Environmental impacts of offshore pile driving on marine mammals in Red Sea based on range-dependent acoustic model

Waled A Dawoud\(^1\), Abdelazim M Negm\(^1\), Nasser M Saleh\(^2\) and Mahmoud F Bady\(^1\)

\(^1\)Egypt-Japan University of Science and Technology (E-JUST), Egypt
\(^2\)Benha University, Egypt

The Red Sea is one of the most important repositories of the marine biodiversity in the world, it support populations for many species of marine mammals (about 15 species of dolphins and whales, and one dugong species). These marine resources have attracted the attention of tourists and increase tourism contribution to the Egyptian economy. At the same time, Red Sea oil and gas reserves are estimated to be around 100 billion barrel of oil equivalent. Kingdom of Saudi Arabia is planning to employ 200 drilling rigs in 2014 most of it will be in the Red Sea. Most of offshore drilling rigs and production platforms are found on group of large diameter piles which are driving into sea bed producing high amount of underwater noise propagating up to a distance of 100 km. Under-water noise emitted during pile construction can mask biologically relevant signals for marine mammals which use sound as a mechanism to navigate and communicate. This noise might lead to behavioral reactions, and at very high levels can injure or even kill them. The potential for underwater noise to affect marine mammals depends on how well the animal can hear the noise. Noises at frequencies can’t be heard well by the mammal are less likely to disturb or injure them except when the sound pressure is so high that it causes physical injury. For sound levels that are too low to cause physical injury, frequency weighting based on audio grams relevant to those species’ hearing sensitivities can be used to weight the importance of those sound levels. Cumulative sound exposure level was found to be the most appropriate measure for evaluating likelihood of injury because pile driving is an ongoing impulsive activity that will occur throughout the construction phase. Range-dependent Acoustic Model was used to assess underwater noise propagation of offshore pile driving taking into account sea bed bathymetry and salinity. It was found that a hammer of 320 kJ rated energy can cause harassment to the marine mammal within a distance of 3.0 km for continuous pile driving and 1.2 km for impulsive pile driving, and it can injure the mammal within 100 m from pile location.

Biography

Waled A Dawoud gained a Master’s degree in Numerical Techniques in Tunnel Analysis. He has more than 10 years of experience in geotechnical modeling and environmental design. He has a good experience in hydro-geological and contaminant transport modeling gained through his work in Middle East. He is now preparing his PhD in Geo-Environmental Design of Offshore Piles at Egypt-Japan University of Science and Technology, Egypt

walid.dawoud@ejust.edu.eg