



## **Impact of Sea breeze event on air quality in tropical city: case of Greater Muscat city, Oman**

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Muscat is a tropical coastal city. In 2006, the population of the Muscat metropolitan witnessed a three-fold increase between 1970 and 2006 resulting in an enormous functional and spatial transition of land from agriculture to urban land uses. Muscat City had 797000 inhabitants. However, subsequent changes in the land-atmosphere energy balance relationships and air quality must have accompanied this urban transition as the case is in all other urban centers. One of the manifestations of these alterations is the "Urban heat island" in Muscat which is highly magnified by its topography of a narrow plane situated between mountain and sea. This configuration makes Muscat city a perfect trap for air pollutants advected by sea breeze from intense road traffic and their dispersion is blocked by steep mountain slopes. In Muscat city urban road system capacity is undergoing expansion, the pace of development of public transport facilities are not keeping up with improvements in car traffic facilities, and car use is in constant rising. A strategic project was developed in 2007 to observe, measure, model, and analyze the impact of this rapid growth of Muscat on the region's climate and air quality. Numerical simulations compared with field measurements are used to explain the effect of sea breezes on air quality in greater Muscat during summer and winter seasons. The sea breeze circulation is seen to develop early with larger strength and inland propagation in the summer case under the influence of moderate synoptic wind and strong heating conditions than in the NE monsoon and winter cases. The horizontal and vertical extents of thermal internal boundary layer are found to be larger in the summer case than in other cases. The analysis shows that air quality in greater Muscat is much more deteriorated in winter season than the summer cases. An analysis based on pollution amounts and sea breeze ventilation is carried out to divide Muscat into areas, each of which corresponds to a specific pollutant behavior.