

WORKSHOP SESSIONS

The Conference allocated two sessions to simultaneous Workshops. Participants were generally free to move from one workshop to another, but each Workshop had an appointed Rapporteur and Chairman. Discussions were intense, wide-ranging and often were continued later informally outside the Conference rooms.

The themes of the four workshops were:

1. Characteristics, behaviour and longevity of microorganisms in frozen ground, with regard to their use in bioremediation.

This workshop was presented in association with INTAS (European Community)

2. Large-area monitoring and assessment of ground contamination

This workshop was presented in association with the Arctic Monitoring and Assessment Programme (AMAP)

3. Fundamental studies relating to contaminant remediation.

4. Case histories and practical procedures.

Summary reports for the first three workshops appear below and on the following pages.

Characteristics, behaviour and longevity of microorganisms in frozen ground, with regard to their use in bioremediation

Chairman: Bernard Stonehouse

Rapporteur: Olga Tutubalina

The workshop started with a presentation by Lothar Beyer on microbial activity measurements for a soil quality assessment in an area of the Russian tundra highly contaminated by crude oil (Usinsk oil spill). The crude oil content in the soil reached 30% and such a soil would ideally be a subject of oil removal, remediation and recultivation. Suitable methods were needed to describe the soil quality after recultivation. The use of common enzymatic activity tests and microbial biomass determination was complicated because some of the enzymatic activities were enhanced by crude oil. Therefore the test methods themselves were tested for suitability and sustainability. Ecophysiological ratios, namely the ratio of the biogenic organic carbon (C_{biorg}) to the total nitrogen (N_t) proved the most successful indicators.

In the following discussion Bernard Stonehouse underlined that oil is a fertiliser and asked whether the soils in question had a high organic content, and whether there was a management strategy for the soils in the Usinsk region. Lothar Beyer illustrated the properties of one peat and two mineral soils in the study area and outlined the local treatment of the soils which consisted of removal of the crude oil (mechanically or by burning) and by planting of grass. After the removal a considerable amount of oil (up to 1.8 mg g^{-1} at 1 m depth) still remained in the soil. Vladimir Ostroumov then inquired what happened with oil in the bottom of the active layer, but the presenter noted that there was no significant permafrost in the areas studied. Further questions were on the soil water content (15 - 30%), methods to estimate specifically soil carbon (this was difficult, and the only indication of the oil carbon was the unusually high C_{biorg}/N_t ratio). Ivan Gogotov inquired about the properties of the oil contaminant and the nature of microorganisms in the area. He also proposed a general remediation approach: i) removal of the upper contaminated soil layer (15-20 cm); ii) immobilisation of the residual oil by phototrophic bacteria. The bioremediation would be facilitated by Usinsk's relatively hot continental summer. However, the focus of the presented project was rather on the methods for soil quality assessment than remediation, as it was important to develop indicators, not influenced heavily by the presence of the oil carbon. It was generally concluded that the current methods provided chemical, not biological measurement. Some agricultural guidelines for soil quality assessment exist for temperate regions, but are not applicable in the area. Peter Williams noted that even very low levels of contamination change microstructure