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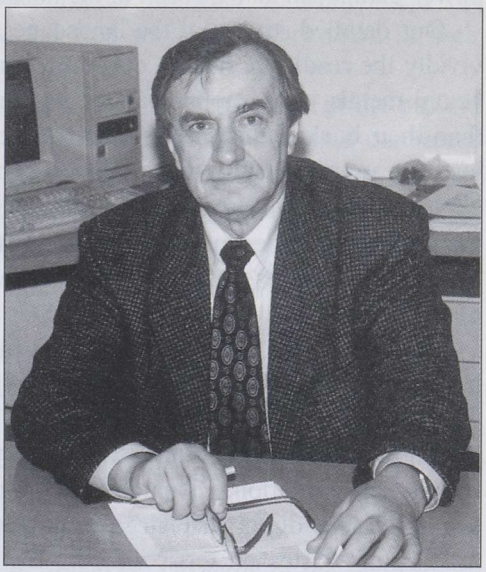
EDITOR'S PAGE

OIL SHALE AND THE ENVIRONMENT



Estonian oil shale was formed in a shallow-water sea basin more than 400 million years ago from mud-like sediments of plant and animal origin by the process of bituminization. It took millions of years of continuous solar energy to photosynthesize the organic matter that forms the basis of more than 6,000 million tons of oil shale. About 1,600 million tons of this accumulated oil shale has been excavated during the last 50 years.

The main principle of the sustainable development declares that we should pass the world to our children in the same condition it was when we inherited it from our parents. Unfortunately the next generation cannot expect to inherit the energy from the Sun accumulated into oil shale during the Ordovician time.

During the last century the attitude towards oil shale has been controversial: it has been glorified as an undervalued raw material for generation of power and for chemical industry. At the same time it has been viewed as a source of environmental damage and economic mismanagement.

In any case, oil shale played an important role in restoring the Estonian political and economic independence in the early 1990s.

The number of people in the world today exceeds 6 billion. Each one of these people needs more than 300,000 kcal of energy a day. At present this kind of energy is mainly available in the fossil fuels. In Estonia, oil shale is the source of this energy. During the peak of power production in Estonia, tens of millions of tons of oil shale were mined every year. Naturally, this mining process is connected with the increase in entropy and with the disturbance of the biogeochemical cycling in the environment.

Excavation of oil shale leads to decline of groundwater horizons and degradation of the quality of fields and forests. In Estonia, the affected area exceeds 45,000 ha, which makes up about 1 % of the total Estonian territory. The number of the environmental problems that follow the burning and

processing of oil shale is remarkable. More than 320,000 tons of fly ash passed through the filters and was emitted into the atmosphere annually in the 1980s. The alkaline oil shale fly ash is characterized by high concentrations of several heavy metals and harmful organic substances. An essential part of these substances was carried to neighbouring countries Finland and Russia by winds. But the impact of the atmospheric depositions emitted by our giant power plants can also be seen in the northeastern part of Estonia.

Our detailed studies of the landscapes in northeastern Estonia demonstrate vividly the results of human consumption: the increase in the content of some heavy metals in the upper part of peat layers is as much as 20 times higher than their background values, and the lacustrine sediments formed during the last 50 years contain much higher concentrations of almost all chemical elements. We can trace disturbances in the ecosystems to the sharply increased atmospheric fluxes – alkalinization, disturbances of the plant cover on the peatbogs, essential changes in the fauna in the lakes, and degradation of the forest.

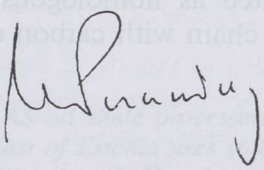
Burning of oil shale in the power plants also results in the emission of huge amounts of CO_2. CO_2 is one of the greenhouse gases that may cause the warming of the Earth's surface.

And that is not all. Chemical industry based on oil shale is a very active source of pollution. Though the purification systems nowadays have decreased the direct discharge of pollutants into the environment, a huge amount of wastes on terricones are the sources of harmful products. Since Estonia is situated in the Baltic Sea catchment basin, the pollutants will sooner or later reach the sea. Even the closing of mines and openpits leads to problems. These are real chemical time bombs, left in Estonia by the intensive oil-shale-based power and chemical industry.

A large number of scientific papers and monographs have been published to discuss the impact of different environmental problems caused by mining and exploitation of oil shale. This special volume of *Oil Shale* deals with different aspects of these issues. For the purpose of the study of landscape and ecosystem, it is very important to understand the processes that assist in the formation of the near-surface pollution fields and influxes of atmospheric impurities to the earth's surface. The long-term monitoring data makes it possible to develop and test methods and principles of compiling maps of dispersion of atmospheric pollutants. This allows us to estimate the proportion of long-range transported influxes. It is more complicated to estimate the impact of atmospheric pollutants on different terrestrial ecosystems. The impact of pollution factors on vegetation may be sufficiently amplified by the local natural conditions such as quality of soils, interspecific competition, succession etc. Nevertheless, the ecophysiological and palaeo-ecological studies show that the state of the forests is dependent on the distance of emission sources like big oil-shale-operating power plants.

The results of the processing of oil shale are also evident in lake sediments. Sediment analyses show essential disturbances in the biogeochemical matter cycling in the lakes. This is especially evident in the layers deposited during the 1980s. Remarkable changes in the composition of these layers indicate changes in the external load of the lakes. In some cases these changes have irreversible consequences. Comprehensive studies are carried out to estimate the intensity and character of matter fluxes in order to understand the inertness and tolerance of the lakes and find ways to restore them to their original condition.

The time of cheap energy is over. So is the use of oil shale in the present way. In the future, the oil shale price must include all expenses connected with the study, restoration and management of the resulting stressed ecosystems. And maybe we will find more valuable purposes for this unique resource, other than the generation of power and environmental problems.



J.-M. PUNNING

Professor, Doctor of Geographical Sciences, Director of the Institute of Ecology at Tallinn University of Educational Sciences, a member of the Advisory Board of the journal Oil Shale ***Jaan-Mati PUNNING*** *celebrated his 60th birthday on March 13, 2000.*

We wish him good health, continuous enthusiasm and further co-operation.

Oil Shale *Editorial Board*
and Editorial Office

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ADDITIONS AND CORRECTIONS

***OIL SHALE* 1999, Vol. 16, No. 3: *Ü. Lille* "On the Origin of 5-alkyl-1,3-benzenediols in the Retort Oil of Estonian Kukersite"**

On page 232, in the fourth paragraph from above, the number marking the preferential content of 5-alkyl-1,3-benzenediols on the kerogen is erroneously too high (**8** %). Please read the above-mentioned sentence as follows:

In the 1960s Ü. Lille ([9-12] and references therein) and co-workers established the preferential content of 5-alkyl-1,3-benzenediols (5-alkylresorcinols) in the retort oil of kukersite (ca **2** % on the kerogen), represented as homologous series from 1 to 17 carbon atoms in the alkyl chain with carbon atom preference 13, 15, 17 in the latter region.

EDITORS