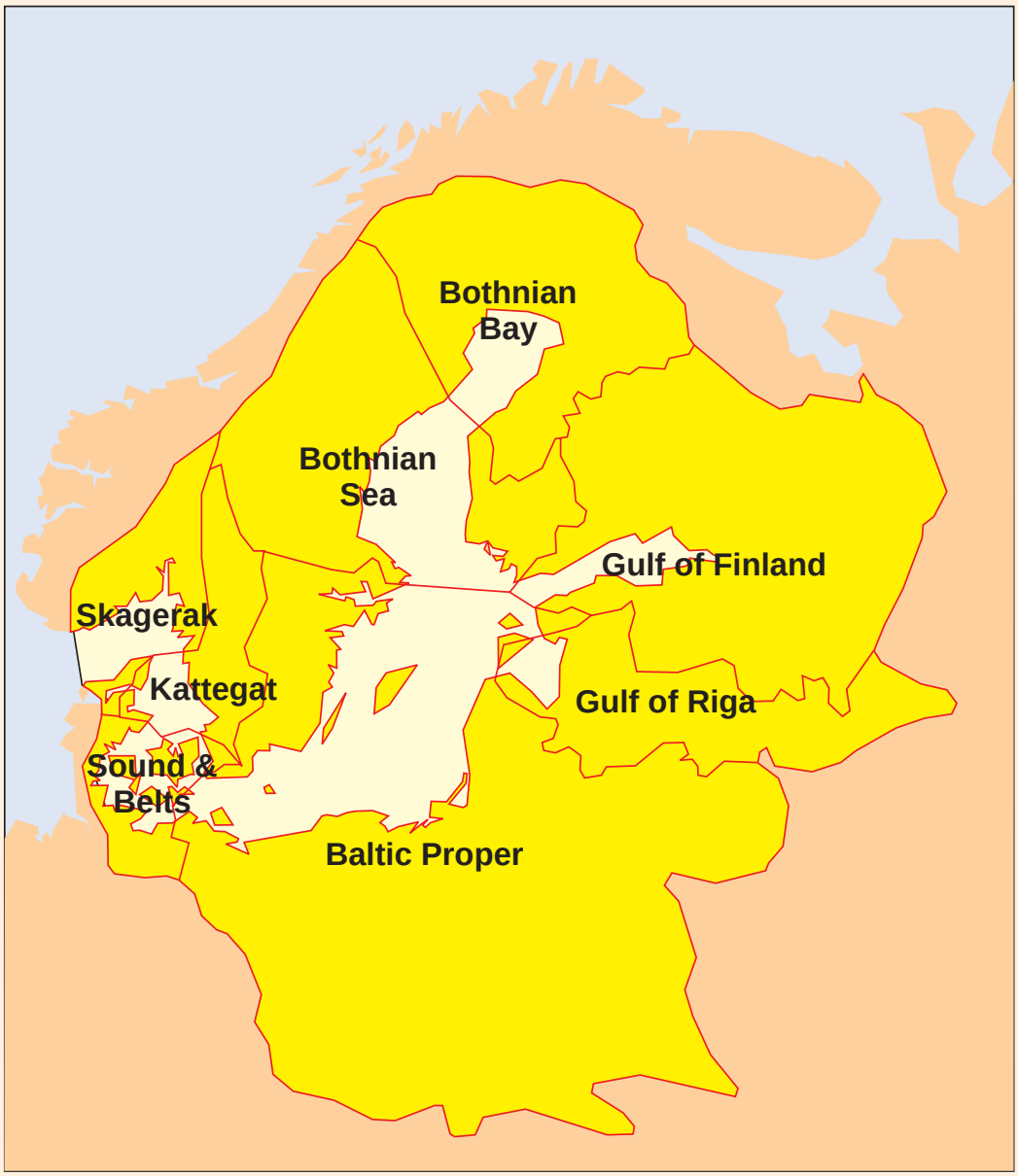
Environmental cycling of selected persistent organic pollutants (POPs) in the Baltic Region

POPCYCLING–BALTIC PROJECT



European Commission Directorate General XII Science, Research and Development

Objectives

The overall goal of the RTD project *"POP-CYCLING-BALTIC"* is to develop a comprehensive, multicompartmental model to study the fate and behavior of POPs in the Baltic Sea environment.

The following POPs have been selected:

- hexachlorocyclohexanes (HCHs),
- selected polychlorinated biphenyls (PCBs),
- hexachlorobenzene (HCB),
- dichloro-diphenyl-dichloroethane (DDE),
- benzo(a)pyrene (B(a)P), and
- selected dibenzodioxins and dibenzofurans.

Specific objectives of the project are:

Task 1. Model Development - to develop, evaluate, and use a non-steady state multimedia mass balance model that describes the fate of selected POPs in the Baltic Sea environment, in order to:

- examine physical, chemical, and biological processes resulting in the migration of POPs through the individual environmental compartments,
- assess the relative importance and absolute magnitude of various chemical inputs to the Baltic Sea,
- evaluate the relative importance of degradation, sediment burial, export in the atmosphere and outflow to the North Sea as loss mechanisms of POPs from the Baltic Sea.

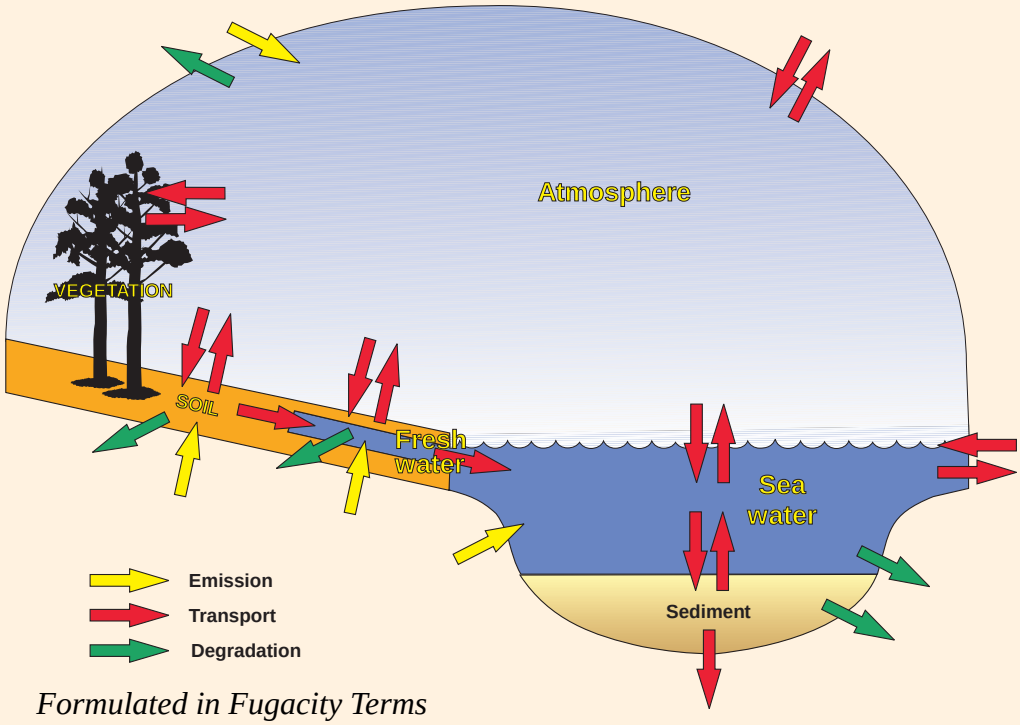
Task 2. Emission Database - to develop an emission data base for modeling purposes:

- review information on present emissions and fluxes
- assess historical emissions within and outside the study region.

Task 3. Environmental Database - to complete and update existing data base of levels of POPs in the countries around the Baltic Sea and use these data for verification of model results

Task 4. Recommendations - to prepare a set of recommendations with respect to the exposure and risk assessment for POPs in the Baltic Sea region.

Approach – Compartmental Mass Balance Model



Formulated in Fugacity Terms

Project methodology

The project is being carried out within three working groups concentrating on:

- emissions,
- compartmental modeling, and
- environmental concentration data.

Emission working group

An emission data base is being established on the basis of collected information and emission estimates within the project. The data base is structured along the major source categories agreed between the European Union program CORINAR and EMEP. It comprises information on sources (type and location), amount of activity, and amount of emitted POPs to the environment.

GIS is used to store the information on location and magnitude of POP discharges in the Baltic Sea region and to obtain information on spatial distribution of POP releases in the study region.

Model working group

The information on emissions/releases of POPs, available from the emission working group of the project, is applied in a non-steady-state multi-compartmental mass balance model based on the fugacity approach. Differences between urban and industrial centres and remote areas within one region are modeled by "nesting" small near-source compartments within the overall compartments representing a region.

Four major aspects related to the fate of POPs are studied with the help of the model:

- seasonal cycling,
- environmental gradients,
- land-air-sea-interactions, and
- long-term changes.

GIS is applied to the data on the environmental parameters which influence the fate of POPs, such as climatological parameters (temperatures, precipitation, sea ice cover, etc), water characteristics (e.g. concentration of suspended solids, primary productivity), and soil and sediment properties (mean depth, organic carbon content). These data are used to obtain realistic environmental input values for the model calculations.

The model results will be verified through the comparison with measurement data available from the environmental data base of the project.

Environmental data base working group.

The development of an environmental data base is the major task of this working group. The data base contains information on:

- congener and/or isomer specific concentrations of POPs,
- sample matrix,
- site,
- date,
- descriptors about data quality,
- information on detection limits, and missing data, and
- origin and reference of the cited data.

GIS will be used during the development of the environmental data base.

The final task of the project is the elaboration of the project recommendations with focus on exposure and risk assessment for POPs in the Baltic Sea region. GIS will be used to tie together the results of the work on emissions/releases of POPs, multimedia model, and environmental data base. This combined information will be used to elaborate a set of recommendations which will concentrate on the exposure and risk assessment for POPs in the Baltic Sea area. Through GIS the collected information will be displayed in an intuitive and easily comprehensible manner.

The duration of the project is from 1 June 1996 through 31 May 1999.

Participants

A short overview of the partners involved in the project:

	Organization name	Function (Participation in Working Groups-WG)	Responsible Scientist
	Norwegian Institute for Air Research (NILU), Norway	Coordinator, WG on Emissions, WG on Modeling, WG on Environmental Data Base	Dr. Jozef M. Pacyna, Project Coordinator Dr. Frank Wania Elisabeth Pacyna, M.Sc
	Swedish Environmental Research Institute (IVL), Sweden	WG on Environmental Data Base	Dr. Eva Brorström - Lunden
	National Environmental Research Institute (NERI), Denmark	WG on Emissions	Dr. Erik Runge
	University of Jyväskylä (UJ), Finland	WG on Modeling	Dr. Jaakko Paasivirta Dr. Seija Sinkkonen
	Dornier GmbH (DOR), Germany	WG on Emissions	Mr. Jorg Munch
	Institute for Ecology of Industrial Areas (IEIA), Poland	WG on Emissions, WG on Environmental Data Base	Dr. Ewa Marchwinska Dr. Janina Fudala
	Universita' Degli Studi di Milano (UDSM), Italy	WG on Modeling	Dr. Davide Calamari Dr. Antonio Di Guardo
	Stockholm University (SU), Department of Zoology, Stockholm, Sweden	WG on Modeling	Dr. Dag Broman
	Technical University of Gdansk (TUG), Poland	Subcontractor to NILU	Dr. Jacek Namiesnik Dr. Agata Kot
	European Commission, DG-XII		Dr. Hartmut Barth

More details

More details about the project is available from:

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