

Vembanad Lake System, Cochin Estuary, India
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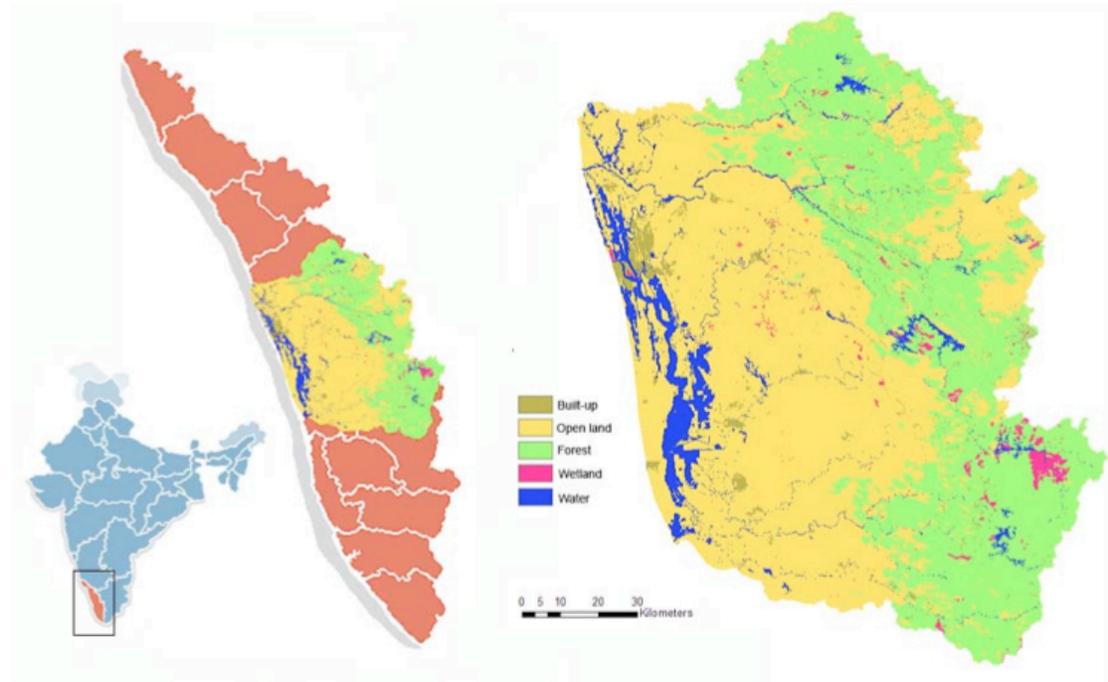


Figure. The Vembanad Lake System and its land use. *Source: Paul Prabin, KTH.*

Background information	Vembanad Lake System (VLS) - 16,000 km ² . Located in the southwest coast of India, the Cochin estuary to the Arabian Sea. The region, and particularly the low lying industrial and agriculture belt area, is sensitive to climate changes and changing water levels, with the whole state of Kerala depending on water level-sensitive hydroelectric projects and agriculture for income. The VLS is also sensitive to changes in fresh-seawater interactions, and to excess nutrient and pollutant discharges from the densely populated regional catchments, and their industrial and agricultural discharges.
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<p>Main research and management problems</p>	<p>This study focuses on investigating and quantifying the hydro-climatic and water flow system, and nutrient-pollutant discharges to the VLS and the sea that are driven and carried by this system, under current, historic and possible future conditions. This is both scientifically and practically important as development and economic activities to support the needs of the increasing population, in addition to climate change, exert growing ecosystem pressures on the VLS, with effluents from chemical and engineering industries, food and drug manufacturing industries, and also from paper, rayon, rubber, textiles and plywood industries. Agriculture and aquaculture practices are prevalent in the VLM catchments contributing to eutrophication and water pollution risks through discharges of eroded topsoil, excess nutrients and pesticides. Cochin city also generates large amounts of urban sewage that is transported through the stream network to the estuary.</p>
<p>Possible end-users</p>	<p>Water-related and responsible local-regional-national agencies, environmental NGOs, other researchers.</p>
<p>Site conditions</p>	<p>The region has a typical tropical climate. The monsoon season June-September yields an annual average rainfall contribution of approximately 300cm, which constitutes 60-65% of the total annual average rainfall. The temperature varies from 30-34°C in the March – May period and 22-24°C in the December period. The VLS catchment region topography starting from the coastal plain by the sea rises gradually in elevation toward the highlands and mountains of the Western Ghats; it is geographically divided into three climatically distinct sub-regions: the eastern highlands (> 75m), the central midlands (7.5m-75m) and the western lowlands (<7.5m). The coastal plain consists of a heavy network of interconnected canals and rivers. Most of the highlands are covered with thick forest, which gains most of the rainfall, and the rest of includes large-scale plantations (tea, coffee, spices, etc.). All of the seven main rivers originate from the highlands and drain into the Vembanad lake and eventually into the ocean. The catchments include 12% built-up areas, 38% agricultural wetlands and open land, 48% forest (mostly in midlands and highlands) and 2% inland waters. Geologically, the highland is typically underlain by crystalline rocks of Pre-cambrian age, where as the coastal and lower-midland parts are undelain by sedimentary rocks of Tertiary age. The western lowlands contain the industrial belt and large areas of agricultural wetlands.</p>

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Monitoring and data	The VLS is fed with freshwater by 7 major, monitored rivers that drain into the Cochin estuary, with their catchments covering 80% of the total land contributing to the VLM runoff. The unmonitored, remaining 20% part of the whole VLM catchment area includes the coastal plain and its heavy network of interconnected canals and streams-rivers. Historical data on river discharge and other hydrological parameters are available with the Central Water Commission (CWC) and India Meteorological Department (IMD), and are relatively readily accessible. Groundwater data is very limited, as there are no monitoring stations for this purpose. Limited data sets are available for pollutant discharges from the industrial parts of the region with the Pollution Control Board (PCB).
Site-related publications by GWEN participants	In preparation