Environmental impact from shale waste deposits in Sweden and Estonia – a comparison

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Oil was extracted from kerogen bearing oil shale in mid Sweden during WW2, but also still today in Estonia. Despite the fact that shales both from Sweden and Estonia have been used for production of hydrocarbons the remaining waste behaves very differently.

Two waste piles have been compared; one in Sweden (Kvarntorpshögen, 28 Mton, black alum shale, 18% kerogen [1]) and one in Estonia (Kukruse, 1.3 Mton, kukersite, 10-65% kerogen [2]). Both piles were created during roughly the same time period (1942-1966 for Kvarntorp and 1951-1967 for Kukruse).

Both waste piles are quite large and both are still generating heat (above 700 °C) after self ignition. Gaseous emission of TOC from both piles is high while only Kvarntorpshögen emits SO_2. However, the chemical composition of the waste is different; Kukruse has very low trace element (Mo 2 and V 10-15 mg/kg dw) and high hydrocarbon concentrations [2] while the trace element concentrations in Kvarntorpshögen are much higher (Mo 114 and V 126 mg/kg dw) and the hydrocarbon concentrations much lower.

Pyrite in Kvarntorp generate some ARD and higher trace element concentrations in the groundwater [1]. Mo and U concentrations as high as 935 µg/L and 1 760 µg/L, respectively. Groundwater at Kukruse is circum neutral and contain very low trace element concentrations (Mo 2.5-11 µg/L) while the hydrocarbon concentrations are much higher (free phase noted).

To summarize; despite the fact that both waste deposits have been generated from the same process and still after 50 years are burning the environmental impact is very different.

Both waste deposits will likely see an increase in the environmental impact when the piles cool off and start generating more contaminated drainage (today most precipitation is evaporated).

[1] Bäckström, M. (2010) In: Wolkersdorfer, C. and Freund, A.; Mine Water & Innovative Thinking, p. 551-554, Sydney, Nova Scotia, CBU Press, ISBN 978-1-897009-47-5
[2] Tamberg, I. and Hansen, R. (2015) Project 2.1.0301.14-0005, Infragate Eesti AS, 108 pp. In Estonian.