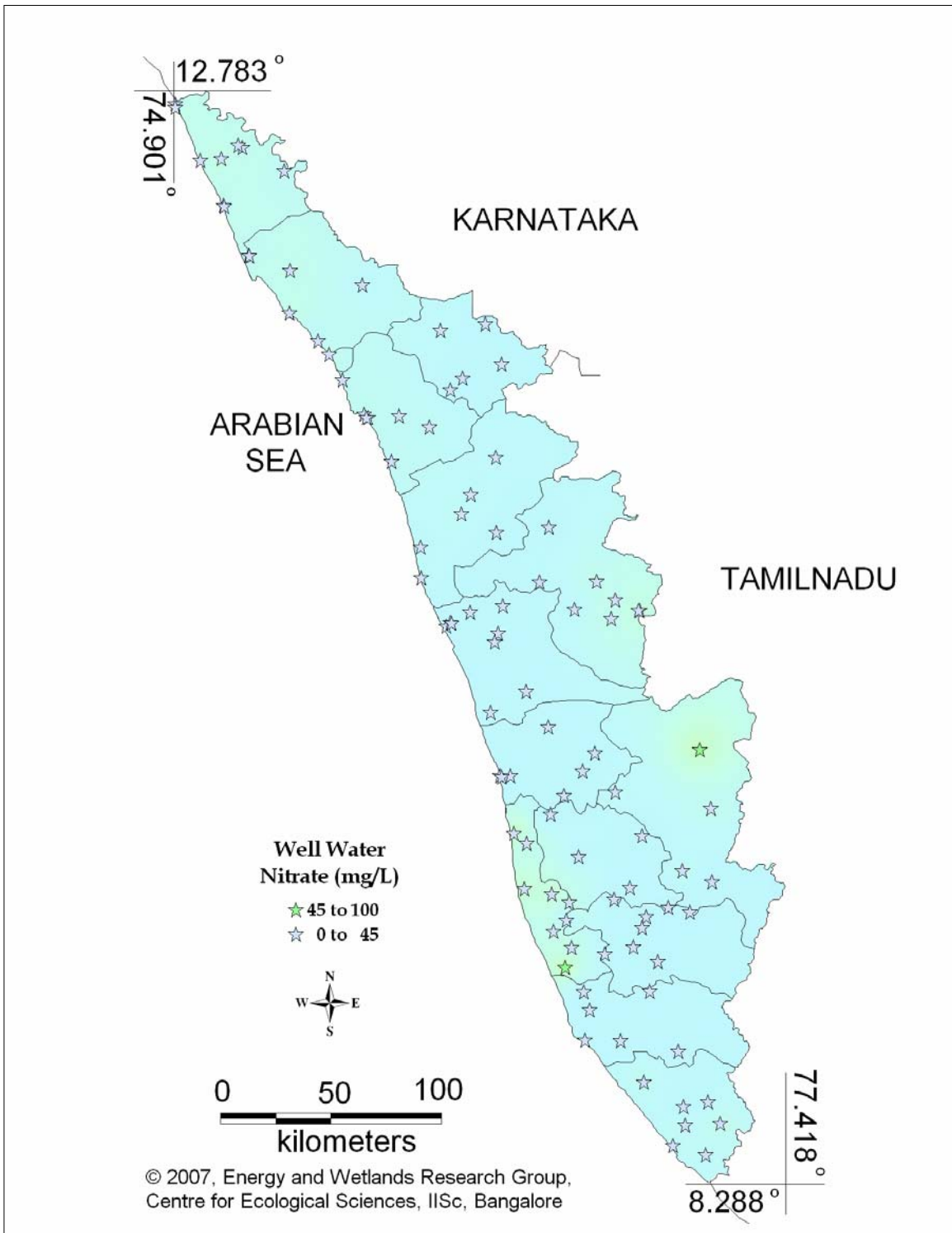


Figure 10.2: Spatial variation of Nitrate in Kerala well water



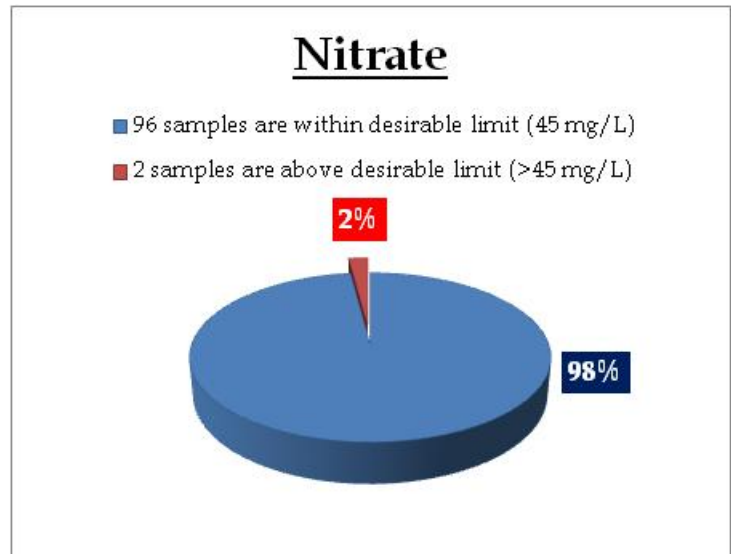
Growth of Algae due to high amount of Nitrates

Well water - Nitrate

Standard for Drinking Water (BIS 105000)

Desirable Limit: 45 mg/L

Permissible limit in the absence of an alternative source: 100mg/L



Remarks

Sampling sites above desirable limit are given in Table 11.2

Table 11.2: Locations above desirable limits of Nitrate

Location	Value	District
Old Munnar	45.30	Idukki
Kayamkulam	50.00	Alappuzha

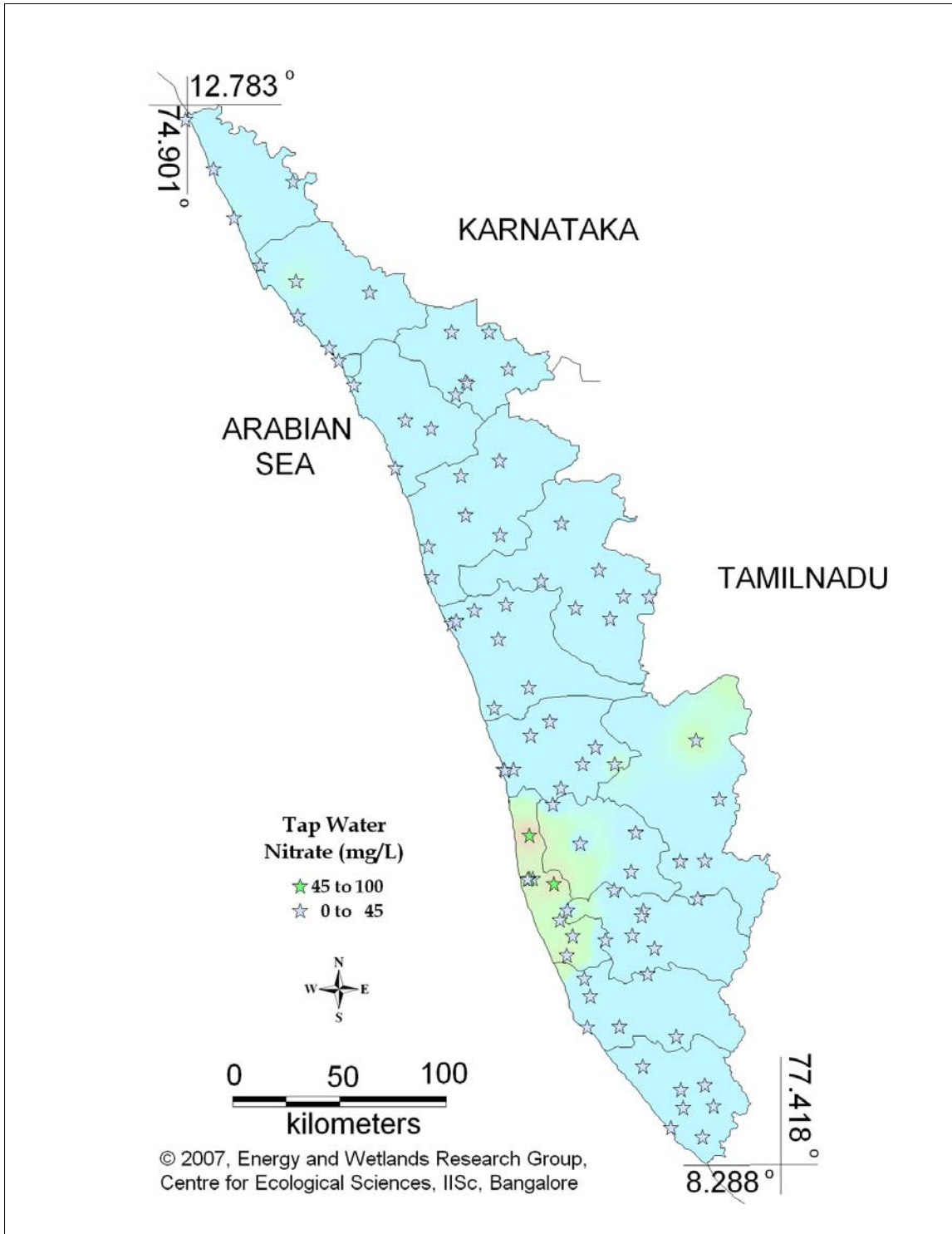


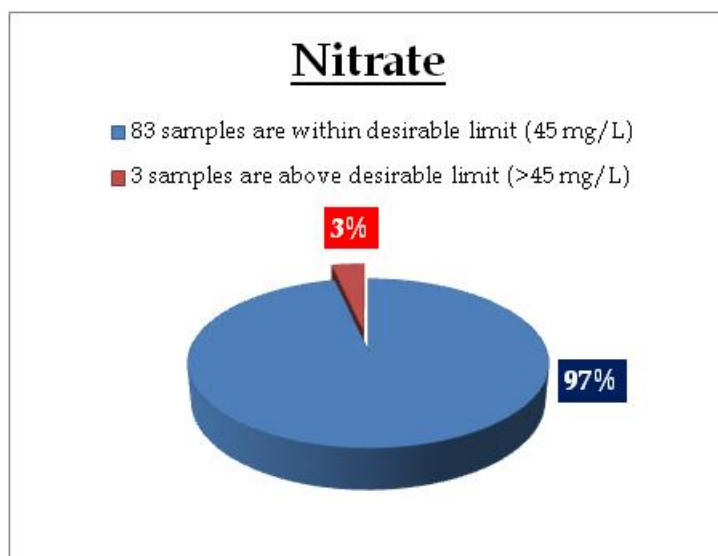
Figure 10.3: Spatial variation of Nitrate in Kerala tap water

Tap water - Nitrate

Standard for Drinking Water (BIS 105000)

Desirable Limit: 45 mg/L

Permissible limit in the absence of an alternative source: <45 mg/L



Remarks

Sampling sites above desirable limit of Nitrate are listed in Table 11.3

Table 11.3: Sampling sites above desirable limits of Nitrate

Location	Value	District
Kavalam-Kuttanadu	46.10	Alappuzha
Thathampally	50.00	Alappuzha
Kalikulam Junction	54.90	Alappuzha