Emissions of Organic Pollutants from Traffic and Roads: Priority Pollutants Selection and Substance Flow Analysis

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Introduction
Large quantities of organic pollutants (OPs) are emitted from vehicles, fuels, road and roadside construction materials and they are accumulated on road surfaces. Contaminated road runoff is transported to surface waters, where the OPs may pose a threat to aquatic ecosystems. Therefore, tools that facilitate the prioritization of hazardous compounds for further studies through substance flow analysis (SFA) need to be developed.

Aim and objectives
The specific goals of this research were to:

- Identify sources and quantity uses of OPs present in road runoff
- Propose a list of Priority Pollutants (PPs) with contaminants intended to be studied further in investigations concerning their optimal elimination from road runoff
- Compounds from the list of PPs is a subject for Substance Flow Analysis

Methods
To identify and classify possible sources of OPs from road environments, as well as to perform the selection of PPs to be included in the SFA, the following methodology was implemented (Figure 1).

Selection criteria
Criteria supporting evaluation of collected data and the choice of PPs include:

- Risk of emission/leaching of pollutants from sources into stormwater systems.
- Emission of specific substances or groups of substances from more than one source in road environments.
- Estimation of use and quantities of OPs emitted from vehicles, fuels and construction materials in Sweden and in the EU.
- Hazardous effects on aquatic environments and humans.
- Availability of analysis methods for chosen substances.

RICH
The RICH (Ranking and Identification of Chemical Hazards) tool was used to provide information regarding physico-chemical and biological properties registered for a wide range of substances occurring in stormwater. The Figure 2 presents sorting steps in the chemical hazards assessment, performed by RICH.

Results: Selection of PPs
The first screening stage for PPs selection allowed to identify and classify the most important sources of OPs in road environment (Table 1).

Results: SFA
SFA is an analytical method developed for quantitative assessment of individual substances through a given system, specified in space and time. For this study, system boundaries are defined in Table 3.

Table 1. Sources of OP emission identified in traffic environment

Table 2. Examples of identified PPs

Table 3. The system boundaries for SFA

Conclusions
- Ten groups of OPs are focus on in the feasibility PPs evaluation method of around 1250 specific organic compounds likely to be emitted from the road and traffic environment.
- Each stage of methodology encompasses limitations regarding availability of data.
- The SAE of PAHs showed that significant amount of OPs are commonly emitted into aquatic environment.