



United Nations
Environment Programme

UNEP Ogoniland fact sheet



Explaining the science

Ogoniland, a kingdom in Rivers State, Nigeria, has a tragic history of pollution from oil spills and oil well fires. The *Environmental Assessment of Ogoniland* is a scientific study of the environmental and public health impacts of the ensuing oil contamination in Ogoniland.

The report provides the scientific basis on which a concerted environmental restoration of Ogoniland can begin. This fact sheet explains some of the basic science underpinning the study.

Sampling fieldwork

Teams from the United Nations Environment Programme (UNEP) travelled throughout Ogoniland taking samples of soil, groundwater, surface water, sediment, fish tissue and air.

The samples were collected according to internationally-accepted procedures which, for example, involved placing sediment samples in coolboxes on-site to conserve their organic compounds. Each sample was given an identification number, and the location and collection date were logged.

Substances analysed

As the assessment set out to determine the nature, extent and impacts of oil contamination, the many samples – more than 4,000 – were analysed by accredited laboratories in Europe to determine which polluting substances were present and their quantities in different locations.

The terms ‘hydrocarbon’ and ‘Total Petroleum Hydrocarbons’ or ‘TPH’ are widely used in the report. TPH are the family of hydrocarbons which originate from crude oil.

The substances – or analytes – examined in the study include certain groups of hydrocarbons that are known to have adverse impacts and which are therefore dealt with selectively in oil-spill assessment and clean-up work.

For example, one is the chemical benzene which is known to cause cancer. Benzene is present in small quantities in crude oil but occurs at substantially higher quantities in refined products, such as petrol. Another group of compounds which is present in crude oil, called volatile organic compounds, was the main target of UNEP’s air quality investigations.

Satellite images

Extensive analyses of satellite images complemented the fieldwork. These images are complex digital photographs of an area taken from a satellite and can provide a variety of useful information in an environmental study. Field visits can provide data and observations from the ground on the date of a visit, whereas satellite images can provide a history of sites covering many years.

Key terms:

Hydrocarbons – naturally occurring organic compound comprising hydrogen and carbon (most common are natural gas and oil)

$\mu\text{g/l}$ – microgram per litre

mg/kg – milligram per kilogram

How to interpret the data

The presence of a hydrocarbon by itself does not indicate serious harm to public health or the environment. The Nigerian Government and international bodies, such as the World Health Organisation, set standards and guidelines as to what levels of pollution are harmful.

The key to interpreting the data gathered during UNEP's assessment is to compare the measured values of the different substances with the relevant Nigerian or international standards.

For example, the Nigerian national standard for the amount of TPH that when present in soil or sediment should trigger efforts to clean it up – referred to as the 'intervention value' – is 5,000 milligrams per kilogram (mg/kg). This level is defined in legislation (the Environmental Guidelines and Standards for the Petroleum Industries in Nigeria or 'EGASPIN') as indicating the quality for which the functionality of soil for human, animal and plant life are, or are threatened with, being seriously impaired.

Thus when the data shows, for example, that the concentration of TPH in soil in Nweekol community in Ogoniland was as high as 63,800 mg/kg – or more than 10 times above the intervention value – it can be seen why this is considered to be a heavily contaminated land site. This should prompt action to prevent people from accessing the site and to begin remediating it.

For groundwater, the study found that at 41 sites, hydrocarbon pollution has reached the groundwater at levels in excess of the Nigerian standard of 600 micrograms per litre (µg/l). The table below shows the sites in Ogoniland with the five highest concentrations of TPH in the groundwater. The local government area of the site is shown in brackets.

Site	Maximum groundwater TPH (µg/l)
Okuluebu Ogale (Eleme LGA)	2,740,000
Bara-Alue (Tai LGA)	1,760,000
Ajeokpori-Akpajo (Eleme LGA)	1,720,000
Korokoro (Tai LGA)	1,180,000
Kpite/Biara (Tai LGA)	1,140,000

Drinking water standards apply when a source of water – regardless of whether it is above or below ground – is used for drinking by the community. The Nigerian standards set 3 µg/l as the acceptable level of hydrocarbons in drinking water. Therefore, this indicates the groundwater from all 41 sites mentioned above (not just those listed in the table) is not suitable for drinking by the community.

As a further example, while Nigeria does not have a specific provision for benzene concentrations in water, the World Health Organization guideline is 10 micrograms per litre (µg/l). The concentrations of benzene detected in five wells in Nsisioken Ogale in Ogoniland exceed the WHO guideline by up to 900 times. The report therefore recommends emergency measures to reduce the health risk to the Nsisioken Ogale community.

More information

The *Environmental Assessment of Ogoniland* report is available at: www.unep.org/nigeria
Tables listing various standards are in Chapter 3.

August 2011