

## **Gap analysis of the flood management system in Metro Manila, Philippines: a case study of the aftermath of Typhoon Ondoy**

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**Abstract** For decades, floods caused by heavy rains have repeatedly inundated critical areas in Metro Manila, which prompted the Philippine government to establish a flood management system consisting of both structural and non-structural measures. However, most of the operational flood mitigation infrastructure was proven inadequate during the onslaught of typhoon Ondoy. The storm brought rains that exceeded the rainfall intensities of the country's previous typhoons. The aftermath of this disaster paints a bleak scenario for the highly urbanized Metro Manila as the effects of climate change increase the likelihood of storms having the same, or even higher, intensities as Ondoy. This study deals with the identification of gaps in Metro Manila's flood management system using the records and observations made during and after typhoon Ondoy. The primary focus of this study was on the performance of the flood control structures, flood forecasting and early warning systems in Metro Manila. The flood control structures were assessed based on the results of field inspection and observations during and after the storm. The flood forecasting and warning systems were evaluated using the information available from various government offices, and from the results of key informant interviews and surveys. The study revealed that factors such as inadequate hydraulic design of the flood control structures in the rivers and drainage systems, lack of an accurate flood forecasting system and lack of proper maintenance of the flood warning system, contributed to the unprecedented flooding on 26 September 2009, which inundated around 34% of Metro Manila. The study concludes by stressing the need for distributed and enhanced flood mitigation programmes, planned and constructed flood control structures, and establishment of effective flood forecasting and early warning systems. The existing flood management programmes should be reviewed and revised in accordance with a new safety level for flood prevention and control.

**Key words** flood management; gap analysis; Metro Manila, Philippines; typhoon Ondoy