

Environmental Management of Marine Fish Culture in Hong Kong

K. W. Choi, J. H. W. Lee and A. Feleke

Department of Civil Engineering, University of Hong Kong, Hong Kong, China

Marine fish farming is an important commercial practice in Hong Kong. The sustainable management of the mariculture activities requires proper siting of the fish farms and stocking density control. Both of these are related to the carrying capacity of the water body concerned, which is mainly governed by its flushing characteristics. The flushing time can be determined using 3D hydrodynamic modelling. This can be coupled with a diagenetic water quality model to determine the carrying capacity.

A systematic methodology using numerical tracer experiments has been developed to compute the tidal flushing in a fish farm. Flushing times are determined from the results of numerical tracer experiment using robust three-dimensional hydrodynamic and mass transport models. A unit tracer concentration is initially prescribed inside the region of interest (such as a fish farm) and zero elsewhere; the subsequent mass transport and the mass removal process are then tracked.

The fish farms are usually situated in well sheltered shallow embayments and may not connect directly to the open water. It is found that it is necessary to define both a “local” and “global” flushing times to represent how effective the pollutants released from the fish farm would be removed to the surrounding water body and the open sea respectively.

Marine fish farm often faces the threat of severe dissolved oxygen depletion due to eutrophic conditions. A diagenetic water quality model simulating the sediment-water-pollutant interaction is employed to address the response of the benthic layer to pollution discharges. With the flushing rate reliably computed, the quasi-steady long-term average water quality and hence the carrying capacity of the marine fish farm can be determined.