# Assessment of Impacts on Tropical Marine Environment for Off-Shore Clean Energy Development

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## Abstract

Off-shore floating solar photovoltaic and wind power installations are two potential future clean energy technology options, being considered by energy developers. Whereas technical feasibility of these options is well demonstrated in many parts of the world, the associated socioeconomic and environmental impacts remain to be investigated. Indeed, associated impacts must be evaluated on project-by-project basis, as these are site-specific and depend on size of the project. Quantitative methods of environmental impact assessment are important because these generate useful inputs for decision makers. The inputs desirably should be accurate, authentic and reliable. In the present work, we demonstrate method for determining ambient noise characteristics of the under-water sound-scape in tropical marine coastal waters, in quantitative terms. The results presented are based on in-situ measurement of noise spectral density underwater, during the period from the year 2012 to 2016. The ambient noise at an underwater site, 30 m deep in tropical littoral shallow waters, has been measured in winter and summer every year during the said period. The site is located near Grande Island (Latitude 15°18'N, Longitude 73° 41'E) 18 km off-the-western-coast of Goa, India. The site is known to be ecologically sensitive zone, which is close to commercial and military air-port, sea-port, fishing areas and popular tourists' island. The results show that during the period of observation, the average power spectral density of underwater ambient noise at the site varies over a range from 82 dB to 116 dB, at 10 Hz frequency. Corresponding variation of average power spectral density of under-water ambient noise is 56 dB to 88 dB at 100 kHz frequency. This indicates that there are wide variations in ambient noise power at frequency spectrum from 10 Hz to 100 kHz. Also, it is observed that the underwater ambient noise power is higher at low frequency in the range from 10 Hz to 1000 Hz and is lower at frequencies in the range from 10 kHz to 100 kHz. The quantitative results presented here are useful reference for measuring environmental impacts due to future on-shore and off-shore developmental activities.