Ecotoxicity tests of surface run-off from roads with high traffic intensity

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2012

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Ecotoxicity tests of surface run-off from roads with high traffic intensity

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CONTENT

- Introduction of Transport Research Centre
- Traffic-related pollution of the environment
- Runoff waters
- Ecotoxicity tests including results
- The most important points

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TRANSPORT RESEARCH CENTRE

Founded in the year 1993 - successor of the former Federal Transport Research Institute

Public research institution – since 1. 1. 2007

Research and development activity with national effect for all branches of transport

Conceptual, methodological, information service for MT with supplementary activities

Application of knowledge from research and advisory service for subjects in the sector of transport

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AREAS OF EXPERTISE

- Transport development

  Transport sector development conception, Road, integrated and combined transport, Transport informatics and GIS, Transport telematics, Non - motorized transport, Civil aviation, Cross-sectional issues in transport

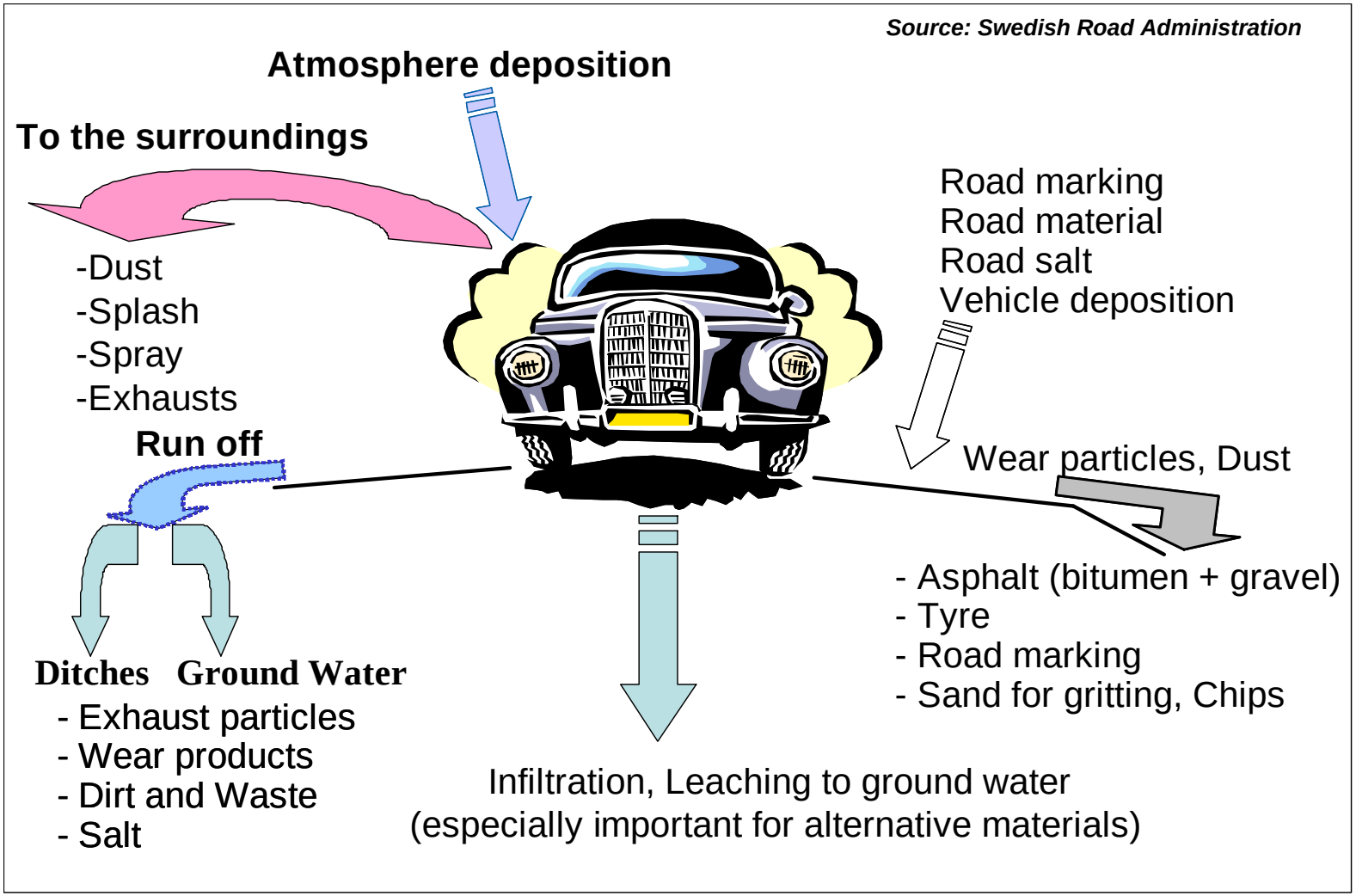
- Transport infractructure and environment

  Management systems, technologies and diagnostics, Materials, Geotechnics, Risk assessment, Alternative fuels and drives, Environmental accoustics, Transport and emission modeling, Sustainable transport

- Road safety and traffic engineering

  Traffic engineering, Traffic surveys, statistics and traffic accident analysis, Humanities, Road design

TRAFFIC-RELATED POLLUTION OF ENVIRONMENT



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TRAFFIC-RELATED POLLUTION OF ENVIRONMENT

- Environmental risks
  - soil usage
  - landscape fragmentation
  - accidents

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TRAFFIC-RELATED POLLUTION OF ENVIRONMENT

- Health risks
  - air pollution
  - noise exposition
  - road accidents

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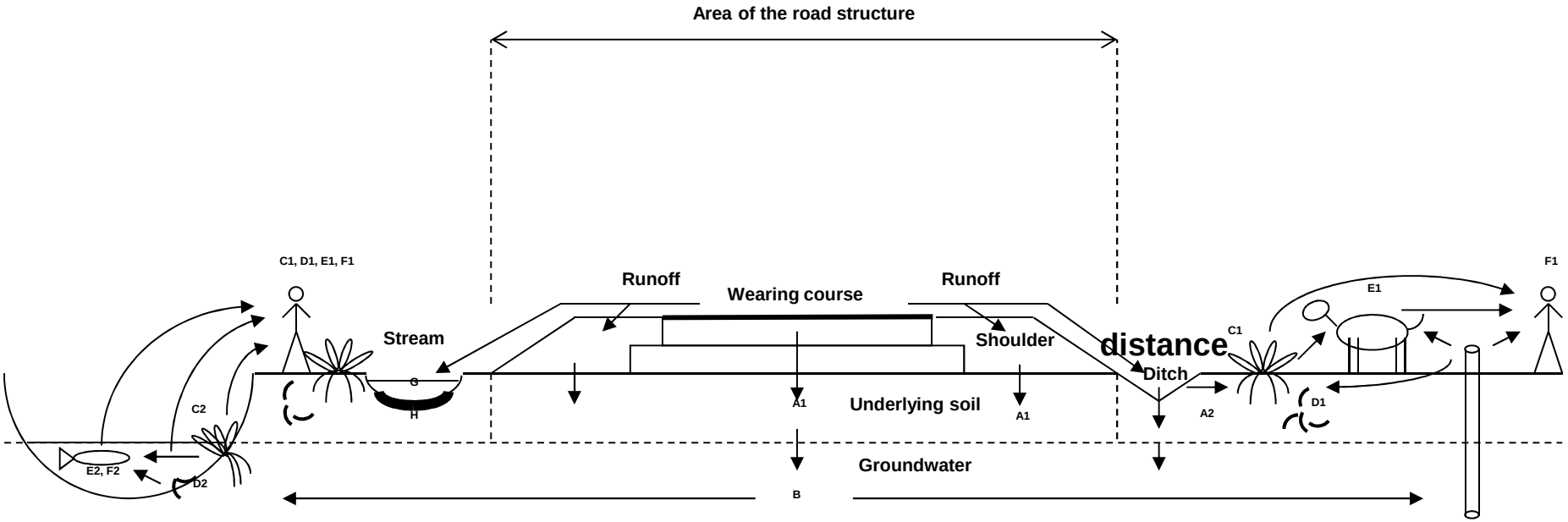
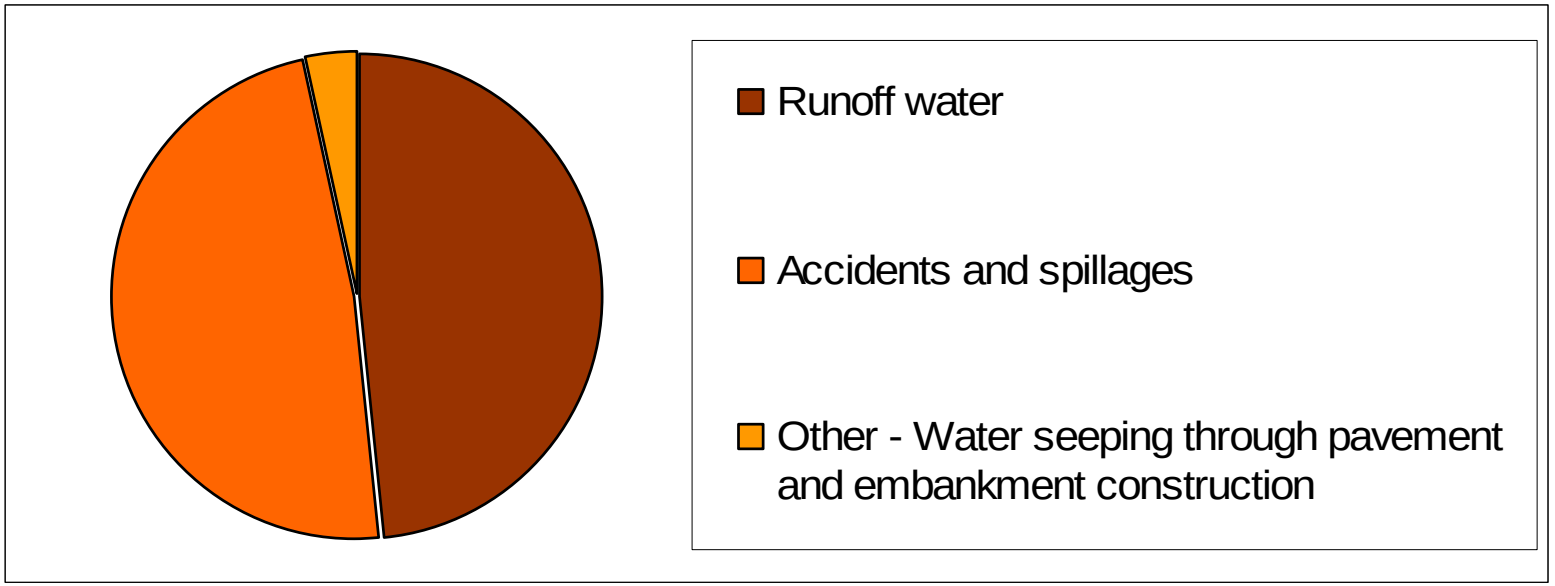
TRAFFIC RELATED WATER POLLUTION

Gardner, 2005

TRAFFIC RELATED WATER POLLUTION

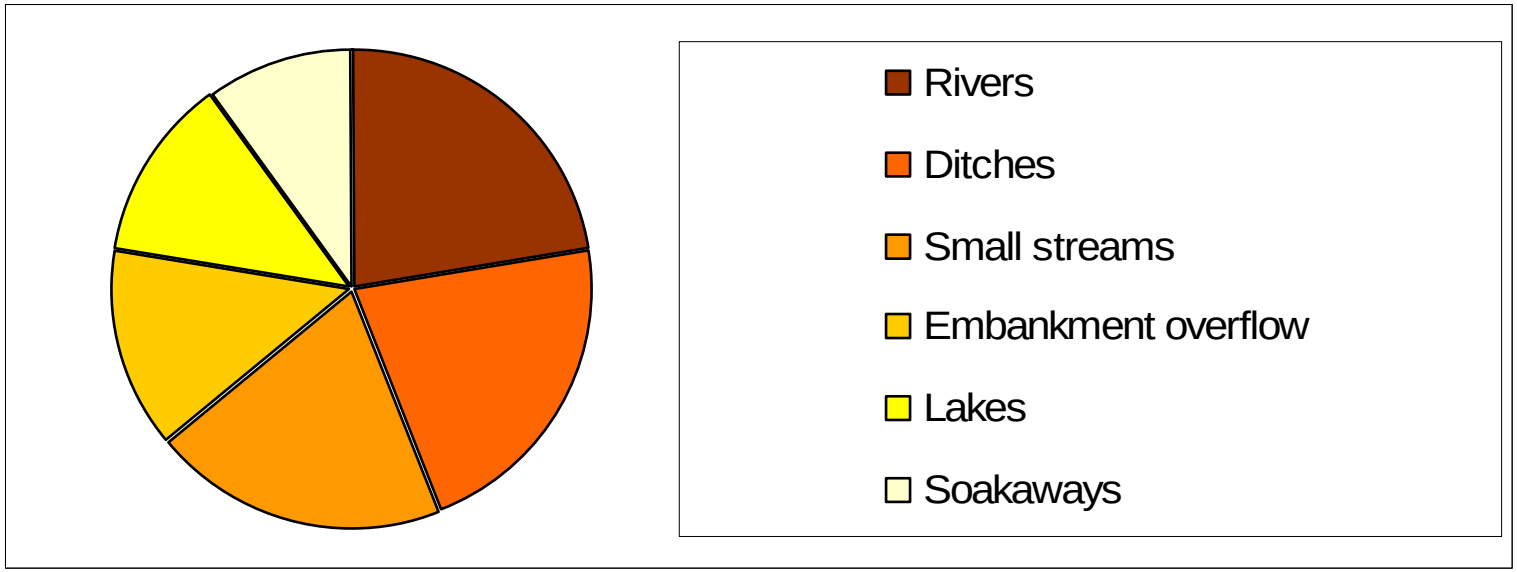


WHICH CAUSE OF WATER POLLUTION IS THE MOST SERIOUS ?



Source: WATMOVE questionaire - 16 European countries + 2 states in USA

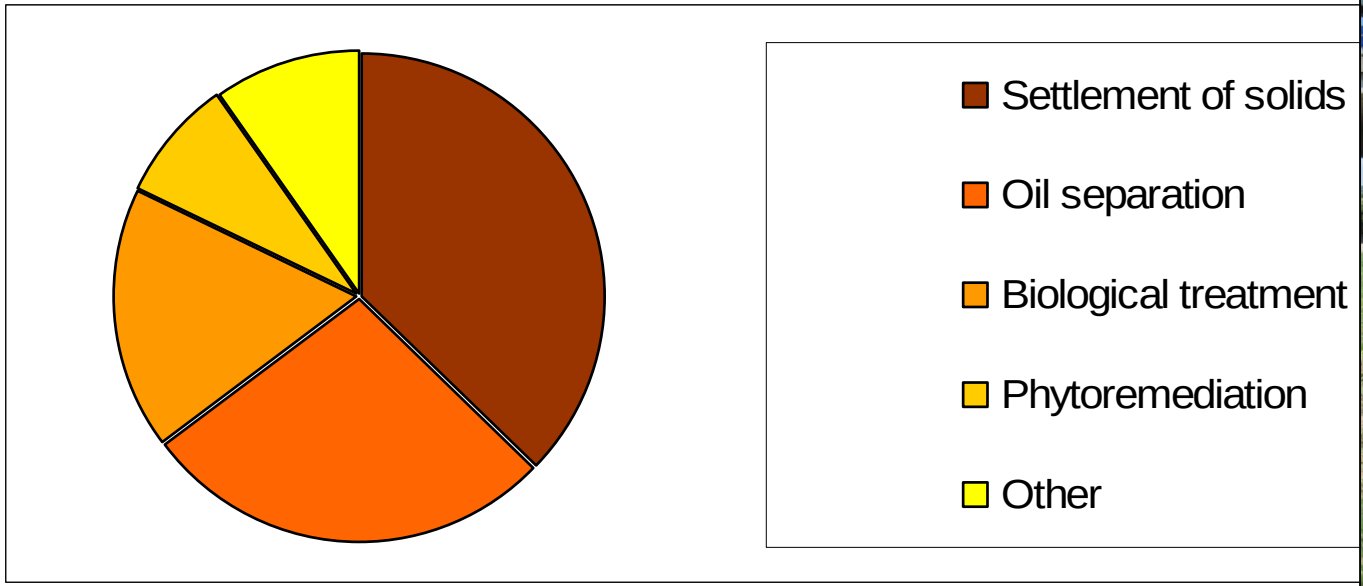
WHERE IS THE RUNOFF DIRECTED?



16 European countries

2 states in USA

RUNOFF TREATMENT

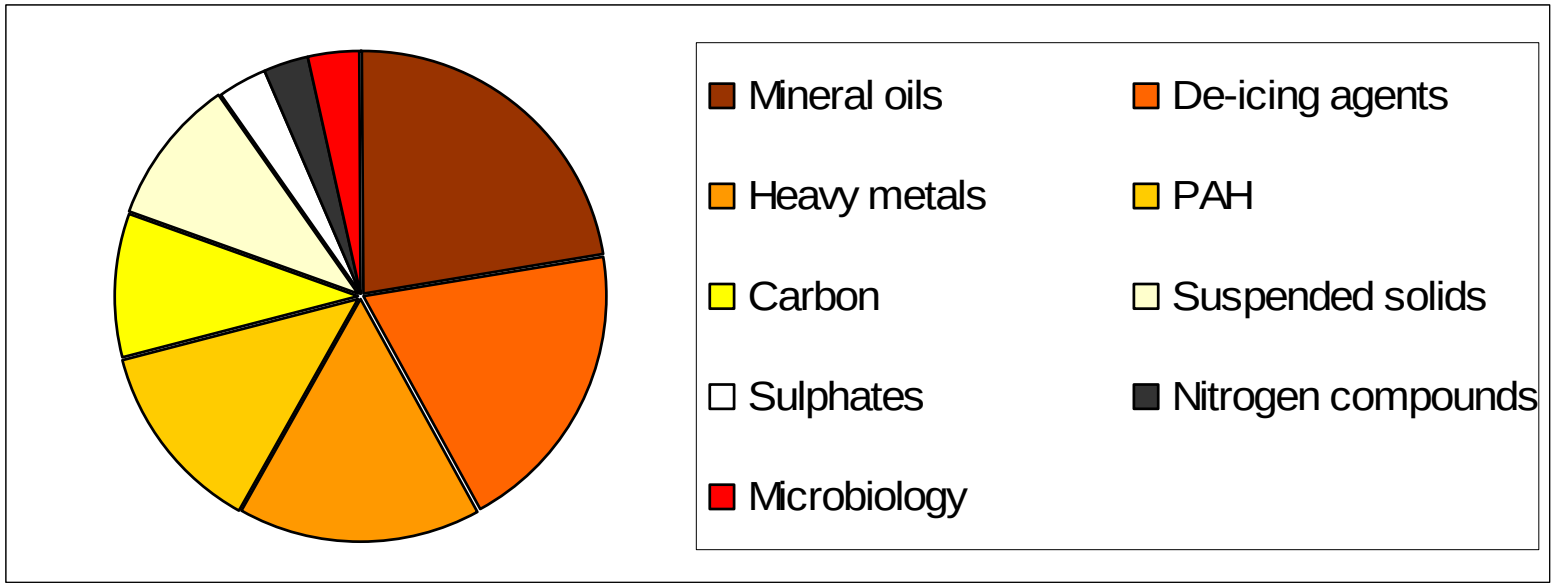


Source: WATMOVE questionaire - 16 European countries + 2 states in USA

TRAFFIC RELATED WATER POLLUTION

- Multispectral pollution
- Sources of contaminants
  - Traffic and cargo
  - Pavement and embankment materials
  - Road equipment
  - Maintenance and operation
  - Snow and ice
  - Exhaust gases

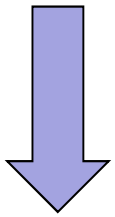
WHICH POLLUTANTS ARE FOUND?



Source: WATMOVE questionaire - 16 European countries + 2 states in USA

WHICH POLLUTANTS ARE FOUND?

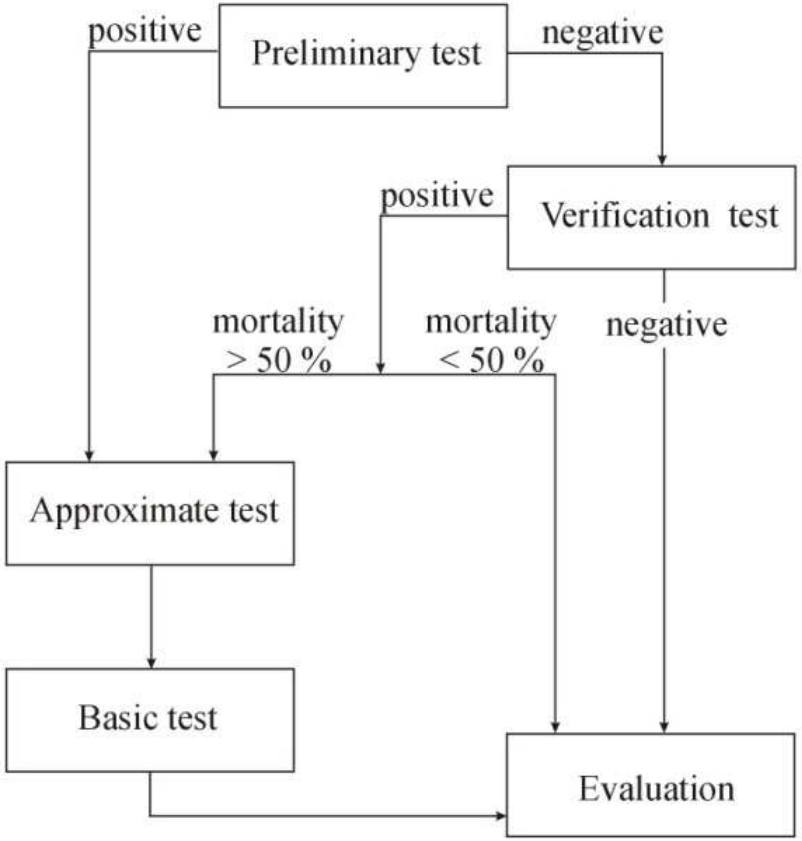
- Heavy metals - corrosion of vehicle compartments
- Zinc, cadmium and iron - tire wear
- Copper, barium, antimony - brake pads, brake linings
- Hydrocarbons - Fuel, fuel additives and lubricants
- Platinum, palladium and rhodium - wear of catalytic converters
- Chlorides – road winter maintenance



TOXIC FOR LIVING ORGANISMS

ECOTOXICITY TESTS

- Ecotoxicity tests should be performed as the first step in evaluation of sample possible effects on living organisms.
- Result - effective concentration of tested substance which causes the death or immobilization of organism
- When results identify toxicity for tested organism, chemical analyses should follow to identify which compound or group of compound is responsible for this effect.



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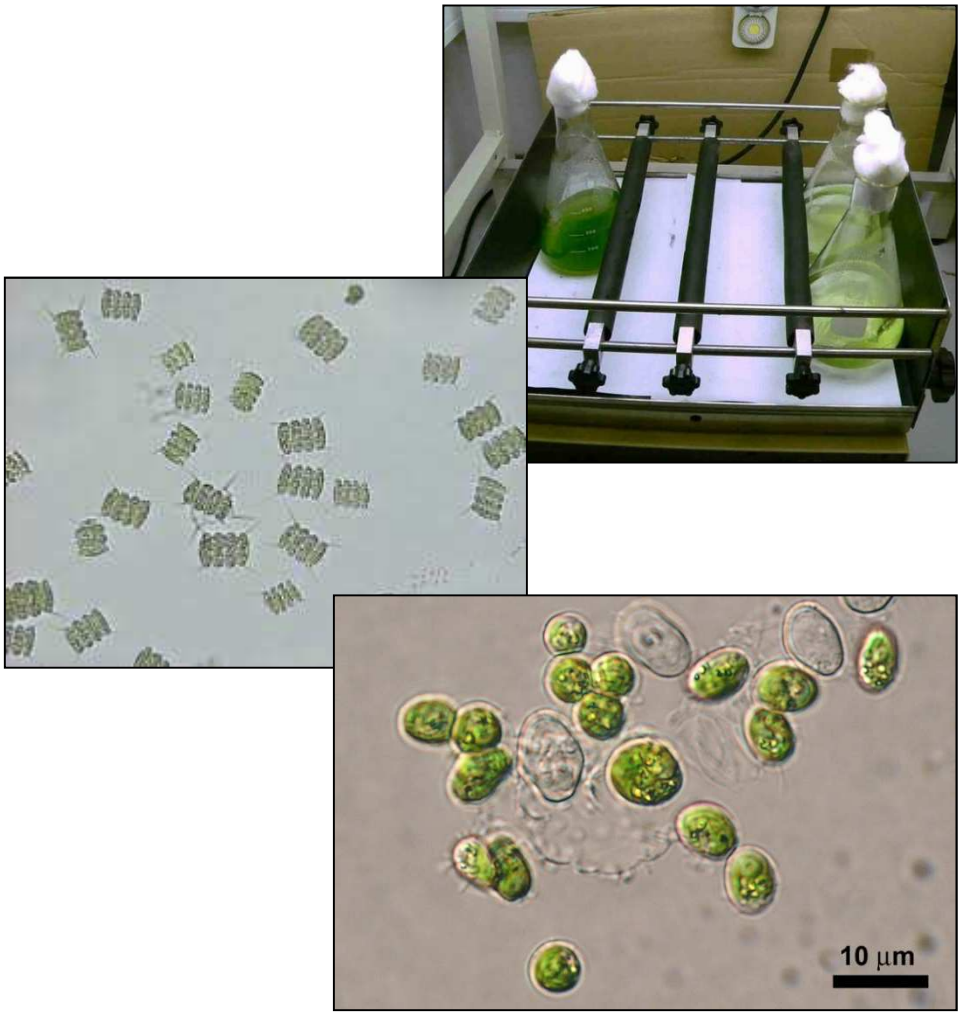
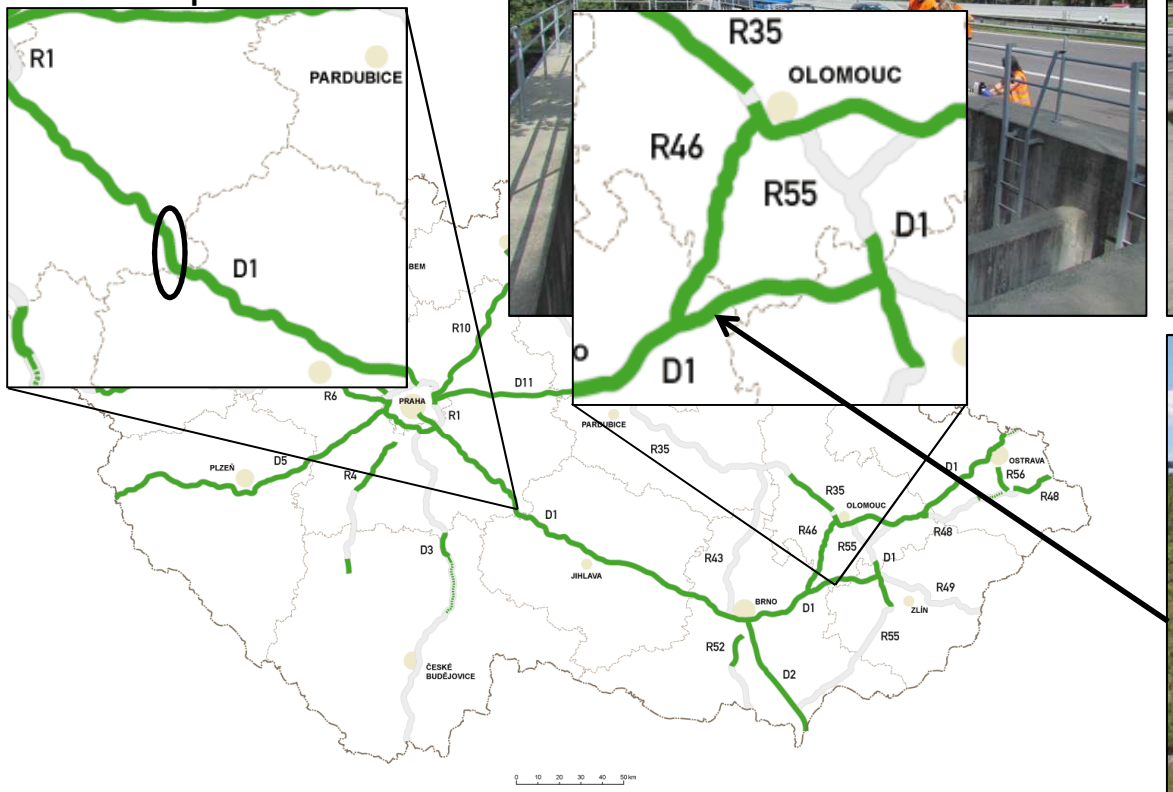
GROWTH INHIBITION TEST - FRESHWATER ALGAE

- To determine effects of substances on the growth of freshwater micro algae.
- Test organisms are exposed to the test substances in batch cultures over a period of 72 hours
- The system response is the inhibition/stimulation of growth in a series of algal cultures (test units)
- The response is evaluated as a function of the exposure concentration in comparison with the unexposed control cultures.

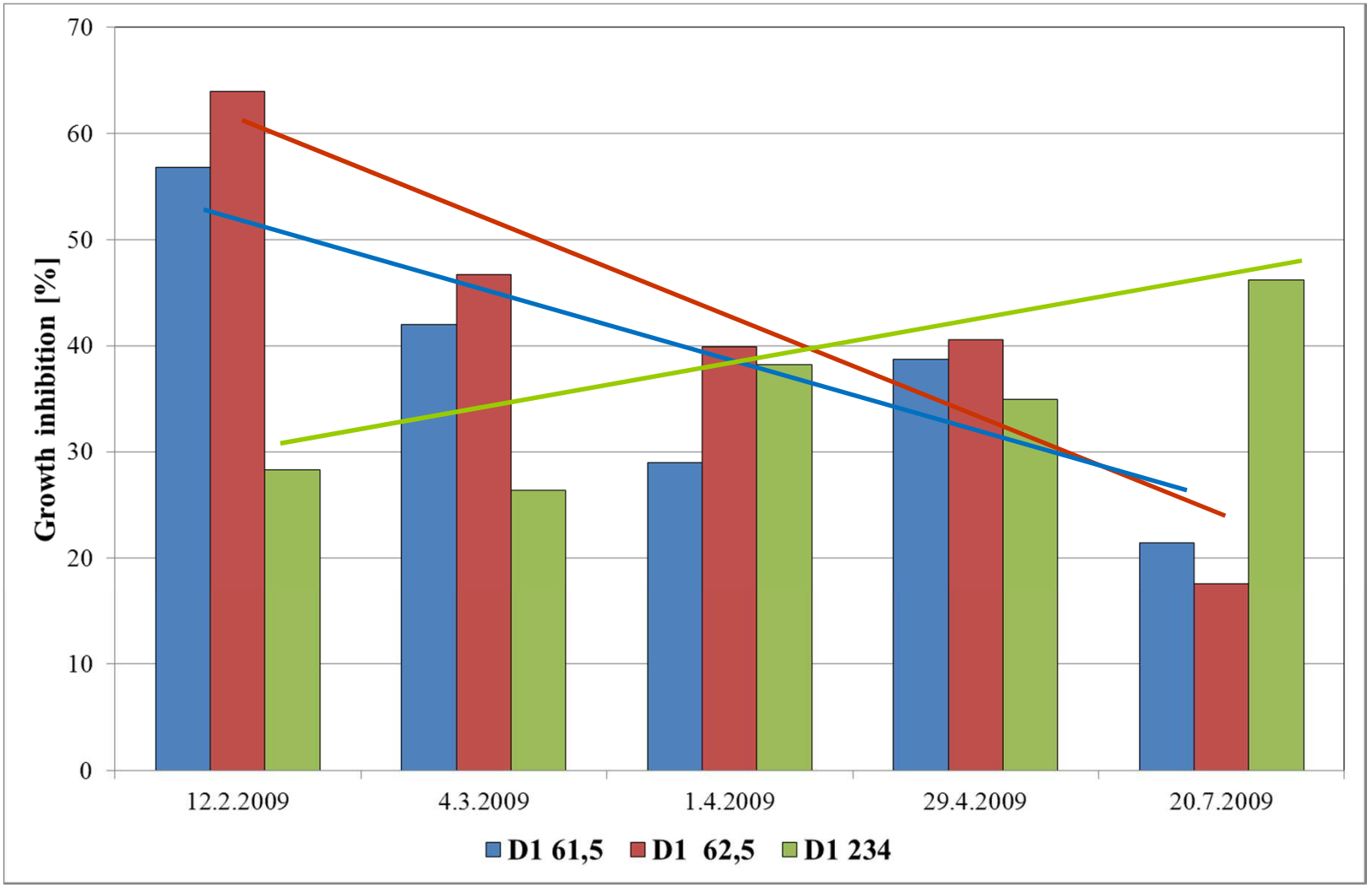


RUNOFF ASSESSMENTS - SELECTION OF LOCALITIES

- Application of Metho… s… Republic – Assessm… t… transportation netwo…

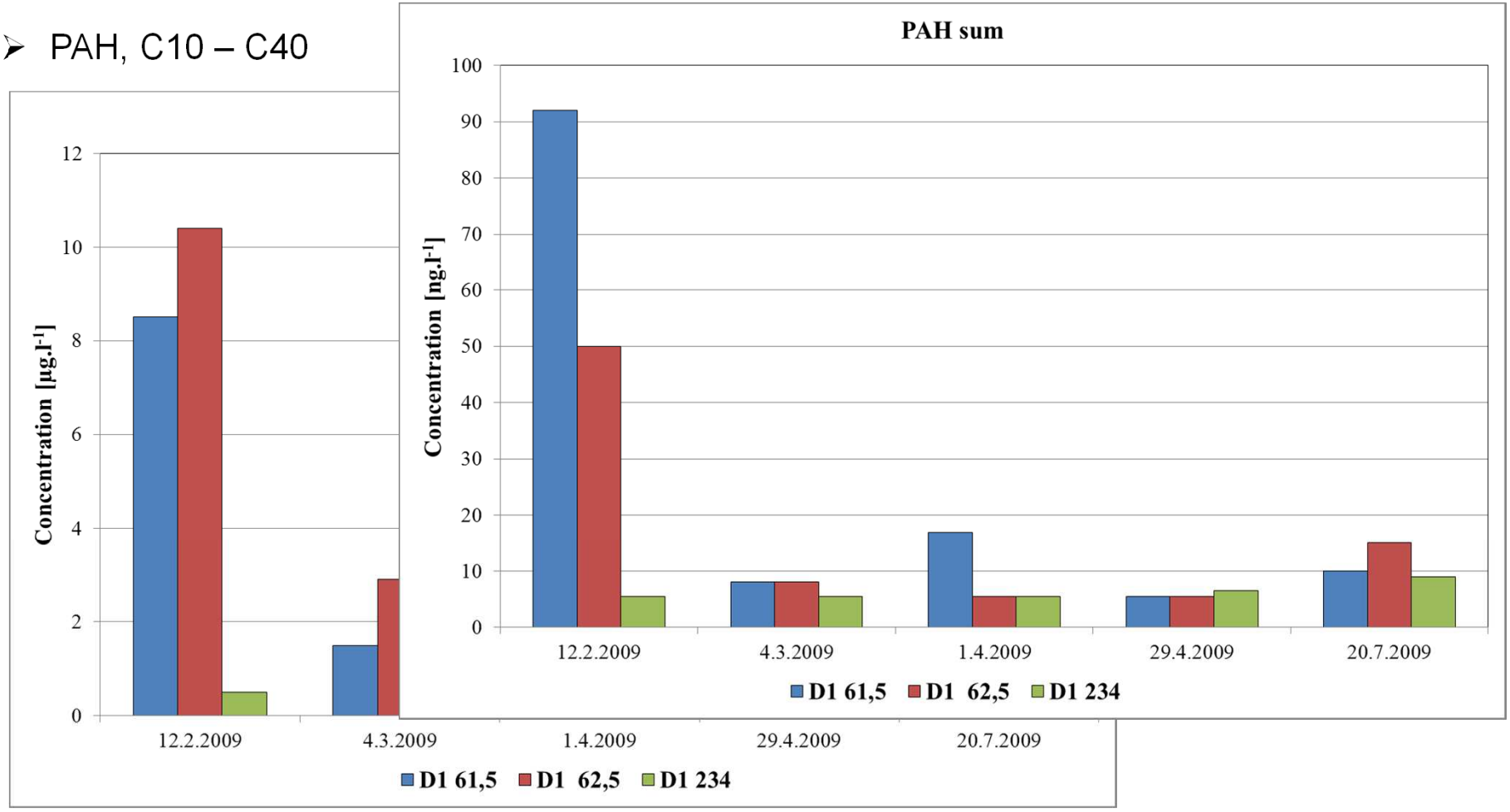


ECOTOXICITY TESTS RESULTS



CHEMICAL ANALYSES RESULTS

- Selected metals, chlorides
- PAH, C10 – C40

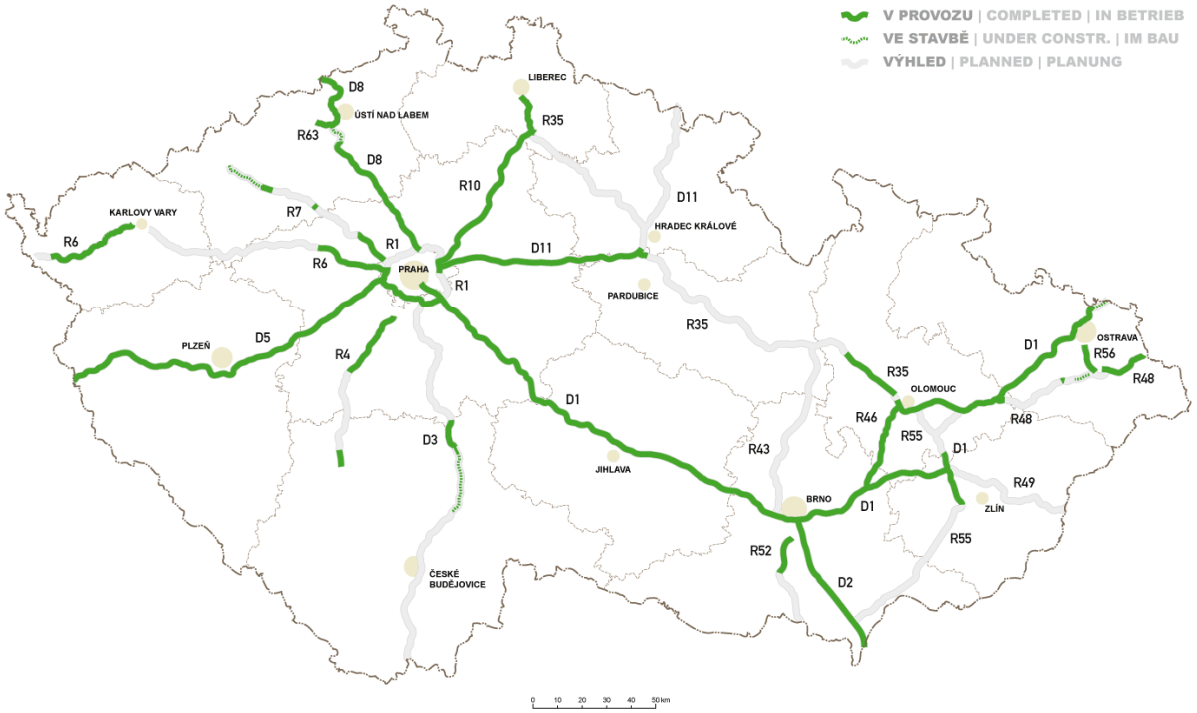


WHY BIOSENZORS ?

- 56,000 Km of highways and other roads are in operation in the Czech Republic at present
- Other extension is planned - will bring larger burden of the environment

Highway and road network
Actual in 1.1.2012

Source: ceskedalnice.cz



WHY BIOSENZORS ?

Pollution of environment reaches at present up to such level that continuous selective control of contaminants in air, water and soil is almost not possible.

On the contrary, it is necessary in accordance with sustainable development to ensure sufficient quality of the environment for future generations. Quality control of separate environmental matrices is associated with this issue.

This control process is at present performed by using classical analytical procedures and ecotoxicity tests in laboratory conditions.

These facts are the reason for large time consumption and financial costs to assess whether a specific sample on the site may pose a risk to living organisms or not.

The necessary of quality control under these conditions leads to the development of biological tests that can detect also unknown substances with toxic effects on organisms.

Thus biosenzors application can simplify and significantly decrease financial costs needed for the process of environmental pollution assessment.

Thank you for attention

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