



Forecasting extreme floods in arid regions: A case study on Alexandria

Adele Young, Biswa Bhattacharya, Ziyi Wu, Hung-Hsiang Huang, Mohanasundar Radhakrishnan, Chris Zevenbergen, and Mohamed Hasan Khalil

IHE Delft Institute for Water Education, Westvest 7, 2601 DA Delft, The Netherlands (A.young@un-ihe.org)

The Middle East and the North Africa is characterised by dry climate with occasional heavy rainfall that leads to catastrophic flooding. Climate change, population growth (and migration) and urbanisation is exacerbating the situation. The region largely is not prepared with short term measures, such as flood forecasting, and long term, such as adaptation, measures. Alexandria is an example city of the region and has been projected to be one of the coastal cities worst impacted due to climate change. The city experienced heavy rainfall in October 2015, which resulted in a serious flood, huge damages and seven deaths. It is argued that the city immediately needs a flood forecasting and early warning system, which will allow it to reduce immediate damages and allow additional time to prepare for adaptation measures. Currently, a flood early warning system is being built in the framework of the Anticipatory Flood Management in Alexandria (AFMA) project, which will allow using extreme rainfall forecast to start pumping out water from Lake Maryot and Airport Lake before the rain starts. This will enable extra storage space to accommodate some of the flood water from subsequent rain. However, forecasted rainfall is uncertain and decision making in anticipatory flood management (to start pumping or not) with uncertain data is problematic. In this research we explored the use of ensemble rainfall forecast from the European Centre for Medium Range Weather Forecast (ECMWF). Ensemble rainfall forecast allows a probabilistic framework in decision making. Analyses of decision making with single rainfall forecast and ensemble rainfall forecast corresponding to some previous flood events showed the advantages of the use of ensemble rainfall forecast in anticipatory flood management.

Keywords: urban flood, early warning, ensemble forecast, anticipatory flood management, Alexandria, Egypt, AFMA.