

RESEARCH BRIEF



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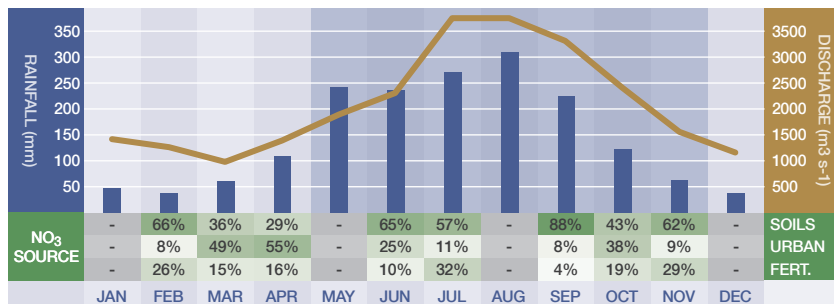
# Nitrate Pollution in the Red River Delta

The Red River Delta is home to the capital of Vietnam, Hanoi. The large population relies on the catchment for the provision of primary water resources for its industry and agriculture. This critical reserve is rapidly becoming impacted by anthropogenic activities and we demonstrate how nitrate pollution, in particular, is influencing the health of the Red River Delta.

## Dominant sources of nitrate in the Red River Delta

- 1 Natural soils originating in upstream regions of the river
- 2 Manure and septic waste from animals and humans
- 3 Chemical fertiliser in regions where rice paddy fields dominate

## Seasonal changes linked to monsoon season

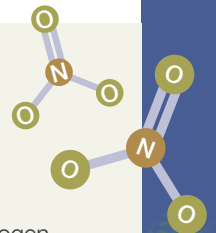


As well as a spatial trend in the source of nitrate pollution in the delta (both Red and Day rivers) we also see a seasonal change in the source and amount of pollution, linked to the monsoon season (Apr to Nov).

During the dry season, manure and septic tank waste contributes 50% of nitrate contamination in the middle and lower reaches of the delta, due to poor waste management. We therefore see a strong impact of urbanisation on these river systems, which is reducing the health of the rivers via decreasing oxygen concentrations.



## What is nitrate and where does it come from?



Nitrate, is a compound of nitrogen, that is essential for plant growth. Via the addition of chemical fertilisers and poor waste water treatment, more nitrate has been entering water courses. This has been increasing with population growth, impacting the global nitrogen cycle.

## What are its impacts?

The addition of nitrogen to the environment leads to a process called eutrophication. Eutrophication is the addition of nutrients to water courses and the excessive biological production that it stimulates. This can be detrimental to water quality.

## Recommendations

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## Pumping in dry season

The Day River system is most vulnerable to nitrate pollution in the dry season, due to the lower water levels. We recommend the pumping of less-polluted water from the Red River system to the upstream sections of the Day River in dry periods to dilute pollution in this stream.

## Re-establish natural links

The redistribution of water to the Day River system will also provide greater water resources for paddy field irrigation of the spring crop. This will re-establish the natural linkages between the two main streams of the Red River Delta.