

Dissolved oxygen

Dissolved oxygen analysis measures the amount of gaseous oxygen (O₂) dissolved in an aqueous solution. Dissolved oxygen is one of the most important parameters in aquatic systems. This gas is an absolute requirement for the metabolism of aerobic organisms and also influences inorganic chemical reactions. Therefore, knowledge of the solubility and dynamics of oxygen distribution is essential to interpreting both biological and chemical processes within water bodies. Oxygen gets into water by diffusion from the surrounding air, by aeration (rapid movement) and as a waste product of photosynthesis. The amount of dissolved oxygen gas is highly dependent on temperature. Atmospheric pressure also has an effect on dissolved oxygen. The amount of oxygen (or any gas) that can dissolve in pure water (saturation point) is inversely proportional to the temperature of water. The warmer the water, the less dissolved oxygen.

Effects on Environment Health

In a nutrient-rich water body the dissolved oxygen is quite high in the surface water due to increased photosynthesis by the large quantities of algae. However, dissolved oxygen tends to be depleted in deeper waters because photosynthesis is reduced due to poor light penetration and due to the fact that dead phytoplankton (algae) falls toward the bottom using up the oxygen as it decomposes. In a nutrient-poor water body there is usually less difference in dissolved oxygen from surface to bottom. This difference between surface and bottom waters is exaggerated in the summer in reservoirs, stream-pools, and embayment when thermal layering occurs which prevents mixing. The surface may become supersaturated with oxygen (>100%) and the bottom anoxic (virtually no oxygen). Shallower reservoirs and actively flowing shallow streams generally are kept mixed due to wind action in the shallow reservoirs and physical turbulence created by rocks in the stream beds.

Adequate dissolved oxygen is needed and necessary for good water quality. Oxygen is a necessary element to all forms of life. Adequate oxygen levels are necessary to provide for aerobic life forms which carry on natural stream purification processes. As dissolved oxygen levels in water drop below 5.0 mg/L, aquatic life is put under stress. The lower the concentration, the greater the stress. Oxygen levels that remain below 1-2 mg/L for a few hours can result in large fish kills. Total dissolved oxygen concentrations in water should not exceed 110 percent. Concentrations above this level can be harmful to aquatic life. Fish in waters containing excessive dissolved gases may suffer from "gas bubble disease"; however, this is a very rare occurrence. The bubbles or emboli block the flow of blood through blood vessels causing death. Aquatic invertebrates are also affected by gas bubble disease but at levels higher than those lethal to fish.

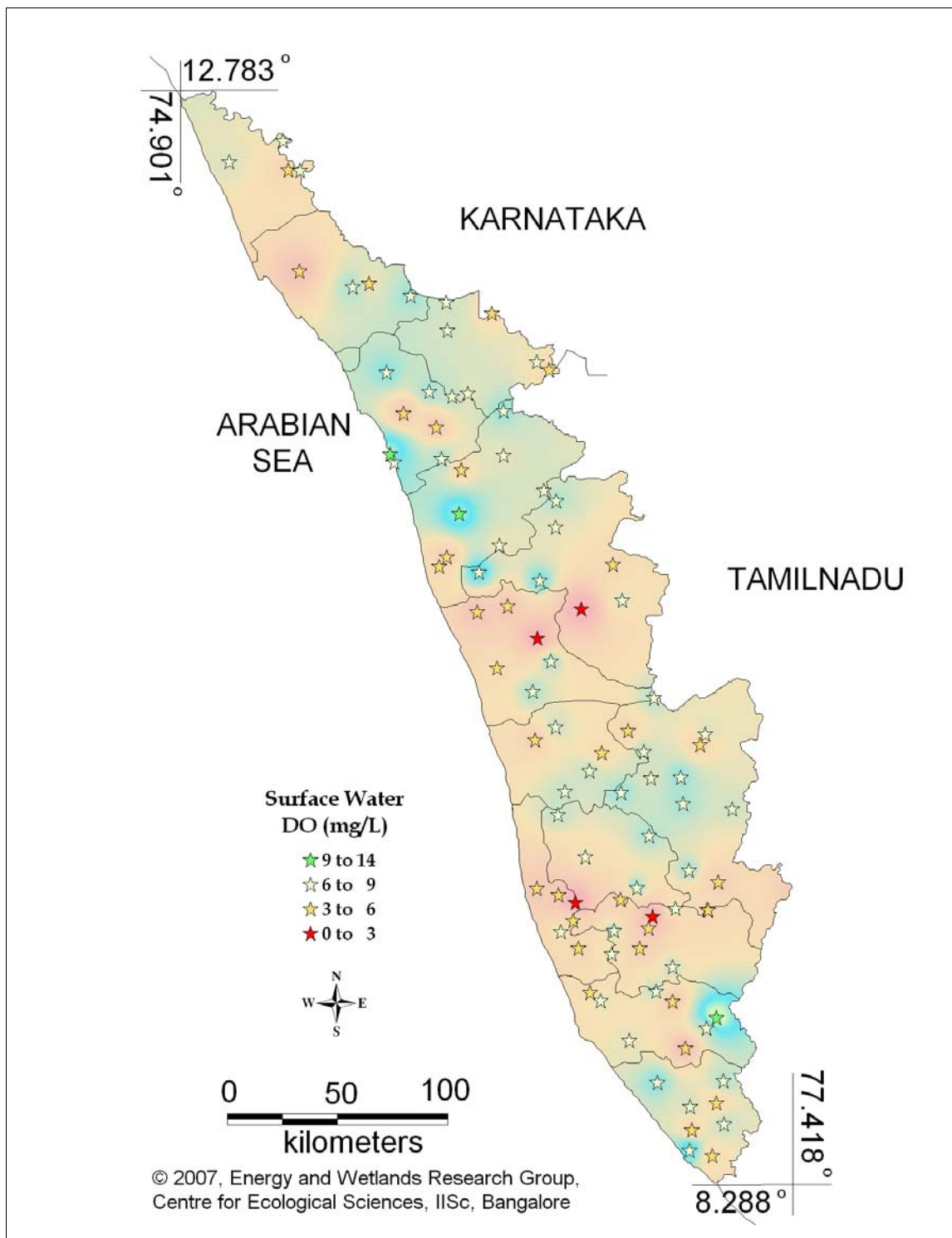


Figure 25.1: Spatial variation of dissolved oxygen in Kerala 's surface water

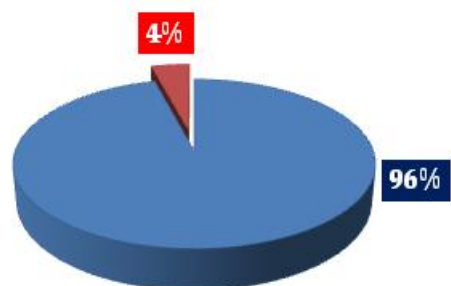
Surface water - Dissolved Oxygen

Tolerance limit for inland surface waters subject to pollution

Desirable Limit: 3 mg/L

Dissolved Oxygen

- 94 samples are well oxygenated (>3 mg/L)
- 4 samples are less oxygenated (<3 mg/L)



Remarks

Sampling sites not in the desirable limit of DO are:

Location	Value	District
Changanacherry	0.89	Kottayam
Alathur	1.73	Palakkad
Athikayam	2.08	Pathinamthitta
Peechi Dam	2.24	Thrissur



Aquatic weeds growth in waterways, which affects the oxygen mixing in water

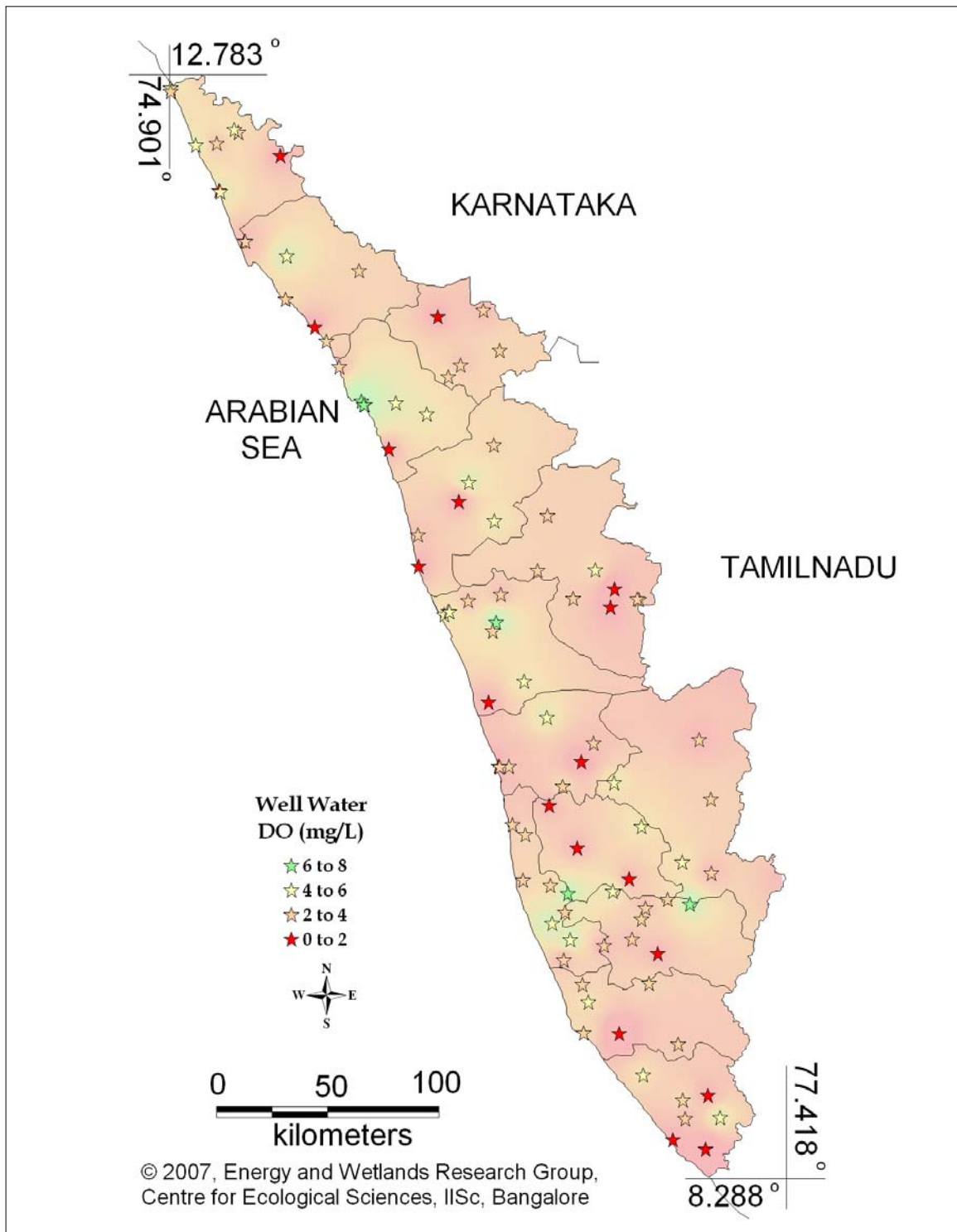


Figure 25.2: Spatial variation of Dissolved Oxygen in Kerala's well water

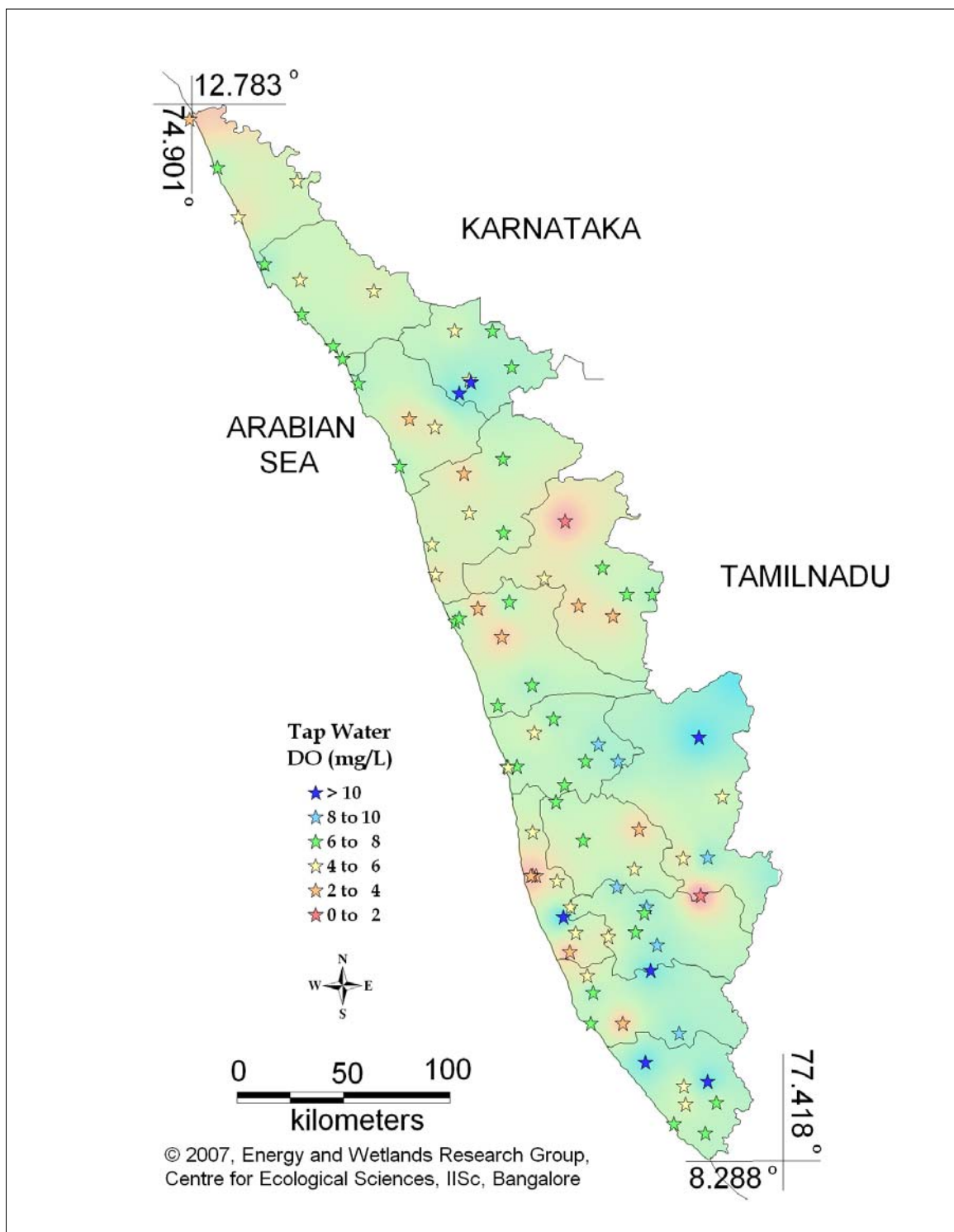


Figure 25.3: Spatial variation of dissolved oxygen in Kerala's tap water

