

# Hardness

Hard water is high in dissolved minerals, both calcium and magnesium. As water moves through soil and rock, it dissolves small amounts of these naturally-occurring minerals and carries them into the ground water zone. Water is a great solvent for calcium and magnesium, so if the minerals are present in the soil around well and its water supply, we end up with hard water. Hard water interferes with almost every cleaning task, from doing the laundry to washing dishes to taking a shower. Clothes can look dingy and feel rough and scratchy. Dishes and glasses get spotted and a film may build up on shower doors, bathtubs, sinks and faucets. Washing hair in hard water may leave it feeling sticky and dull. Finally, hard water can cause a residue to build-up in pipes that can lower water pressure throughout the house.

## **Effects on Environment and Human Health**

Hardness does not pose a serious health risk and is not regulated. In fact, calcium and magnesium in drinking water can help ensure to get the average daily requirements for these minerals in our diet.

However, hard water can be a nuisance due to the mineral buildup on plumbing fixtures and poor soap and detergent performance. It often causes aesthetic problems, such as an alkali taste to the water that makes coffee taste bitter; build-up of scale on pipes and fixtures than can lead to lower water pressure; build-up of deposits on dishes, utensils and laundry basins; difficulty in getting soap and detergent to foam; and lowered efficiency of electric water heaters.

## **Remedial Measures**

Water softeners operate on the ion exchange process (specifically a cation exchange process where ions are exchanged). In this process, water passes through a media bed, usually sulfonated polystyrene beads. The beads are supersaturated with sodium (a positive ion). The ion exchange process takes place as hard water passes through the softening material. The hardness minerals (positively charged Calcium and Magnesium ions) attach themselves to the resin beads while sodium on the resin beads is released simultaneously into the water. When the resin becomes saturated with calcium and magnesium, it must be recharged. The recharging is done by passing a concentrated salt solution through the resin. The concentrated sodium replaces the trapped calcium and magnesium ions which are discharged in the waste water. Softened water is not recommended for watering plants, lawns, and gardens due to its elevated sodium content.

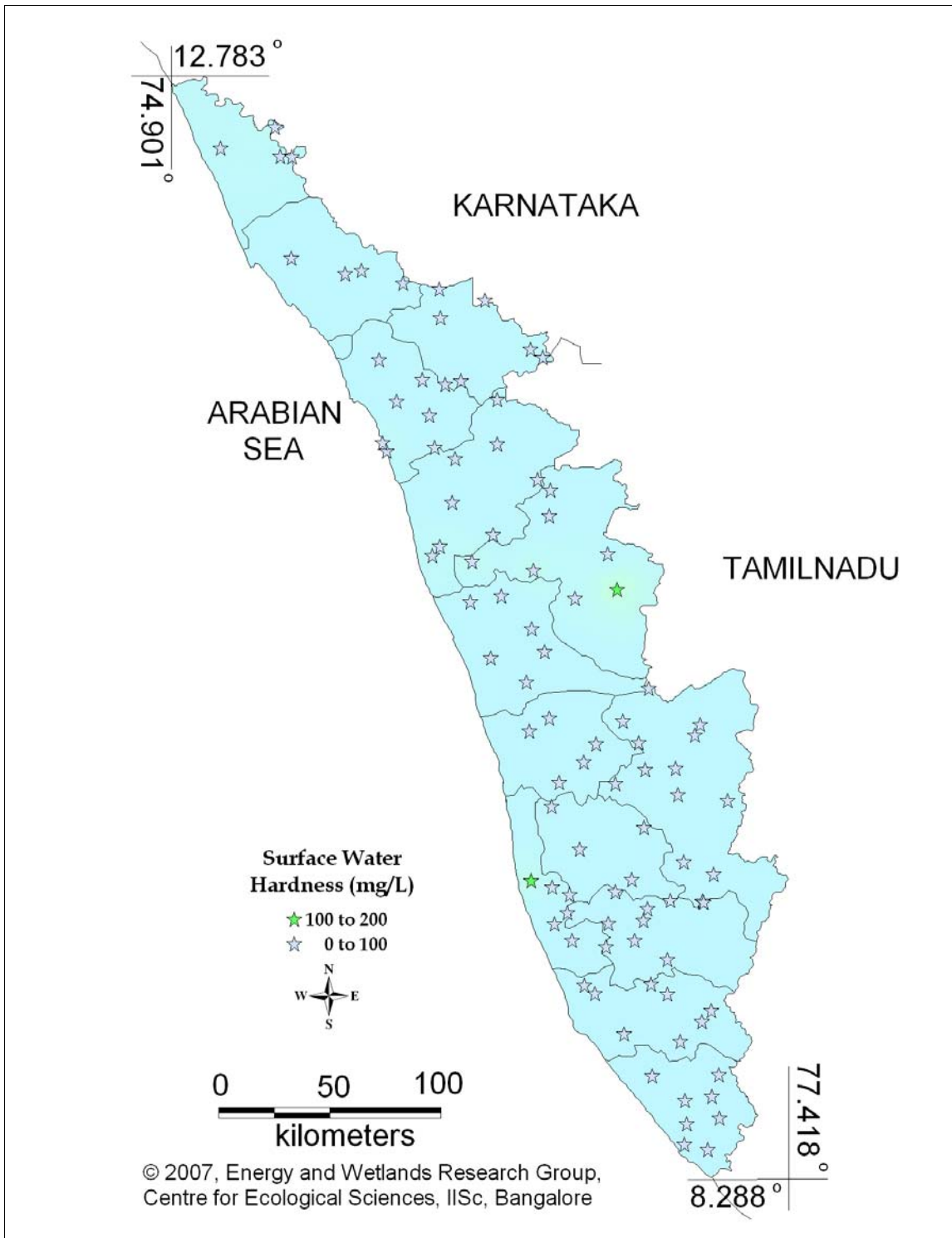


Figure 15.1: Spatial variation of Hardness in Kerala's surface water

# Surface water - Hardness

Tolerance limit for inland surface waters subject to pollution

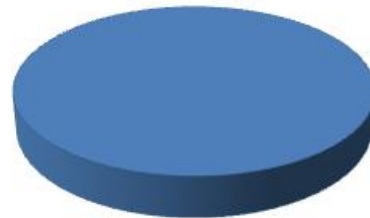
Desirable Limit: 300 mg/L

Permissible Limit: 600 mg/L

## Hardness

■ 98 samples are within desirable limit (300 mg/L)

100%



### **Remarks**

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

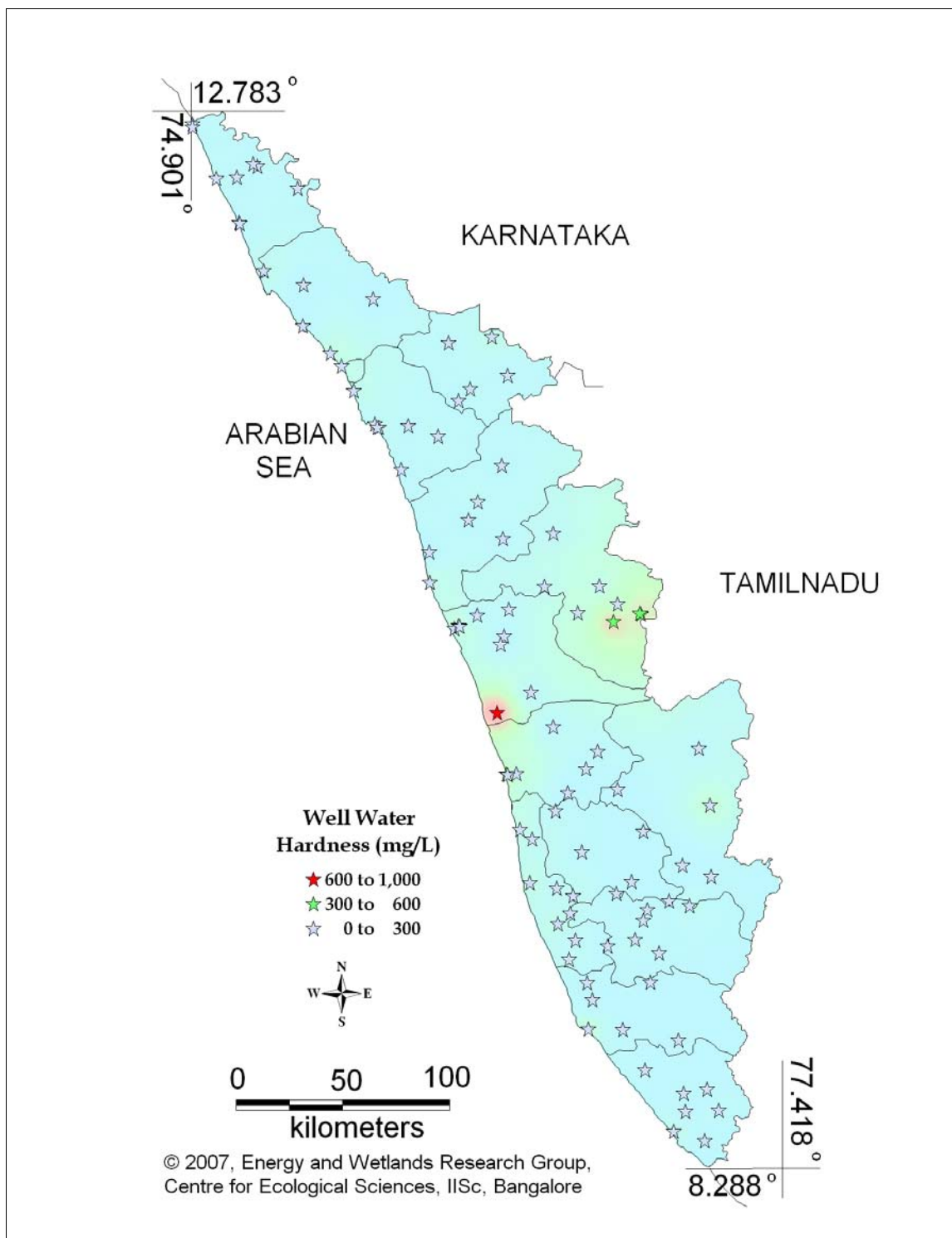
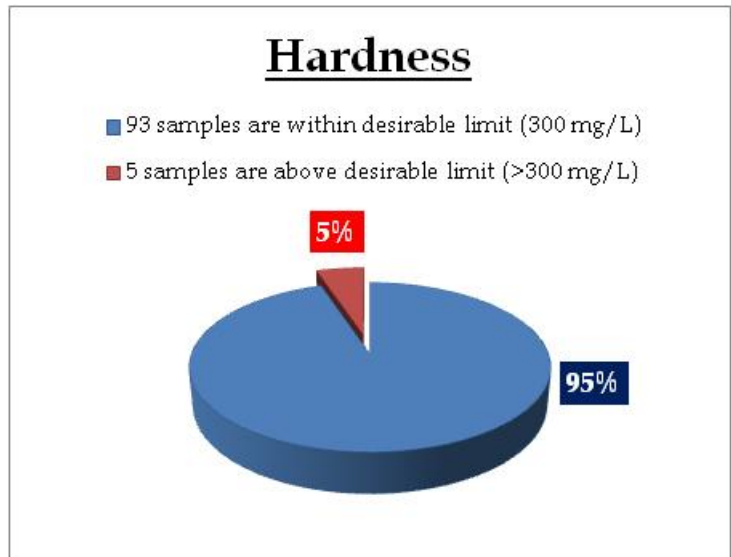


Figure 15.2: Spatial variation of Hardness in Kerala's well water

# Well water - Hardness

Standard for Drinking Water (BIS 105000)  
Desirable Limit: 300 mg/L  
Permissible limit in the absence of an alternative source: 600mg/L



## Remarks

Wells at following sampling sites have hardness above desirable limit

Location	Value	District
Kannimari	320.00	Palakkad
Fort Cochin	392.00	Ernakulam
Placimada	512.00	Palakkad
Kollengode	520.00	Palakkad
Koodungalur	700.00	Thrissur

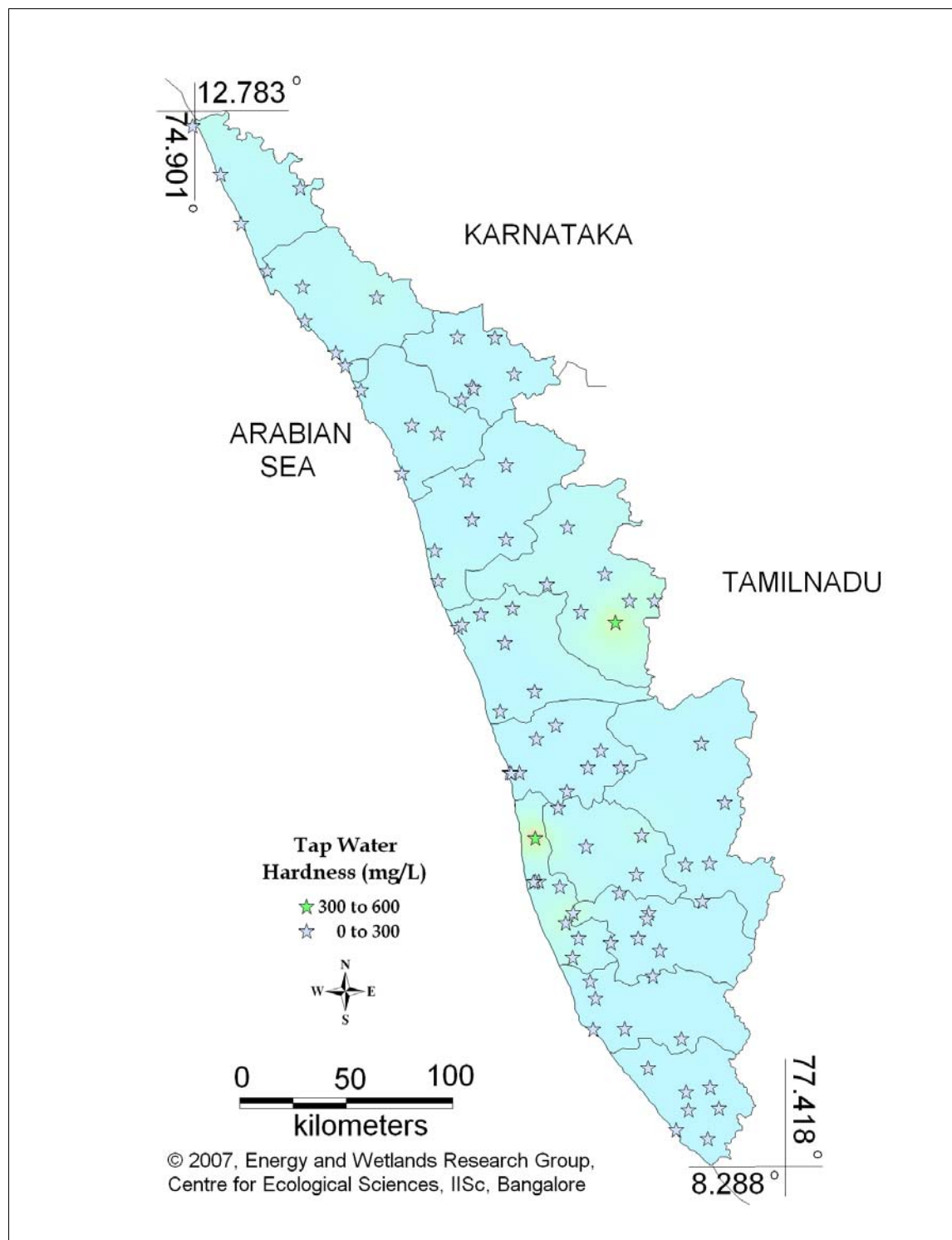


Figure 15.3: Spatial variation of hardness in Kerala's tap water

# Tap water - Hardness

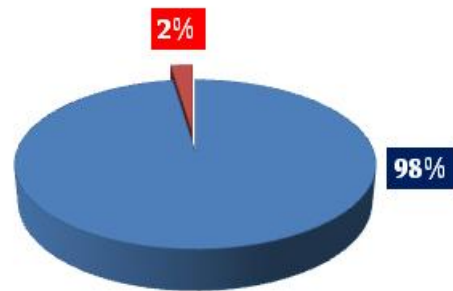
Standard for Drinking Water (BIS 105000)

Desirable Limit: 300 mg/L

Permissible limit in the absence of an alternative source: 600mg/L

## Hardness

- 84 samples are within desirable limit (300 mg/L)
- 2 samples are above desirable limit (>300 mg/L)



### Remarks

Tap water at following sampling sites have hardness above desirable limit

Location	Value	District
Kollengode-Vellanara	424.00	Palakkad
Kalikulam Junction	500.00	Alappuzha