Investigating spatio-temporal changes in groundwater quality for London between 2000-2020

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Objectives:

- Study groundwater quality for London, from 2000 to 2020.
- Spatio-temporal variation of Hardness, Dissolved Oxygen (DO), Sodium, Nitrates, and Nitrite.
- Data analysis and visualization of open access integrated datasets.

Data and Methods used:

- Open access data obtained from water quality archive of Environment Agency (EA) for over 500 wells.
- R programming and GIS tools for Data analysis and visualization.
- London spatially divided into 5 subzones: Central, East, North, South, and West.
- Temporal Analysis on quarterly basis:

Quarter 1 (Q1)	Winter	December, January, February
Quarter 2 (Q2)	Spring	March, April, May
Quarter 3 (Q3)	Summer	June, July, August
Quarter 4 (Q4)	Autumn	September, October, November

Significance:

- Sustainable management of groundwater resource.
- Mapping groundwater depletion areas for London.
- Needs for treatment of groundwater.
- Baseline for groundwater quality parameters.

Results:

- Overall groundwater of London: dominant magnesium bicarbonate type.
- From 2000 and 2020: the groundwater hardness range between 50 mg/l to 2363 mg/l, sodium between 11 to 308 mg/l and DO between 0 to 10.7 mg/l.
- Localised patches of different parameters below Drinking Water Inspectorate acceptable limits were found.

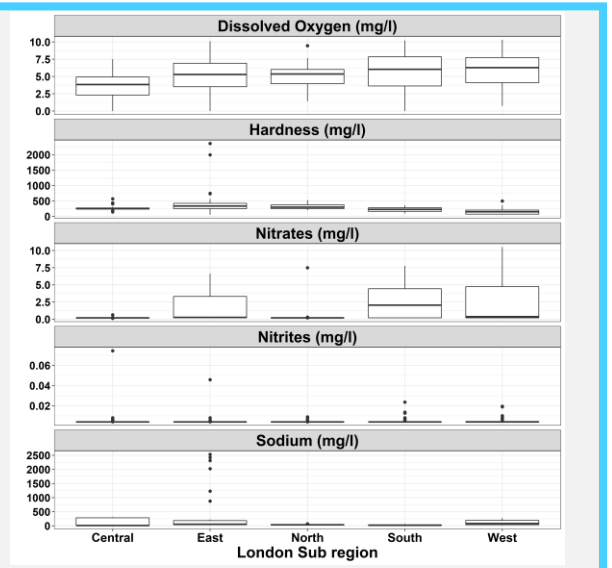


Fig: Box plots for groundwater quality parameters

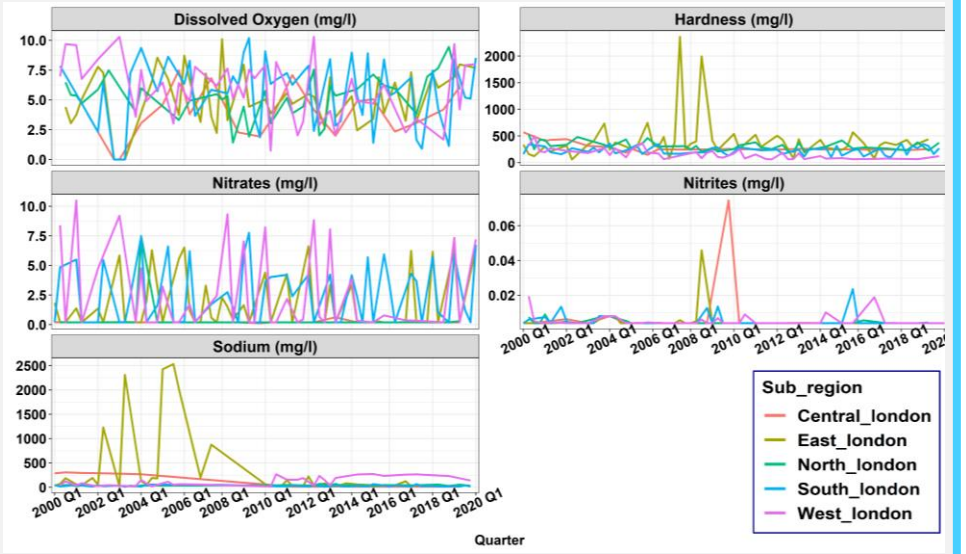


Fig: Temporal plots for groundwater quality parameters

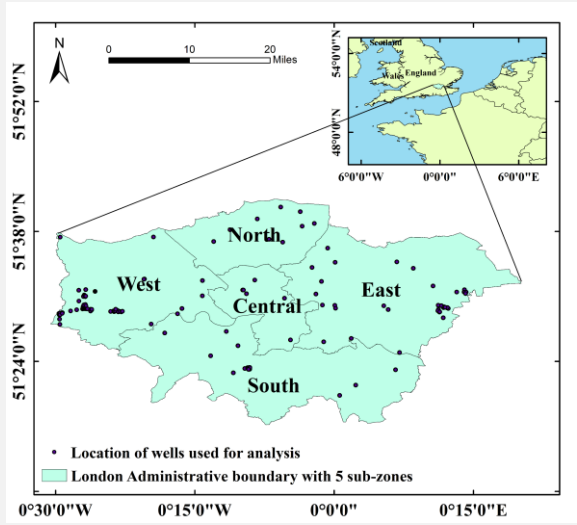
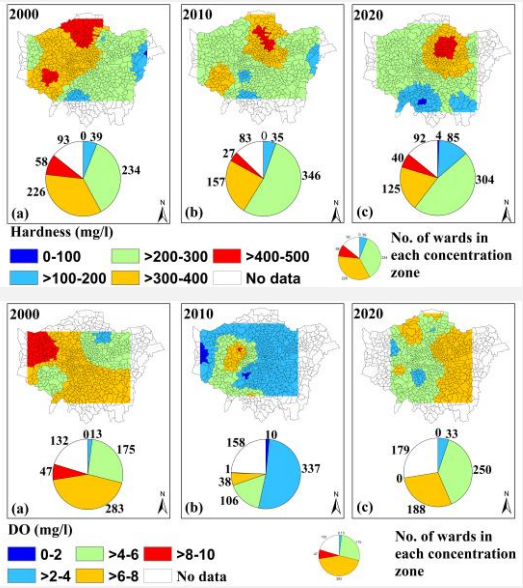


Fig: London, its 5 subzones, with location of observed borewells



- Spatial variation of Hardness and DO is shown.
- Similar variations can be shown for other parameters.
- Red and Orange areas represent localised zones of groundwater pollution, for a particular parameter.
- Temporal and box-plots shows time-series and statistical variation of different groundwater quality parameter.