

A review of effective flood forecasting, warning and response system for application in South Africa

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Abstract

Cyclone Eline caused severe flood damage in South Africa during February 2000. It has been estimated that the total amount lost was approximately R3 000 million. South African farmers lost more than 50% of their export products. Flood damages and disruptions to humans and animal species were even bigger in Mozambique.

The emphasis in South Africa is still on, *inter alia*, structural mitigation measures. Policy-makers seek foreign support and finances, especially during the reconstruction phase after floods, for reparation purposes only. Little to no attention has been given to scientific hazard and risk assessments to determine a sustainable flood standard for different river reaches, which will contribute to appropriate mitigation and prevention strategies. The aim, after flood disasters, is primarily to ensure that flood losses will be covered and to restore the level of existence of flood victims to where it was before the flood. Furthermore, mainly because of institutional problems currently experienced in South Africa, roles and responsibilities of institutions involved in disaster management are not clearly identified. Last mentioned are the reason for absence in South Africa of a formal flood forecast, warning and response system (FFWRS). In most cases where a flood warning system exists, there is evidence that it is insufficient, mainly because of a lack of knowledge and understanding of a well-functioning, appropriate FFWRS.

Sustainable prevention and mitigation strategies should be achieved within a holistic integrated catchment management approach. Such approach is multidisciplinary and is therefore not based on a single engineering solution. The main aim of this paper is to discuss one aspect covered by a holistic integrated catchment management approach, namely a flood forecast, warning and response system, which contributes to the prevention and mitigation of flood losses.

Introduction

During February 2000 South Africa and Southern Africa experienced severe floods, which caused extreme flood damage to roads, infrastructure, agricultural crops and property. It has been estimated that the total impact of the February 2000 floods for South Africa alone was more than R3 000 million. South African farmers in the disaster-stricken areas lost more than 50% of their export products. The question arises, especially from policy-makers and communities; what can be done to at least reduce the negative impacts of floods?

The answer to this question would be to implement effective and efficient flood-plain management in order to ensure sustainable development. A flood-plain management plan must be comprehensive and must provide an effective framework for the development of land and water resources in catchment areas (Dempster & Brammer, 1995). The primary objective of a flood management plan is to attempt to find permanent solutions to flood problems. In the past 10 years in various places in the world, it has been shown in several studies that the flood management policies of specific countries have influenced the course of development in flood plains without managing to halt it (Dempster & Brammer, 1995; Parker 1995; Galloway 1995; New South Wales Government, 1986). In order to comply with the idea of sustainable, integrated long-term planning in the compilation of development plans (Adams, 1995; Ghosh, 1991), a holistic approach to integrated catchment management is proposed for South Africa. "A holistic co-operative approach is necessary which would ensure in achieving a sustained

minimal standard human life for the people and protection of the environment. There is no other alternative for the survival and betterment of the people of the region" (Bancid, 1995).

An effective mitigation and prevention strategy will *inter alia* be to develop and implement a flood forecast, warning and response system (FFWRS). Bancid (1995) indicated that FFWRS is recognised as a highly cost-effective, flood mitigation measure.

The main aim of this paper therefore is firstly to review holistic approaches to integrated catchment management, whereafter a flood forecast, warning and response system will be discussed in detail as a cost-effective flood prevention and mitigation strategy for catchments.

Integrated catchment management

Various activities are associated with sustainable integrated catchment planning, as depicted graphically in Fig. 1.

Activities listed in Fig. 1 should firstly be investigated individually by provincial and local authorities, whereafter results should be integrated in order to arrive at a sustainable integrated catchment management plan. A multidisciplinary approach is clearly indicated. In terms of this approach it would be unreasonable to expect provincial and local governments to house expertise and specialist services on a permanent basis. Consequently, an institutional network approach is proposed for South Africa whereby specialised services, most of which could and should be privatised, could be provided to provincial and local authorities. This 'approach will facilitate installation of the desired institutions for South Africa and reduce hazard losses in flood plains (Haque & Zaman, 1993).

A second question can be posed: What exactly do all activities in Fig. 1 entail? Because of the extent of activities in Fig. 1 it will

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