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EDITOR'S PAGE

ENVIRONMENTAL IMPACTS OF OIL SHALE INDUSTRY: DELIVERY OF SCIENTISTS' CLEAR MESSAGES NEEDED

Estonian oil shale industry has been repeatedly used to trumpet the careless attitude of humans towards the environment. Without any doubt, the quality of reclamation of the open pits could be higher. The organic contaminants leaching from waste heaps of chemical plants are causing severe problems, and ultra-alkaline leachate of power plant ash plateaus is hazardous. The decomposition of carbonates during combustion releases extra carbon dioxide, raising Estonia to the top of CO_2 emitters per capita. However, the pollution potential of the industry has been again and again connected with "legends", such as high releases of heavy metals. And, regarding the visual impact, I almost got beaten up by a hang glider in 1988, when taking samples from Kukruse waste rock dump. The reason was that I mentioned reuse of the waste as a possible outcome of the university's diploma project…

With Estonian oil shale industry being specific throughout the World, it is also by far the prevailing mining industry in Estonia. Therefore, the criteria of comparison of the environmental impacts of different mining activities are lacking, and the community is eager to accept myths such as those about heavy metals.

On the regional market, power generation based on Estonian oil shale has to compete with countries having high hydroenergy potential, nuclear power plants and thermal energy sources of higher calorific value. Tens of thousands of jobs, which in small Estonia mean the fate of the whole Ida-Virumaa region, depend on the continuation of the industry. The question, if the industry can operate environmentally friendly, gets automatically both 'Yes' and 'No' answers based on multiple opinions. The scientific background of these opinions, however, is often weak and based on some details in the overall fuel cycle.

In these conditions, *OIL SHALE* should accomplish the mission to provide policy- and decision-makers with scientifically justified environmental information and impact analysis of oil shale mining, chemical treatment and power generation. An important gap to fill is a comparison of the impacts of oil shale industry with other fossil fuel cycles and impacts of other industries in the international context. It has become more and more important that scientific research should deliver more clear and concise messages.

Bringing some examples, the mineral composition of kukersite oil shale is such that acid drainage has never been and will never be a problem in the mining area. Although 10 g of pyrite is able to lower the pH of 300 liters of water to 3 when oxidized, and the waste of oil shale mines contains over 3 Mt of pyrite, the calcite content of kukersite is so high that acidity is immediately buffered. Heavy metals are rather immobile in near-neutral pH range. Thus, the content of heavy metals in the water pumped out is only slightly above the natural background values and well below the maximum permission limits.

The same cannot be said about Dictyonema oil shale in Maardu phosphate mine dumps: pyrite of the shale is actively oxidizing and the shale contains only trace amounts of carbonates. Although buffering limestone as a part of the overburden is available, it is disposed as big lumps and gets covered by hydroxides and sulfates. The risk of acid breakthrough is highest in the north-eastern part of the Maardu site, where the limestone layer in the overburden was thinnest. Maardu site needs definitely additional investigations.

The risk of spontaneous combustion is connected with both oil shale types in Estonia – kukersite and Dictyonema shale. Although during the last decade no new fires have followed, the risk still remains and is especially important to account for, when any kind of developments foresee reallocation of the waste, or someone will have a "brilliant" idea to light a bonfire on a waste heap…

The hydrochemical calculations have shown that the ash plateaus of power plants will generate ultra-alkaline leachate (with the highest pH measured at 13.6) for hundreds of years. The problems will possibly be larger when the sites are abandoned so that no water is circulated between power plants and ash lagoons.

The developments initiated by the higher taxation of chemical plants waste have taken rather ridiculous character. For a chemical plant, it is cheaper to declare all semicoke as a raw material for soil production, or alternatively to transport the waste into combustion plant where after burning the class of hazard is lowered. These developments, however, do not decrease significantly the already accumulated pressures to the environment. The chemical plants have been polluting the surroundings for decades, and the already polluted soils, surface water and groundwater are the problem areas that should be approached in first order.

These were just some examples of the problems and sites to which more detailed further research should be orientated. At the same time, similar problems related to the exploitation of oil shales are expected to appear throughout the world. *OIL SHALE* is expected to provide high-quality environmental information and deliver clear messages based on comparative fuel cycle analysis.

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The scientific work is concentrated on physical-chemical modelling of the processes at mining areas and solid waste disposal sites. Currently, my role in the EU project PECOMINES (2001-2003) as a national detached expert from University of Tartu to EU Joint Research Centre (Ispra site, Italy) is to compile an inventory and environmental impact assessment of mining sites and mining waste in 10 EU Candidate Countries.

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