

## RELATIVE RISK APPROACH: A METHODOLOGY FOR THE ECOLOGICAL RISK CLASSIFICATION OF INORGANIC SUBSTANCES

Marie-Claude Sauvé, M. Beking, R. Bouwhuis, V. Dorais, J. Gauthier, J.R. Hill.

*Environment and Climate Change Canada, Science and Technology Branch, Ecological Assessment Division, Gatineau, Canada*

*Marie-Claude.Sauve@canada.ca*

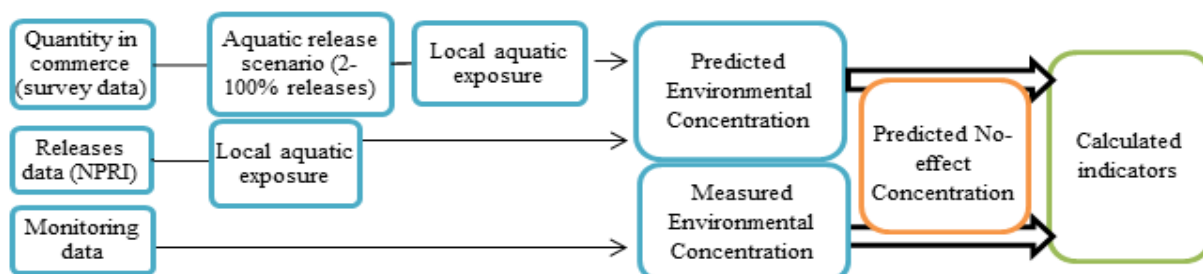
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### Introduction

Under the *Canadian Environmental Protection Act, 1999*, Environment and Climate Change Canada and Health Canada assess and manage, where appropriate, risks of chemical substances to the environment and to human health. The Chemicals Management Plan (CMP) is a Government of Canada initiative that addresses approximately 4300 substances identified as priorities for assessment. In the next phase of the CMP (2016-2020; Canada, 2016), about 1550 substances remain to be addressed, including approximately 380 inorganic substances. Early activities to address inorganic substances include identifying assessment data needs, developing tailored strategies and approaches, and early stages of assessment drafting. In particular, a relative risk approach is under development for identifying and classifying the potential ecological risks of inorganic substances as low, medium, and high potential for ecological concern. This approach considers both modelled (i.e. predicted) environmental concentrations—based on the solubility of the substances, estimated concentrations in effluent, and environmental release estimates from industrial and commercial use and from consumer activities—and monitoring and surveillance data of Canadian surface water concentrations. Both measured and predicted environmental concentrations are compared with the best available predicted no-effect concentration obtained from existing Canadian and international guidelines to provide indicators of relative ecological risk. The approach will be presented as a tool to classify the relative risk of inorganic substances.

### Methods

Predicted environmental concentrations were calculated using generic near-field aquatic release calculations. Substance function codes and North American Industry Classification System (NAICS) codes provided in a nation-wide industrial survey (EC, 2009; 2012) were studied to assign generic emission factors of 2%, 25%, or 100%, depending on the potential for aquatic releases. Other inputs include releases to water reported to the National Pollutant Release Inventory (NPRI, 1993-2016) and generic values for calculation of local aquatic exposure scenarios. Measured environmental concentrations were obtained from federal and provincial/territorial water quality monitoring databases. Relative risk indicators, as presented in Figure 1, were calculated as a metric of the ratio of exposure (modelled or measured) to effects.



**Figure 1:** Methodology for establishing indicators

## Results

Relative ecological risk ratings (high, medium, and low) for individual and groups of inorganic substances were assigned in a weight of evidence approach that considered the analysis of both the modelled and the monitoring indicators. Table 1 shows the ranking metrics used for the modelling analysis. The metrics used for the monitoring data analysis involved considerations of scope of national coverage, frequency of indicators >1, and the magnitude of indicators >1.

**Table 1.** Relative risk ranking for modelled indicator results

Category	Magnitude and frequency of the predicted no-effect concentration
High	More than one indicator >10
Medium	One indicator >10 or more than one indicator between 1 and 10
Low	Less than or equal to one indicator between 1 and 10

## Conclusion

The relative risk approach is an innovative and efficient method allowing the Government of Canada to focus its efforts on inorganic substances of highest concern. In addition, the approach will allow interested stakeholders and partners to provide further data to support the risk assessments. Risk classification could consider other factors such as coordination with on-going international activities and consideration of emerging science issues.

## References

Canada, Dept. of the Environment and Climate Change, Dept. of Health. 2016. *Early stakeholder engagement to help inform the plan to address the remaining 1,550 substances under the Chemicals Management Plan*. Canada Gazette, Part I, vol. 150, no. 6, p. 152-195.

EC [Environment Canada]. 2009 and 2012. DSL Inventory Update data collected under the Canadian Environmental Protection Act, 1999, section 71: *Notice with respect to certain inanimate substances (chemicals) on the Domestic Substances List*. Data prepared by: Environment Canada, Health Canada; Existing Substances Program.

[NPRI] National Pollutant Release Inventory [database]. 1993-2016. Gatineau (QC): Environment and Climate Change Canada. [http://www.ec.gc.ca/pdb/querysite/query\\_e.cfm](http://www.ec.gc.ca/pdb/querysite/query_e.cfm)