Recent advancement in water quality indicators for eutrophication in global freshwater lakes

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Abstract:
This poster is based on a recent review article, “Recent advancement in water quality indicators for eutrophication in global freshwater lakes” (Suresh et al).

Introduction
Most of the current approaches focus on in-lake monitoring to assess eutrophication status of lakes, which is needed, but not enough to explain the story of causes and effects.

The feedback of anthropogenic influences that include interactions of nutrient inputs with climate, landuse, hydrology is necessary to evaluate trophic status and to set realistic water quality targets.

Indicators that represent these characteristics in a holistic way can help to better understand and monitor the responses and extent of impacts.

A new causal network to map the cause-effects and highlight the complex system interactions in lake basins

Interdisciplinary overview of the influencing role of drivers and pressures using seven cross-cutting themes.

Key Messages
• Driver and pressure indicators can be proxies to monitor water quality status and impacts.
• Comprehensive indicators allow systematic understanding of nutrient dynamics and promote consideration of sources of emission.
• Fill the gap in water quality monitoring data, especially in the emerging economies of the world.

Discussion
One-way coupling: planned implementation to global freshwater lakes

Review method and D-P-S-I-R framework

Existing evidence of DPSIR studies to identify and categorize the potential indicators

Mapping the interactions of these indicators to form causal network instead of DPSIR causal chain

Review of nutrient-specific mechanisms for drivers and pressures to identify future research opportunities

Activities (sources and sectors) causing nutrient enrichment

Drivers

Nutrient flows and pathways from specific sources

Pressures

Physical, chemical, biological or ecological changes in lakes

States

Effects on people and environment

Impacts

Actions of management, policy making to protect people and environment

Responses

Figure 1: (left) Review method; (right) DPSIR conceptual framework for eutrophication. It was developed (EEA, 1999) to design integrated management solutions. Deliberation of interventions could either be to regulate drivers, pressures, states or impacts (solid lines from response) while D-P-S-I (solid lines) are one-way cause-effect chain.

Causal network for drivers and pressures

Figure 2: The new causal network of DPSIR framework with 58 selected indicators. (top) Highlighted network connections for selected drivers and (bottom) pressure indicators.

1. Temperature
2. Precipitation
3. Floods
4. Droughts
5. Population
6. GDP
7. Water use
8. Crop yield
9. Irrigation eff.
10. Dietary pattern
11. Fish catch
12. Agri. Landuse
13. Urban land
14. Natural land
15. River connectivity
16. Light available
17. Residence time
18. NP ratio
19. Lake depth
20. Land nutrient input
21. Sanitation
22. Wastewater treatment
23. Fertilizer use
24. Soils
25. NP leaching
26. Groundwater(NW) nutrient storage
27. PUE eff.
28. Livestock density
29. Min. Disposition of N
30. Aquaculture efficiency
31. N
32. P
33. carbon
34. Sediments
35. Water level
36. Stratification
37. Water transparency
38. Oxygen depletion
39. Macrophytes
40. Phytoplankton
41. Zooplankton
42. Algal blooms
43. Food security
44. Water availability
45. Water quality(WQ)
46. Ecosystem imbalance
47. Recreational value
48. Human health
49. Fish kills
50. WQ monitoring
51. Soil management
52. Conservation and restoration
53. Agri. Management
54. GW protection
55. Education and awareness
56. Regional directives
57. LU policy and management
58. Global actions like SDGs.