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Superficial water quality assessment to the water framework in coastal catchments of Atlantic Forest Biome, Southern Brazil, Santa Catarina State

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Brazil lacks on water quality data essential to establish the water framework directive. The existing water quality data are normally non-systematic and stored in separated databases such as environmental agencies, universities, and private companies, not organized in a single platform. This study analyzed water quality data from costal catchments of the Atlantic Forest Biome with different land use and surface areas in southern Brazil, Santa Catrina State. The outlets of these catchments are influenced by river and saline forcings. Water quality samples were gathered from open databases, such as the State water quality program, universities, research institutes, water supply companies, environmental agencies, and private and individual monitoring. The database consists in non-systematic monitoring from 2010 to 2023. Five water quality parameters were selected considering availability in most samples, such as: dissolved oxygen (DO), biochemical oxygen demand (BOD), nitrate, total phosphorous and thermotolerant coliforms. The median was used to define the water quality in monitoring points. Samples results were compared to maximum permitted concentrations established by the National Environment Council (CONAMA in Portuguese), Resolution n. 357/2005. The Brazilian water framework directive indicates that Class 1 is good water quality and Class 4 or less is related to poor quality (CONAMA, 2005). The analyzed catchments presented surface areas varying from 200 km² to 2370 km². The main land use in catchments are natural forests, especially upstream. On flatlands and plains, the land use by human activities is dominated by small family agriculture, pastures, planted forests, aquaculture, mining, and urban areas. Results show that total phosphorous and thermotolerant coliforms were the most limiting parameters considering the national framework directive, indicating bad to poor water quality (Class 3 and 4), respectively. Both parameters are related to the release of non-treatment effluents in surface waters suggesting contamination from residences or animal sewages. Most of the municipalities don't have basic sanitation, such as collecting and treatment of wastewater. DO and BOD were associated with moderate and good water quality (Class 2 and 1), respectably. Nitrate, which is normally associated with overdoses of agricultural fertilizers, was not a limiting parameter for the catchments. All nitrate concentrations were under the national framework limit of 10 mg/L-N. In general, water quality results indicate the need for an advanced treatment system in order to ensure potable water to population. However, in the Santa Catrina State scenario the conventional treatment systems normally present good results to remove BOD, total phosphorous and thermotolerant coliforms. It is also necessary that each environmental region could adjust the national water framework concentration limit per region to some parameters considering the specificity of rivers due to natural and geological formations, such as total phosphorous which in Santa Catarina, the concentration limit in the national resolution is low even to natural environments.