

# STRATEGIES FOR MITIGATING ROAD POLLUTION OF WATER BODIES

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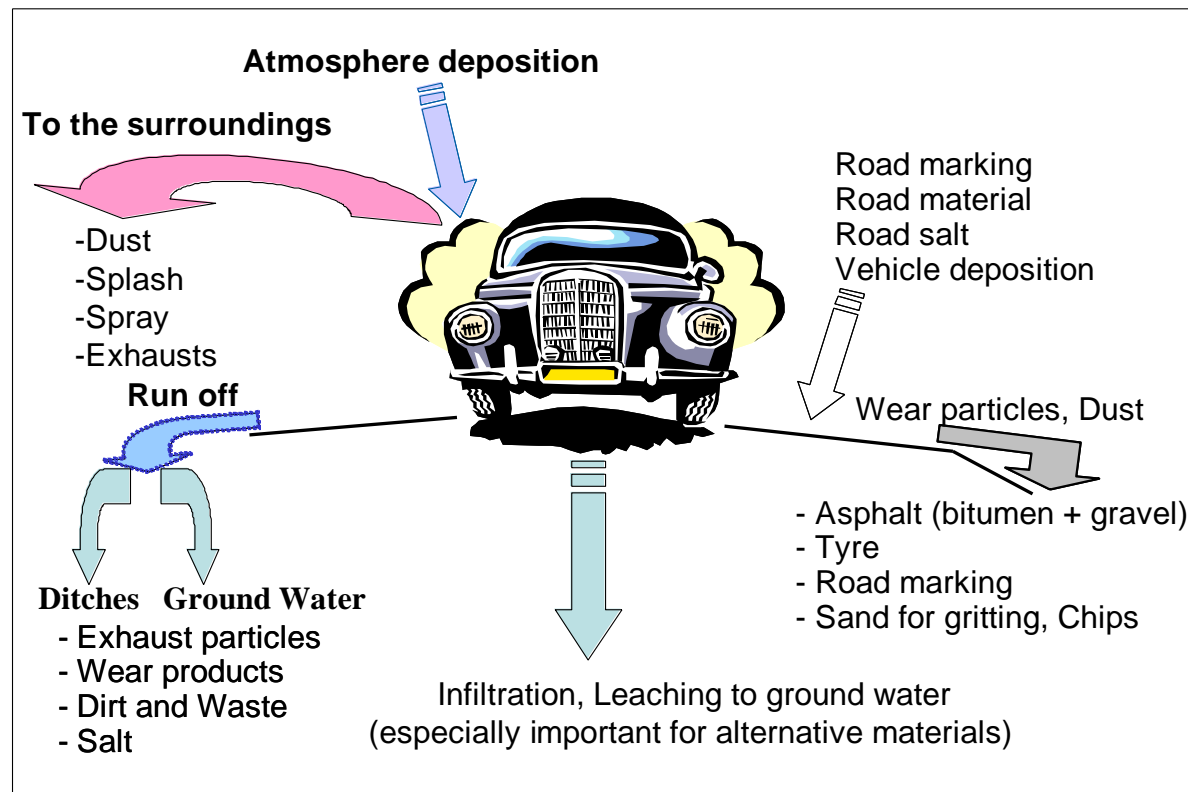


# Outline

- Introduction
- Starting points
- Pollution mitigation
  - Location
  - Strategies
  - Methods
- Conclusions



- Roads and road traffic can act as serious sources of various types of pollution.



# Introduction

- Pollutants spread to the environment:
  - through different pathways,
  - with different transport agents,
  - and different mechanisms.
- Once pollutants are transported away from the road and traffic sources:
  - they can reach various environmental compartments,
  - where they can have detrimental effects.

# Introduction

Pollution from roads and traffic must be managed and its harmful affects prevented at all stages,

- especially in **ENVIRONMENTALLY SENSITIVE AREAS.**

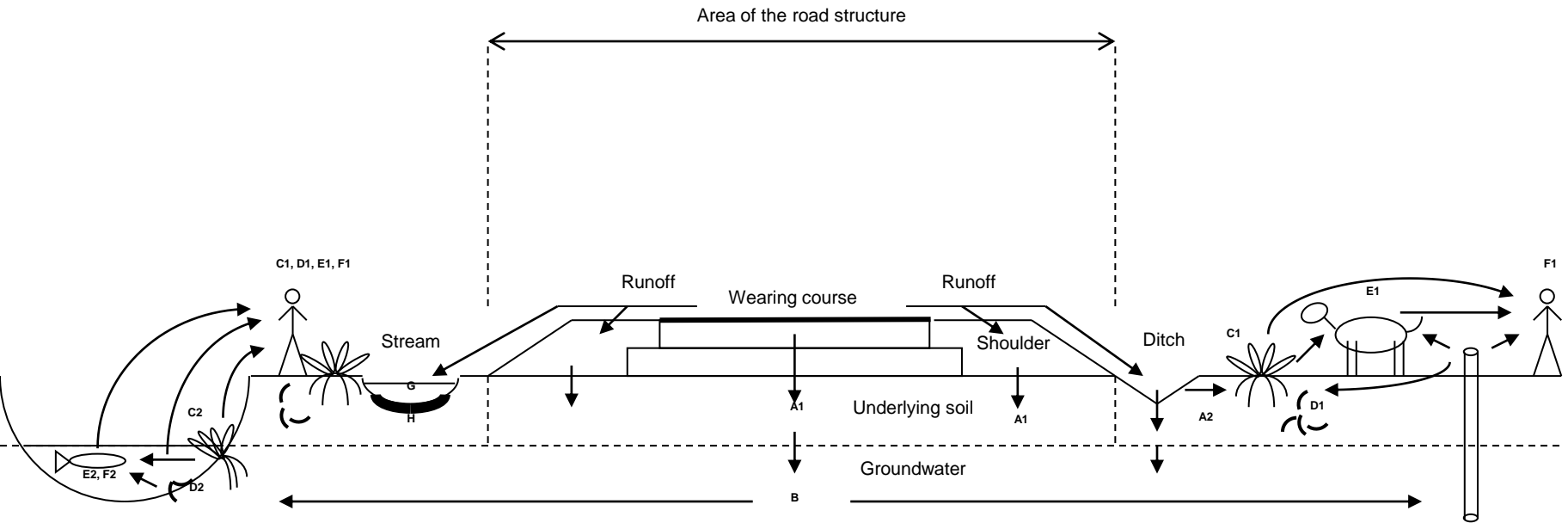
## Pollution mitigation – starting points

- Pollutant fate in the particular environment should be established and it should help to estimate potential risks and hazards to water bodies pollution.
- Care must be taken that the benefit to water body is not offset by an equal or worse disbenefit to another environmental compartment.

## Pollution mitigation

- In general the pollution management policy is that protection of the environment should be performed in a way that the source concentrations of contaminants are reduced as much as possible and to limit, or prevent completely, the appearance of contaminants in the targets.

# Source – pathway - target





## Pollution mitigation – conceptual model



## Pollution mitigation – conceptual model

Mitigation approach	Mitigation method	
	Ex-situ	In-situ
Mitigation at source	Prevention	Prevention
	Avoidance	Reduction
Mitigation along Pathway	Reorientation	Interception
Reduction at Target	Compensation	Remediation

## Location of intervention measures

- Ex – situ methods are implemented externally as non - technical measures or as technical measures performed on places that are not part of near road environment.
- In - situ methods can be defined as mitigation methods implemented on the road or it's near vicinity,
  - intervention measures,
  - non – intervention measures.

## Pollution mitigation – conceptual model

Mitigation approach	Mitigation method	
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## Prevention

- Prevention methods are in general applied to stop emissions of pollutants in the environment or at particular environmental sensitive areas,
  - banning of leaded fuel,
  - banning the use of road de-icing agents on the environmental sensitive areas.

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## Avoidance

- Avoidance methods can be in general defined as special design procedures mainly connected with road alignment that avoids crossing environmental sensitive area,
  - a road may be longer in order to avoid a particularly sensitive ground water body leading to greater construction costs and ongoing fuel consumption costs.

## Pollution mitigation – conceptual model

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	Ex-situ	In-situ
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	Avoidance	<b>Reduction</b>
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## Reduction

- Reduction methods are those that are implemented in the case when emissions from roads and road environment cannot be stopped,
  - traffic restrictions such are travel velocity reductions,
  - reduction of traffic flow.

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## Reorientation

- Reorientation methods divert water that was polluted at the road surface or inside the pavement out of the area sensitive to water pollution or it they divert locally to the run-off treatment facilities where water is intercepted and treated,
  - watertight drainage systems that divert run-off water.

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# Interception

- Interception methods are technical measures that enable interception of pollutant flux,
  - run-off treatment facilities (e.g. detention ponds)
  - absorption barriers (e.g. reactive barriers).

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# Compensation

- Compensation methods are economic measures or replacement measures.
  - As an economic measure compensation methods are applied as indemnity to the owners of the land crossing by road or influenced by it.
  - As a replacement measure the case that road construction and all the consequences of it damage particular habitat or water body.

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## Remediation

- Remediation methods are only feasible when some deleterious and adverse effects appeared at environmental targets.
- These methods can be understood only as uttermost at incidents when previous mitigation measures were not successful.

## Conclusions

- Useful conceptualisation that can be used in
  - Planning.
  - Designing.
  - Construction.
  - Maintenance.
- Many open questions related to the understanding of the environment and road interaction.