



Management of petroleum hydrocarbon contaminated sites in Nigeria: Current challenges and future direction



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ABSTRACT

Sites affected by petroleum hydrocarbons from oil exploitation activities have been identified as a major environmental and socio-economic problem in the Niger Delta region of Nigeria. The current Nigerian regulatory instruments to manage these contaminated sites are fragmented and the roles and responsibilities of government agencies, such as the Department for Petroleum Resources (DPR), and the National Oil Spill Detection and Response Agency (NOSDRA), are not well defined. This lack of coordination has led to ineffective land contamination policy and poor enforcement more generally. Appropriate, risk-based policy instruments are needed to improve regulatory capacity, and to enhance the regulator's ability to manage new and existing petroleum hydrocarbons contaminated sites. Lessons can be learned from countries like the United Kingdom (UK) and the United States America (USA) that have experience with the management and clean up of historically contaminated land. In this paper, we review the status of petroleum hydrocarbon contaminated sites management in Nigeria and identify the gaps in existing policy and regulation. We review the contaminated land policies and regulation from the UK and the USA, and identify lessons that could be transferred to the Nigerian system. Finally, we provide a series of recommendations (e.g. source – pathway–receptor approach, soil screening criteria, clean-up funding, liability) that could enhance contaminated land legislation in Nigeria.

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1. Introduction

The Federal Republic of Nigeria, commonly referred to as Nigeria, is located in West Africa, covering an area of 923,773 km² (Nwilo and Badejo, 2006), and is comprised of 6 regions, 36 states, and 774 Local Government areas (Adeyemi, 2013). Nigeria has a diversity of natural resources, such as bitumen, coal, iron ore and crude oil. Nigeria is the 12th largest producer of petroleum hydrocarbons in the world and its main oil producing region is the Niger Delta. The Niger Delta is located at the apex of the Gulf of Guinea on the west coast of Africa and within Nigeria's southern geopolitical zone (Fig. 1). Approximately 31 million people live within the Niger Delta (NDDC, 2014). Geographically, the Niger Delta (Fig. 2) covers an area of 112,000 km² and encompasses one of the most bio-diverse ecosystems on the planet (Ugochukwu and Ertel, 2008). Ecologically sensitive regions include, for example, coastal barrier islands, mangrove swamps, and freshwater swamps (NDDC, 2014).

In the late 1950s, Britain (British Petroleum) discovered crude oil in the region and in 1958 the country started commercial pro-

duction at Oloibiri – a village in the Niger Delta – producing 6000 barrels per day (Kadafa et al., 2012). Today, about 606 oil fields (355 situated onshore and 251 offshore), 5284 oil wells, and 7000 km of oil and gas pipelines are operated by 13 multi-national companies in the region (Nwilo and Badejo, 2006; Kadafa, 2012). The region prides itself as the hub of oil exploration and production infrastructure in Nigeria (Eke, 2016), and currently produces on average 1.7 million barrels per day as of 2015 (OPEC, 2015).

The oil sector has become vital to the Nigerian economy. Reports estimate the export value of oil from the region to be \$89b USD per annum (OPEC, 2015), or in excess of \$600b USD since 1960 (Ite et al., 2013). This translates into a contribution of up to 35% of Nigeria's gross domestic product (GDP), and over 90% of its foreign exchange wealth (Akpabio and Akpan, 2010; OPEC, 2015). Despite the country's oil wealth, the majority of the population, including the oil producing communities in the Niger Delta, remain relatively poor (Eke, 2016). The common employment is agriculture, food production, and fisheries (NDDC, 2014).

The Niger Delta has been reported as one of the most heavily oil-impacted regions in the world due to over five decades of oil exploitation activities (Zabbey and Uyi, 2014), coupled with poor management practices that have led to the contamination of soil and groundwater resources. Since the inception of the Nigerian oil

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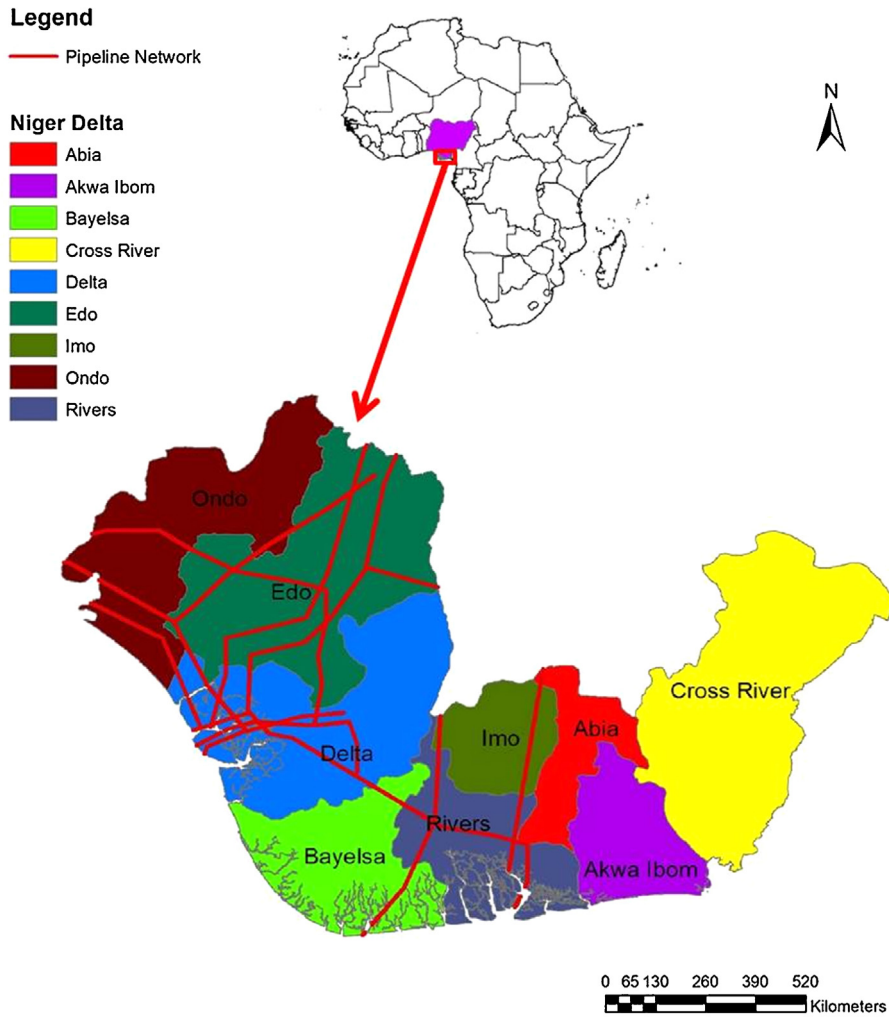


Fig. 1. Map of Africa showing the Niger Delta region (red box) and oil pipeline network (red lines). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

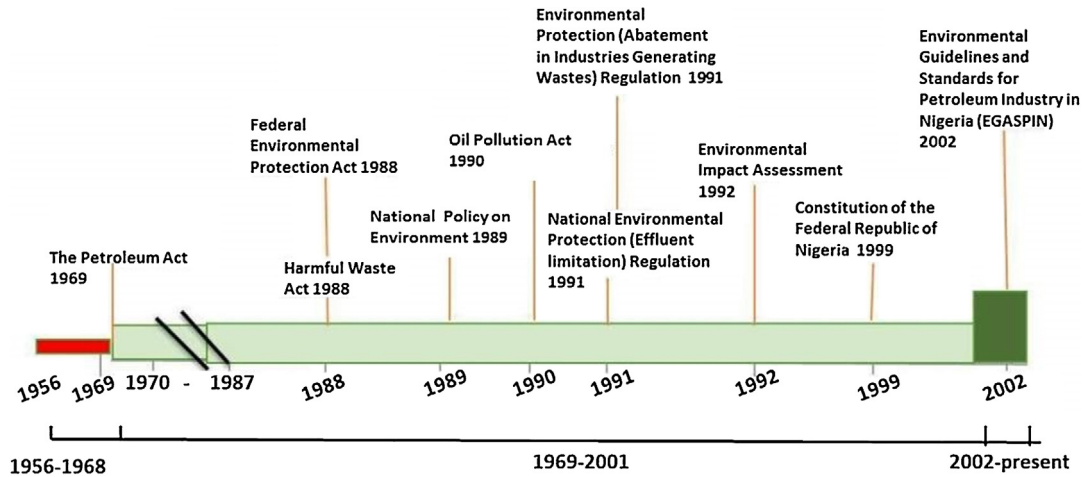


Fig. 2. Timeline presenting the development of contaminated land management policy in Nigeria from 1956 to present. Red – period of no legislation; light green – period of non-specific legislation; green – period of specific legislation. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

sector, 13 million tonnes of hydrocarbons have been reported as spilled in the Niger Delta (Nwilo and Badejo, 2006; Kadafa, 2012) as a result of sabotage, pipeline vandalism (individuals that break pipeline during oil theft), well blowout, and engineering failure (e.g.

pipeline rupture) (Nwilo and Badejo, 2006; Ambituuni et al., 2014; Könnet, 2014). Considerable oil contamination of the land has been reported (Ite et al., 2013; Linden and Palsson, 2013) and recent esti-

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