Long-Term Impact of Oil-Burning on the Environment of Kuwait

Samira A. Omar[1] , Gerard. Grealish[2], Mike. Quinn[3] and Waleed Roy[3]

[1]Aridland Agriculture Department, Food Resources Division, KISR
[2]AACM International, Adelaide, Australia
[3]Department of Advanced Systems, Environment and Urban Development Division, KISR

KUWAIT INSTITUTE FOR SCIENTIFIC RESEARCH
PO BOX 24885
13109 SAFAT
KUWAIT

ABSTRACT

During the Gulf War in 1990/91, the Kuwait desert environment was polluted by the formation of oil lakes and oil-contaminated surfaces resulting from the sabotage of the oil infrastructure by the retreating Iraqi troops. Oil-producing wells were set ablaze and damage to others allowed crude oil to flow freely. The oil formed networks of oil rivers and oil lakes that accumulated around oil wells and in relatively low areas. Soot from the burning oil was deposited over the surrounding land surface across large distances. Near the burning wells, oil mist and soot combined to form tar mats.

The purpose of this study was to determine the magnitude of oil damage still present almost ten years after extinguishing the oil fires, in two the largest oil-fields in Kuwait namely: the Greater Al-Burqan (56,245 ha) and As-Sabriyah / Ar-Rawdatayn oil fields (30,160 ha). The objectives of the survey were to: 1) categorize the types of damage; 2) map the extent of damage; and 3) estimate the volume of contaminated soil.

The field survey identified four types of oil-contaminated soil layers (liquid oil, oily soil, tar mat and soot) and a 'clean' soil type, where no oil contamination was observed. Field observation, laboratory data (TPH, Heavy metals, EC and PH) and laser-induced fluorescence measurements supported these groupings. Mapping

of each group was conducted by using GIS. A map at scale 1:50,000 was generated from the data that showed the distribution of contamination. In Greater Al-Burqan, 37,115 ha (66% of the total area) was contaminated, and in As-Sabriyah/Ar-Rawdatayn, 16,859 ha (54% of the total area). Contaminated areas were mapped as oil lake, dry oil lake, tar mat, and soot.

Area measurements combined with contaminated depth measurements made in the field, for each of the categories, provided an estimated total average contaminated soil volume of about 31.3 million m^3. The bulk of the contaminated soil occurs in the dry oil lake map unit areas and the oil lake areas. The dominant type of contaminated soil is 'oily soil'. Results of this study on volume data can be used to assist with identifying remediation and rehabilitation measures. Soil management for each contamination category, is proposed in the study. Further work is now required to determine the risk posed by each contamination category, which is a function of the hazard (i.e., does it affect human health or the environment) and exposure to the hazard. The destruction of Kuwait's oil production industry, at the conclusion of the Iraqi occupation in Kuwait, resulted in extensive pollution of the environment that will take several decades to recover.

KEY WORDS

Soil, oil contamination, field survey, laser-induced fluorescence, map, pollution, environment.