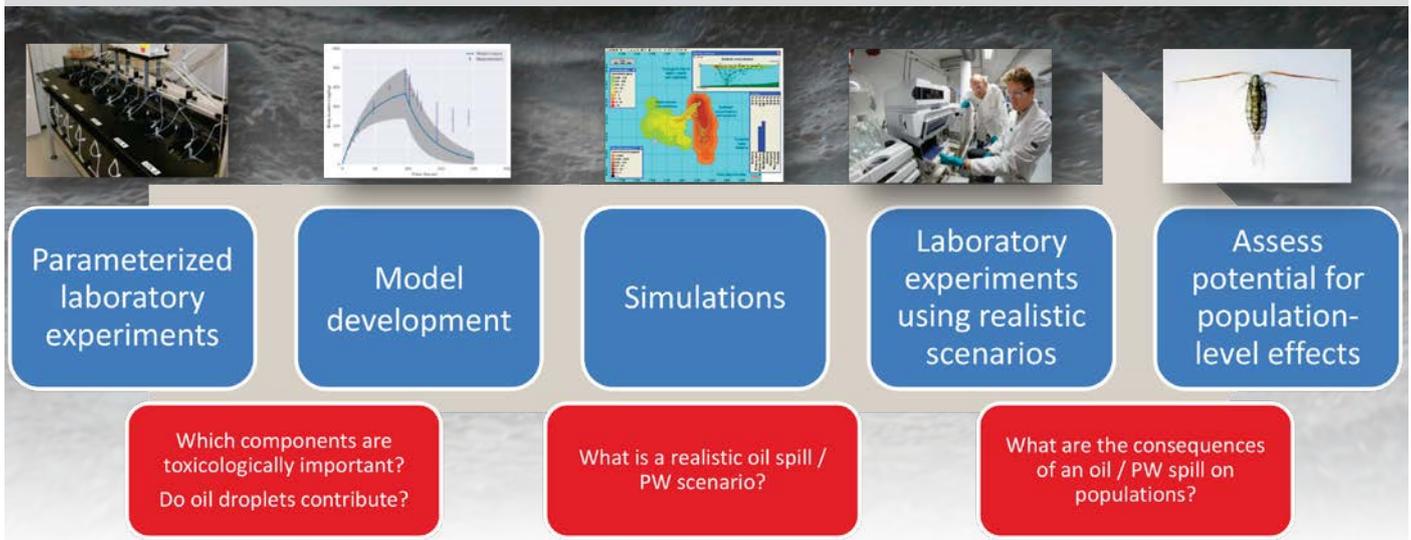


Environmental risk and damage

March 2015



Environmental risk and damage assessment of oil spills and produced water discharges

Combining ecotoxicology experiments with oil spill modelling

Relevant species: SINTEF has in close collaboration with NTNU and BioTrix maintained a continuous culture of the copepod *Calanus finmarchicus* at their joint Sealab facility. This is an ecological key species in the Northern Atlantic Ocean including the Barents Sea. We also work regularly with early life stages of fish (e.g. Atlantic cod).

Experimental facility: A custom-made exposure system has been developed by the SINTEF/NTNU Sealab group specifically aimed at producing controlled oil dispersion to be fed into a flow-through system for exposure of organisms. This system enables controlled experiments with dispersed oil and produced water (PW) including concentration gradients (constant, exponential, decay, spiked etc.), and oil micro-droplets (constant and differential droplet size distributions).

Numerical models: SINTEF has together with the industry developed numerical models for regular (DREAM) and accidental (OSCAR) discharges of produced water and oil. These models predict environmental transport, fate, environmental risks and effects of spills. Scenario simulations will provide input to the experimental design of environmentally realistic oil/PW spill scenarios.

Ecotoxicity studies serve two major purposes:

- Provide experimental data to improve quantitative predictions of models estimating environmental effects to support decision making (e.g. net environmental benefit analyses)
- Assess if realistic spill/discharge scenarios have environmental impacts by designing experiments to be as environmentally realistic as possible

Models are being developed and implemented into the large OSCAR/DREAM framework based on data acquired from targeted experiments.

Typical questions we can answer:

- Which constituents of produced water and oil contributes to and drives toxicity?
- Do oil droplets contribute to toxicity of spilled oil and produced water?
- Does the use of chemical dispersants increase the toxicity of spilled oil?
- How does oil exposure during early life stages of fish affect long-term fitness of the population?
- Would a realistic exposure scenario of PW result in population-level effects on key marine species?

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