



Forcing factors of coastal change: case study Sultanate of Oman (Arabian Peninsula)

Goesta Hoffmann

German University of Technology, Applied Geosciences, Muscat, Oman (goesta.hoffmann@gutech.edu.om)

The coast of Oman stretches around 1700km along the Oman Sea and the Arabian Sea and encompasses hard-rock as well as soft-rock sections. Along this coastline different climatic as well as tectonic settings are encountered which result in different land use and associated population density as well as in different risk of vulnerability to natural hazards.

More than half of the population of the Sultanate (2.3 million) is concentrated along the coast in the Muscat Governorate (27 %) and the Al Batinah Region (28 %), respectively. As the largest cities of the Sultanate are located here the population density is highest (e.g. Muscat Governorate 162.1 person/km²). Furthermore the coastal plains of the Al Batinah Region are intensively used for agricultural purposes – due to the existence of a shallow aquifer and are of major importance for the country's food production as well as for industry and settlement. During the last decades a remarkable economic growth in combination with a positive demographic trend resulted in fast expanding urban areas and increased land utilization within the north-eastern part of the Sultanate. This area will be of significant value for the future development of the country as well, eventually resulting in conflicting land use demands and a development potential which is restricted by (unknown) natural limitations.

The environmental conditions of the Al Batinah Region are exceptional and related to the Quaternary evolution of the coast. Coastal evolution is a function of several forcing factors e.g.: differential land movement which in turn is an effect of local variations in the tectonic stress field; climate and sediment availability. We quantify the various forcing factors by analysing Quaternary coastal sediments and geomorphologic features (e.g. terraces, notches) as archives and indicators. This study focuses on revealing long-term and short term changes within the coastal zone. Long-term changes can be described by the reconstruction and comparison of the relative sea-level development along the coastline. Short-term changes – or events – may have a significant effect on coastal areas and are either climatically induced (e.g. hurricanes) or tectonically induced (e.g. tsunamis). Both natural hazards are known to have occurred along the coastlines of the Sultanate in the past. However, the recurrence intervals and the potential damaging effects have never been studied properly which hampers risk assessment and mitigation of damages.

The varying climatic conditions, tectonic settings and associated natural hazards demand for a holistic scientific research approach to quantify these forcing factors of coastal evolution in the geological past to formulate future scenarios under changing boundary conditions to enable a sustainable future development.