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A comparison of evacuation models for flood event management – application on the Schelde and Thames Estuaries

M.J.P. Mens & M. van der Vat
Delft Hydraulics/Deltares, Delft, The Netherlands

D. Lumbroso
HR Wallingford, Wallingford, Oxfordshire, UK

ABSTRACT: In recent years flood event managers have paid increasing attention to reducing the consequences of flooding by preparing evacuation and rescue plans. Local and regional authorities are often obliged by law to draw up flood emergency plans. In many cases these define responsibilities, but details on which evacuation route to take and how much evacuation time is available are often missing. In recent years a number of evacuation models have been developed which aim to provide this insight. This paper provides an overview of existing and recently-developed evacuation models and discusses their suitability to assist flood event managers. The purpose of this paper is to draw conclusions regarding their reliability and suitability in the preparation of evacuation plans. This paper focuses on the technical information that is needed during the evacuation-planning stage, in which several evacuation options are assessed. The models have been tested on the Thames Estuary in the UK and the Schelde Estuary in the Netherlands. It was found that most of the existing evacuation models have been developed for use at a macro scale. However, local and regional flood event managers require meso- and micro-scale models that allow for more detail regarding loss-of-life estimates, information on potential road congestion and the effects of management response. The upscaling of responsibilities requires an exchange between model scales to see the effect of local evacuation plans on large-scale road congestion.

1 INTRODUCTION

1.1 *Need for evacuation models*

In recent years flood risk managers have paid increasing attention to reducing the consequences of flooding by preparing evacuation and rescue plans. Local and regional authorities are often obliged by law to draw up flood emergency plans. There is however little experience within the European Union with using methods and models to support the planning and execution of evacuation for flood events. Surveys carried out in France, Germany, Hungary, the Netherlands and the United Kingdom have shown that there is a need for modelling tools to develop detailed evacuation plans (Lumbroso et al. 2008). To our knowledge, there are currently no models used to support evacuation and rescue for flood management in the UK. The response to flood risk management in the UK has mainly focused on flood defence asset management, and forecasting and warning to reduce flood risk rather than on organised evacuation. In the Netherlands evacuation models have been developed, e.g. Evacuation Calculator (Van Maarseveen 2004) and ESCAPE (Windhouwer et al 2005), but until now they have only been used in exercises. There is need for tools and methods to assist in the planning of evacuation/rescue operations and to estimate the optimal use of the transport network and the time required for execution of an evacuation. One of the questions to be answered is if the available models provide enough insight into the evacuation process to support the development of detailed evacuation plans.

1.2 *Flood event management*

Flood event management deals with actions that aim at reducing the impacts of flooding, at times when a warning is issued. Decisions need to be taken regarding the operation of barriers, closing of gates and effective evacuation and rescue strategies (Mens et al. 2008). Flood event management thus focuses on the short-term, compared to flood risk management which involves strategies that in most cases are planned and implemented over 10–30 years. The well-known disaster cycle (Bouchon et al 2006) is composed of the following categories:

- Prevention and mitigation;
- Preparation;