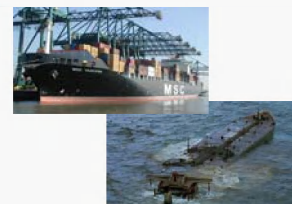


Arijs K.¹, Volckaert A.², Versonnen B.¹, Vanhoorne B.³, Vangheluwe M.¹, Le Roy D.², Maes F.⁴,
Calewaert J.B.⁴, Mees J.³, Fockedeij N.³, Claus S.³, Janssen C.⁵

¹EURAS - member of ARCADIS, ²ECOLAS, ³Flanders Marine Institute (VLIZ), ⁴Maritime Institute - Ghent University, ⁵Research Group Environmental Toxicology - Ghent University

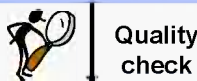
Introduction and aims

Several shipping accidents in Belgian territorial waters made the various government agencies involved aware of the need to develop integrated tools to assess the risks & environmental impact of accidental spills of hazardous compounds. The MIMAC project, funded by the Belgian Science Policy, aimed to integrate the results of 2 projects related to marine incidents management: DIMAS (Development of an Integrated Database for the Management of Accidental Spills) & RAMA (Risk Analysis of Marine Activities in the Belgian part of the North Sea).



DIMAS data collection: 250 compounds

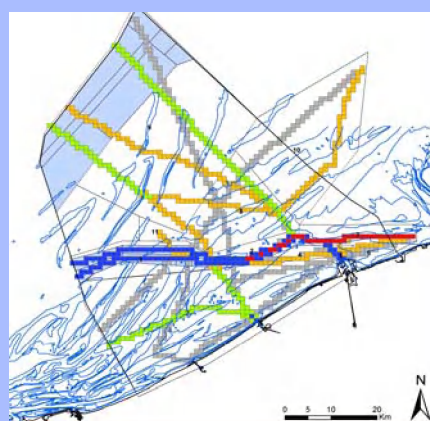
- Physico-chemical properties
- Ecotoxicology
 - ✓ Water / sediment
 - ✓ Saltwater / freshwater
 - ✓ Acute / chronic effects
 - ✓ trophic levels (fish, algae, plants, invertebrates, microorganisms, ...)
 - ✓ endpoints (mortality, growth, reproduction, ...)
- Human effects
 - ✓ Risk & safety phrases
- GESAMP hazard profiles



MIMAC

Risk assessment (RAMA)

- Identification of hazardous activities in the Belgian part of the North Sea

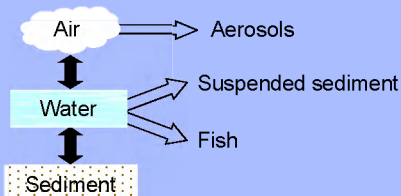


- ✓ Total 57.791 voyages (or ± 320.000 ship mov.)
- ✓ 40% dangerous goods (DG)
- ✓ 60% of DG in packaged form; 40% in bulk
- ✓ 74% with oil tankers, RoRo/ car carriers, containers

Relational database & modelling

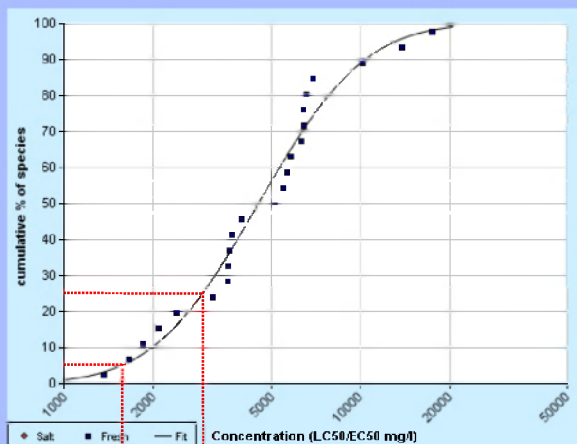
- Exposure modelling

Environmental partitioning modelling in marine specific environment, based on MacKay level I model



- Effect modelling

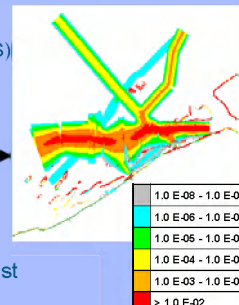
Expressed as potentially affected fraction (PAF), based on SSD (species sensitivity distribution) approach



- Low risk (< 5% PAF)
- Attention (5-25% PAF)
- Major risk (> 25% PAF)

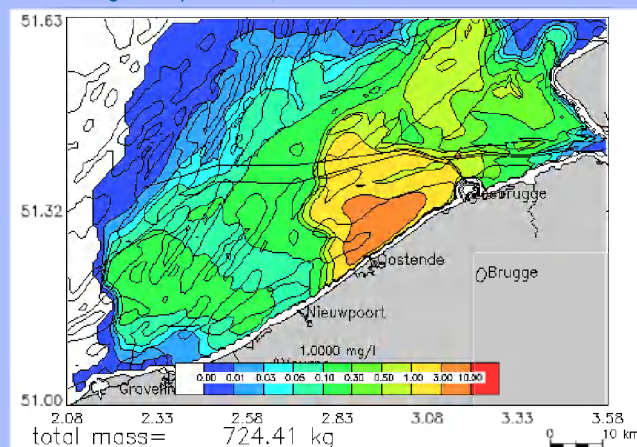
- Release assessment

- ✓ Marine Accident Risk Assessment System (MARCS)
- ✓ Accident frequency (accidents / year)
- ✓ Accident spill frequency (accidents with environmental spill / year)
- ✓ Spatial cargo spill risk (tonnes spilled / year)



- Description of effects of incidents

- ✓ Sensitivity analysis
- ✓ Effect analysis
 - Worst case simulation of HNS spill near coast
 - 75 simulation days
 - Maximum concentration
 - Ecological impact area, based on 5% effect from PAF



Conclusion

Both the results of RAMA and DIMAS as well as the outcome of the MIMAC symposium of October 2006 are ready to be used in contingency planning. The risk analysis of RAMA forms a basis for the evaluation of the degree of preparedness (products, equipment, response) while the database developed within the DIMAS project forms an operational tool that can be readily used during pollution combating operations at sea.

<http://www.vliz.be/projects/mimac>