

FP7 Project ArcRisk: Arctic Health Risks: Impacts on health in the Arctic and Europe owing to climate- induced changes in contaminant cycling

May 2009 – January 2014

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Project website: <http://www.arcrisk.eu/>

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**Arctic Health Risks:
Impacts on health in
the Arctic and Europe
owing to climate-
induced changes in
contaminant cycling**



Topics addressed: FP7-ENV-2008-1

Topic: ENV.2008.1.2.1.2. Comparison of health risks in populations in the Arctic and selected areas in Europe due to the spreading of contaminants resulting from climate change.

Grant agreement: 226534

Project budget: 4.74 million Euro (EU contribution 3.5 million Euro)

Project duration: June 2009 - November 2013

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Scientific questions

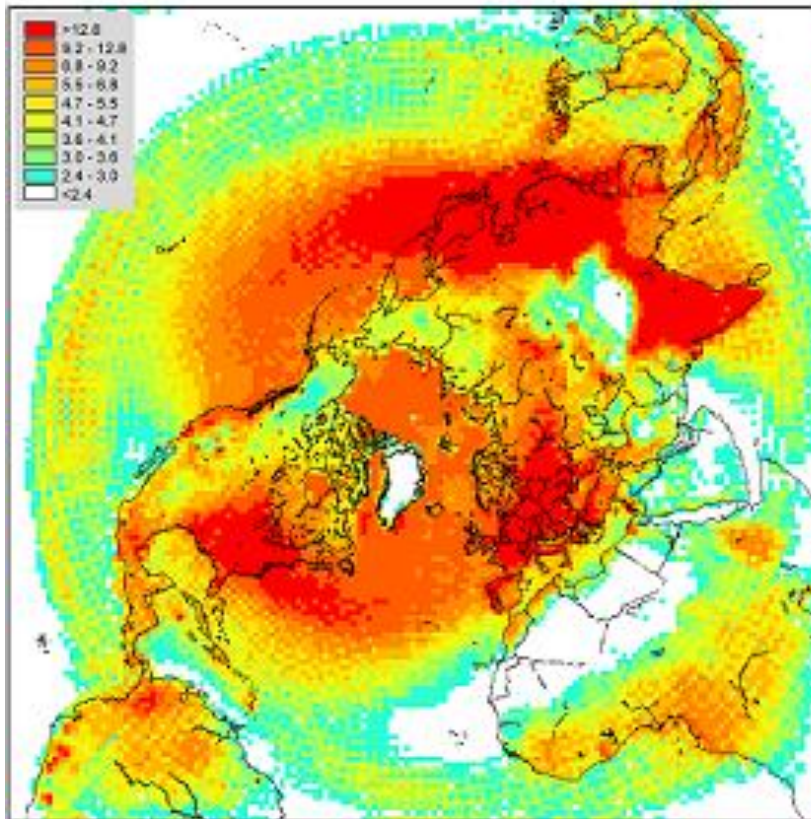
- How will climate change affect the long-range transport of chemical contaminants to the Arctic?
- How will climate change affect contaminant pathways and transfer in Arctic air, water and soil and the uptake of contaminants in marine and terrestrial food webs and ultimately into traditional food organisms?
- How will climate change affect human dietary exposure to contaminants in Arctic foods?
- What health outcomes may be linked to contaminant exposure in the Arctic and in selected European areas?

Scientific programme

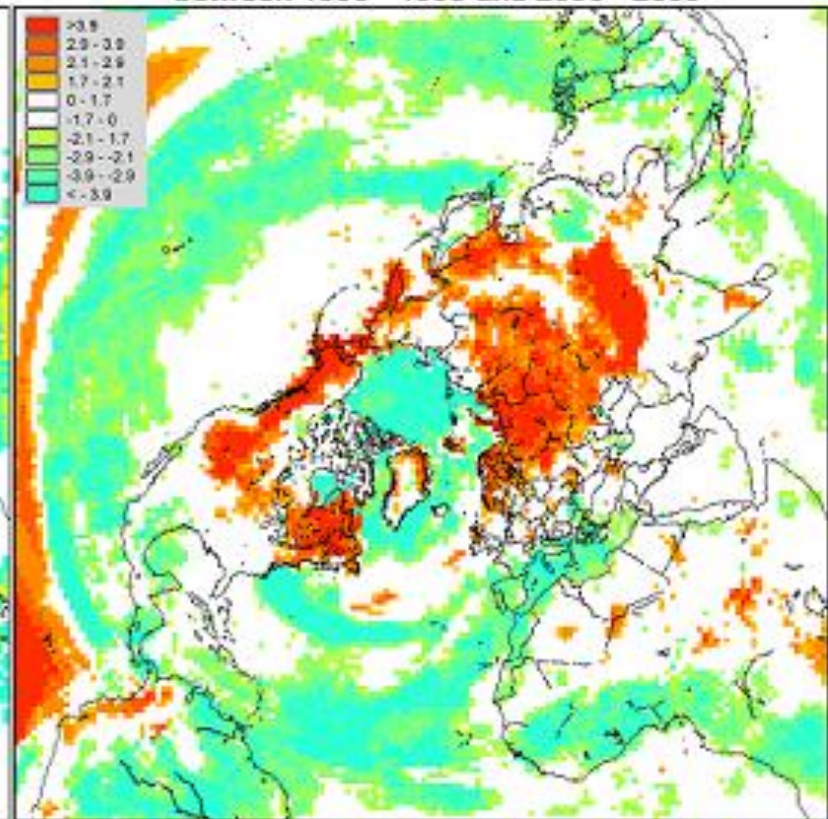
- Core contaminants: polychlorinated biphenyls (PCBs), pesticides (HCHs and DDTs), mercury, perfluorinated compounds
- Modelling: long-range transport of contaminants to the Arctic via the oceans and atmosphere transport and the effect of climate change
- Modelling: uptake and transfer of contaminants in an Arctic marine food chain and a Baltic Sea food chain for comparison
- Measurements: contaminant concentrations in air, seawater, sea ice, meltwater; marine lower trophic level, fish, reindeer, seals
- Human health outcomes: cohort studies and literature reviews of effects of contaminants on reproduction, cancer, childhood development, neurological/behavioural effects, endocrine diseases

Model results: Change in mercury deposition under climate change

Deposition rate of total mercury, 1990 - 1999 ($\mu\text{g}/\text{m}^2/\text{y}$)

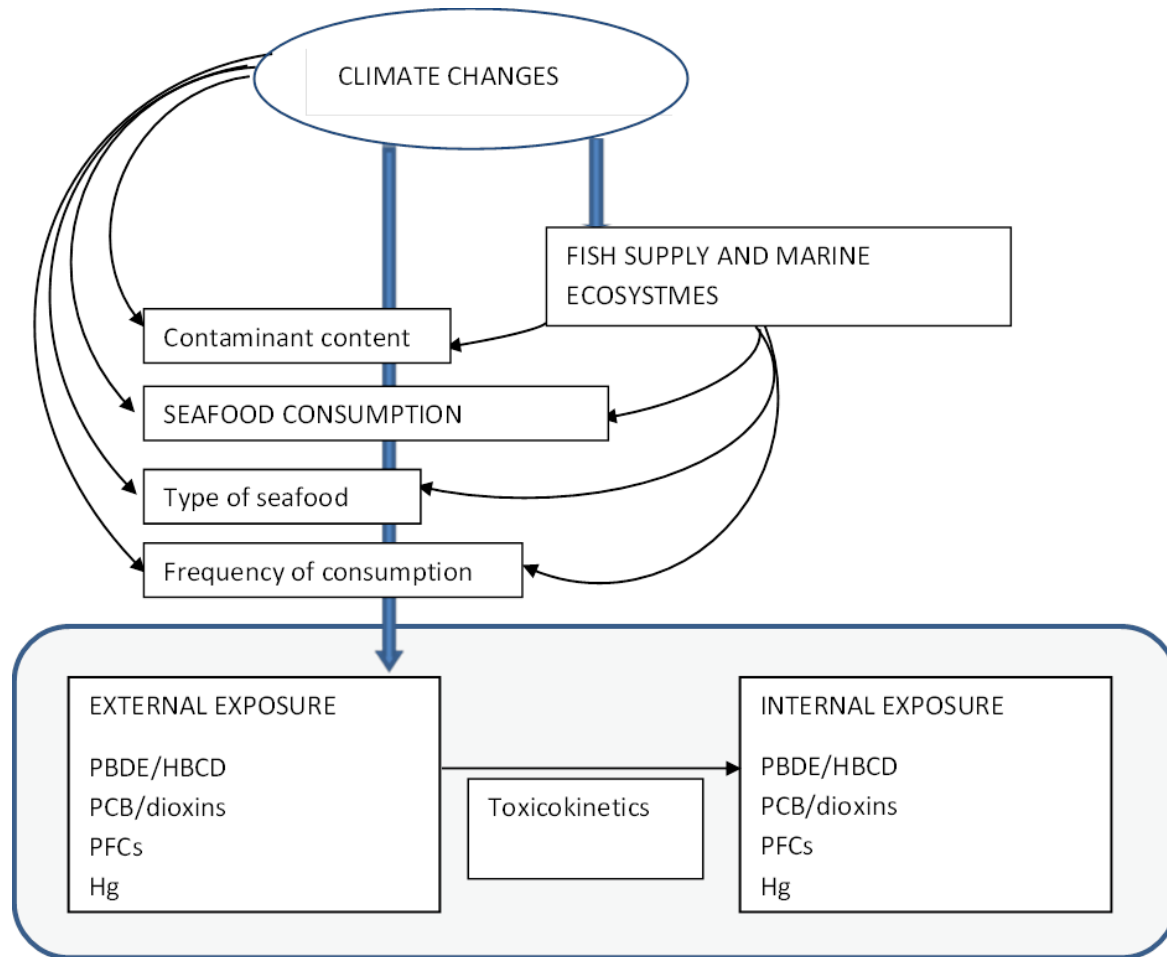


t-statistic for changes in mercury deposition between 1990 - 1999 and 2090 - 2099



Key conclusions on effects of climate change on contaminant distributions in the Arctic

- Climate change will affect the global distribution of 'legacy' contaminants but declines in concentrations due to phase-out of these chemicals will have a larger effect
- Using climate change scenarios for potential future-use persistent agricultural and industrial chemicals with a wide range of properties, changes in modelled contaminant concentrations in Arctic air and seawater ranged from 0.5 to 4 times higher for certain types of chemicals
- The loss of Arctic sea ice will change the distribution of volatile contaminants between seawater and air; higher temperatures will increase the volatilization of contaminants from soil and water to air and thus increase their transport to the Arctic, however, higher temperatures will also increase degradation of these contaminants

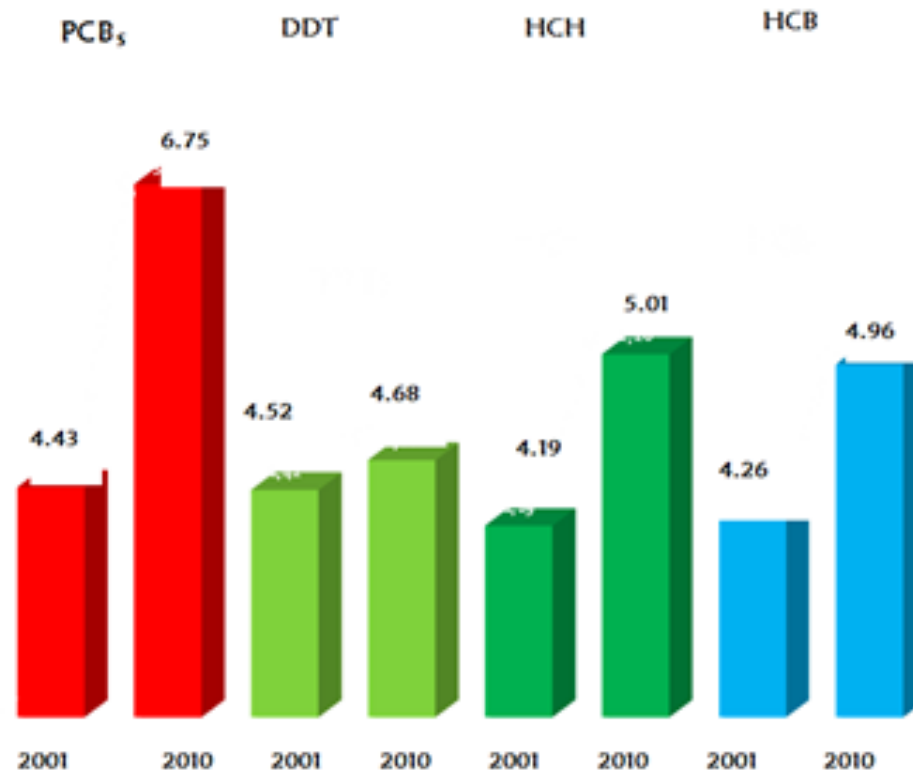


Based on current predictors of contaminant exposure, the influence of climate changes on future contaminant exposure will to a large degree depend on the consumption of fish and other seafood

Simplified causal diagram of how climate change may influence contaminant exposure via seafood consumption



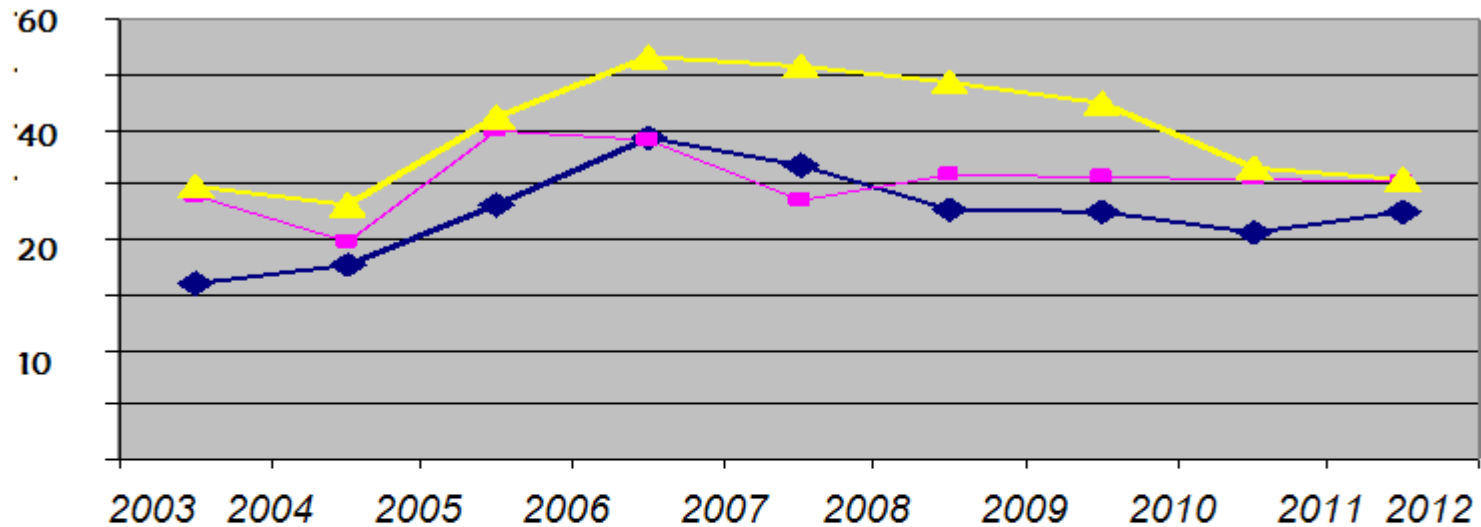
Serum concentrations of POPs in 10-year-old indigenous children



Temporal trend of the POP serum concentrations in the monitored cohort of indigenous children 10-yr old, µg/L

Odland, 2013

Annual incidence rates of diseases potentially associated with the exposure to POPs in indigenous population



Incidence rate of diseases associated with the human exposure to POPs, new cases per 1000

- ◆— Malignancies
- Adverse pregnancy outcomes
- ▲— Endocrine disorders



Contaminants and health outcomes

- Fish and other seafood products are the main sources of dietary contaminants, particularly mercury and POPs, but micronutrients and other components in fish and seafood have positive effects
- The effects of contaminants are most evident during foetal and early childhood development
- Determining the developmental and health effects of low-level contaminant exposure is very difficult
- Studies of effects usually relate to one or small group of contaminants but exposure is to many contaminants: 'cocktail'
- Regarding future contaminant exposure due to climate change, the impact of changes in contaminant concentrations in food will be small relative to the impact of changes in dietary behaviour



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Thank you!

