

## Characterization of the origin of pollutants in groundwater using biostatistics tests and the land use: Case of watershed Ehania, southeast of Cote d'Ivoire

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The threat of agro-industrial operations on the quality of groundwater resources has become a major concern for the world's population, mainly in agricultural areas. To solve this problem, several methods have been adopted. They are vulnerability to pollutants and statistics methods. In this study, statistical tests were adopted to determine the likely source of pollutants in the groundwater resources. First, we analyzed the spatial variation of pollutants parameters. Then, these pollutants parameters have been integrated in a statistical test such as the self-organizing map of Kohonen (SOM). Method used allows to show the similarity of any correlation between the physic-chemical parameters. To validate these results, a land use map was developed to identify the sources of pollutants in production functions of different activities taking place in the basin. The results indicate very high levels of certain pollutants such as  $\text{NO}_3^-$ ,  $\text{Cl}^-$  and  $\text{SO}_4^{2-}$  with generally higher than WHO standards values. These high levels observed could be attributed to the generally free nature of aquifers alteration and sedimentary formations in areas of high agro-industrial production. The analysis of the data from tests such as kohonen stats method reveals a strong correlation between pollutants ( $\text{NO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{Cl}^-$ ) and conductivity showing the likely origin of these surface pollutants. An origin is linked to the existence of large agro-industrials exploitations. These results are reinforced by those of the overlay map of the sampling sites on the land use map, which shows a strong coincidence between high values of pollutants and production areas of the pollutants that are agro-industrial exploitations. These areas of coincidence are observed in the north where banana's industrials plantations that are less visible are found and mostly in the southwest part where is one of the largest oil palm plantations in the world (36,000 hectares).

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