Stichting RIONED

Oppervlaktewaterkwaliteit: wat zijn relevante emissies?

Vergelijkende analyse van vervuilingsbronnen en maatregelen aan het afvalwatersysteem, beoordeeld op hun effect op de kwaliteit van diverse oppervlaktewateren

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Omslag foto: bvbeeld
Vormgeving: Grafisch Atelier Wageningen
Druk: Modern, Bennekom

ISBN: 97 890 73645 257

Summary

The research project 'Urban surface water quality; sensitivity analysis of mass fluxes' aimed at identification of the knowledge gaps on mass fluxes from the urban waste water system. This aim has been reached through three questions:
1. which water quality problems occur in receiving waters?
2. to what extent does the urban waste water system contribute to the total load affecting receiving water quality?
3. can the contribution of the urban waste water system be mitigated sufficiently to solve the surface water quality problem?

The research analyzed the relative contribution of the urban waste water system to quality problems in five typical receiving waters :
1. a small urban pond;
2. an urban canal;
3. a semi rural polder;
4. a regional water body;
5. the national water system of The Netherlands.

Methodology
For each typical size of water system specific pollutants have been appointed to be the dominant pollutant causing a specific water quality problems. Accordingly, the relative contribution of the urban waste water system to the total load of these pollutants in the water system has been identified. In that respect it is essential to notice the difference between:
- Emission: how much pollutants emits a certain source towards the urban water system?
- Loads: how much of these pollutants effectively end up in the water system?

The polluting loads are calculated for respectively an average, a realistic upper and lower value for the concentrations to be taken into account. For each type of water system and for each combination of pollutant loads the resulting water quality has been calculated. The dose-response relationships are kept as much simple as reasonably possible. For ponds and canals, the impact of heavy metals and PAH's have been related to the chemical quality of the sludge layer in the receiving waters .

Finally, the effects of commonly used improvements of the urban waste water system have been analyzed, including:

- reconstruction of a separate sewer system to a improved separate sewer system;
- application of a soil filter at the outlets of separated systems;
- introduction of sustainable urban drainage systems
- high level effluent polishing at the wwtp.

Results

The research has shown the following measures to be effective with respect to one or more water quality problems in at least one type of receiving waters:

- treatment of rain water outlets with a high removal ratio for most parameters, like a soil filter;
- reconstruction to an improved separated system;
- source control;
- enlargement of inline sewer storage and/or treatment capacity;
- addition of relatively large offline storage facilities downstream of cso's;
- high level effluent polishing par example with sand filtration, use of a Bio-membrane reactor, optimal operation of ultra-low-loaded wwtp's.

Research needs

The results of the sensitivity analysis have been translated to needs for further investigation of applicable concentration levels of pollutants from the urban waste water system. Further need for research exist if:

- the urban waste water system contributes significantly to surface water quality problems (see table 9.2 and appendix 1);
- the severeness of the surface water quality problem depends on the bandwidth in the applicable concentration levels of the contributing pollutant (see table 9.3);
- and, the surface water quality problem can be solved by improvement of the urban waste water system (table 9.5). Improvements as changing the lay-out of the surface water systems haven't been analyzed.

The research has concluded that the following parameters need further research to downsize the bandwidth in the concentrations of pollutants emitted from the urban waste water system:

- for separated sewer systems: Phosphorus, heavy metals, PAH, bacteria;
- for combined sewer systems: Copper and BOD;
- wwtp: Heavy metals, PAH, crop protection substances and endocrine disruptors.