Chapter 10

CONCLUSIONS

The present study includes detailed analysis based on high-resolution grain size parameter, sedimentological parameter, environmental magnetism and palynological abundance to delineate the palaeoenvironmental/ climate implication on the GRK basin. The significant outcome of the present study is the establishment of the depositional conditions related to Holocene sea-level variations in the GRK basin. The present study based on the two sedimentary cores from Dhordo and Berada has led to the following conclusions.

1. Based on the textural characteristics, the Dhordo core is divisible into four textual classes while the Berada core is categorised into six textual classes. The Dhordo core is subdivided into (1) slightly sandy slightly clayey silt, (2) slightly clayey silt, (3) very slightly sandy slightly clayey silt (4) very slightly clayey sandy silt. The Berada core is subdivided into (1) slightly sandy slightly clayey silt, (2) slightly clayey silt, (3) very slightly sandy slightly clayey silt (4) very slightly clayey sandy silt (5) slightly clayey sandy silt (6) fluvial sediment. The persistence of the fine-grained lithology in both the cores is striking. No fluvial sediments are encountered in the Dhordo core; however, fluvial sands are encountered in the bottom part of the Berada core which is obviously the extension of fluvial deposits from the rocky mainland in the south and mark fluvial sedimentation before the transgression of the sea into the Great Rann basin. Overall, both cores together, suggest continuous sedimentation in shallow marine conditions for a long period of time, with minor variations in depositional conditions.

2. The present study provides conclusive evidence in respect of the uninterrupted marine sedimentation in the tectonically formed basins of the Ranns of Kachchh since ~10 ka BP. Based on the AMS date of ~10 Ka BP obtained from Dhordo core at a depth of ~59 m and ~10 ka BP obtained from the basal part of the marine sequence in Berada core at ~39.88 m depth, it is inferred that the central part of the Great Rann basin was submerged by a shallow sea by ~10 ka while the marginal parts including the Banni plain were completely submerged by ~10 ka BP. Overall,

both cores together, suggest continuous sedimentation in shallow marine conditions for a long period of time, with variations in depositional conditions.

3. The environmental magnetic studies on the Berada and Dhordo cores revealed significant palaeoenvironmental changes throughout the past ~10 ka BP. The Rann basin during Greenlandian Stage received sediments under developing but inconsistent monsoonal conditions. The environmental magnetic parameters show sediment influx to the basin under strong monsoonal conditions during Northgrippian Stage. Consistent aridity signatures in GRK basin revealed around - 4 kyr BP that was interrupted by a slightly wetter phase around 1500-1000 years under otherwise weaker monsoon (arid environment) during Meghalayan Stage.

4. The palynological studies from the GRK basin revels the past vegetation and its evolution during the Holocene period. The Banni plains appear to have evolved from originally a fluvial landscape during LGM that was occupied by shallow marine sea ingression which enabled rapid growth of mangrove swamps during ~10-8 ka BP in the region peaking at ~8 ka. Whereas no such condition developed in the central part of the basin. The strengthening of SW monsoon enhanced the warm-wet conditions in the GRK basin during the Northgrippian Stage. The deterioration in the monsoonal condition initiated at around ~5 ka in the basin. The present grassland of Banni plan was established after the withdrawal of the sea in the past ~2 ka.

5. Overestimated ages of radiocarbon dates acquired through organic carbon dating are the result of prominent reworking and deposition of older carbon from the basin. The hard water effect, shallowing effect and fluvial processes resulting in admixture of siliciclastic material resulting aging effect of the sediment. The chronology of sedimentation in the GRK basins is established based on radiocarbon dates. The high sedimentation rate 8.71 cm/y is recorded from the central basin whereas the southern margin of the basin shows comparatively low sedimentation rate 1.71 cm/y during Greenlandian Stage. The sedimentation rate during Northgrippian Stage from central basin is comparatively lower than the southern margin sedimentation rate 1.9 cm/year. Drastic decrease in the sedimentation rate was noted during the Meghalayan Stage.

7. The sedimentological study of the two cores revealed significant change in the depositional condition from the GRK basin. The study points towards variation in

the depositional conditions under fluctuating sea level conditions during Holocene period. The central basin core show sub tidal condition of deposition while the southern margin received sediments under estuarine or marshy condition during Greenlandian Stage. The transformation to sub tidal depositional condition is reflected from the southern margin while central basin continued to receive sediment under sub tidal condition. The basin received sediment under intertidal condition during Northgrippian Stage. The transformation to supratidal condition of deposition in GRK basin is noted during the Meghalayan Stage.

8. The sediment accumulation curve of the GRK basin indicates that the basin witnessed transgression during the Greenlandian Stage, which leads to inundation by the sea at the southern margin of the basin. The transgression in the GRK basin continued during the Northgrippian Stage marking the high tidal limit towards the KMF near Berada core. The regression phase in the GRK was established during the Meghalayan Stage. The Dhordo core was exposed during Meghalayan Stage whereas the Berada core was exposed during end of the Northgrippian Stage.