Collapse of island foundation in atoll nation: the Republic of Maldives

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The Republic of Maldives is an atoll nation consists of approximately 1,200 cay islands on 23 atolls in the Indian Ocean. In 6 February 2002, a reef collapsed at the northeastern coast of Male, capital of the republic. The collapsed reef area reaches a width of 60 m and a depth of 44 m. Subsequently the small collapse occurred in 15 January 2004. There are many cracks around the collapsed wall. It is an unprecedented disaster in the atoll nations.

Intra-reef structure was observed at the collapsed scarp from reef surface to -25 m. The surface of the reef slope was tightly consolidated at the thickness around 1 to 2 meters. This consolidated wall structure is formed by the accretion of corals (encrusting, massive and thick branching form) and calcareous algae. The loose sediments of fragmented branching and tabular corals, and calcareous sand are packed up inside the consolidated wall. The reef flat is also consolidated at the top 2 to 3 meters by the accretion of tabular, massive and stubby branching corals. Then sedimentary structure changes gradually to the coral clasts at its bottom.

Radiocarbon ages show the consolidated wall formed from 8,200 to 6,500 cal yBP. It may coincident with the catch-up reef growth phase under the Holocene sea level rise.

The tightly consolidated wall of 1 to 2 meters which was formed during the natural reef formation at the surface of reef slope, acts as a retaining wall for the unconsolidated sediment accumulated inside the reef. By collapsing the consolidated wall, the loose reef sediments are exposing in the northeastern Male Reef.

In the Republic of Maldives, recent urbanization causes the concentration of population into major islands especially to the capital. The deformation of reef-island system is proceeding by reclaiming and dredging activities around the densely populated islands. The reef collapse in the northeastern Male suggests that it is necessary to assess the reef stability by subsurface geological research before the constructing works on reefs in the atoll nations.