



A methodology for the pre-selection of suitable sites for small dikes in arid areas: a case study in the region of Kidal, Mali

Giovanni Forzieri, Marco Gardenti (1), Francesca Caparrini (2), Fabio Castelli (1)

(1) Dipartimento di Ingegneria Civile, Università di Firenze (ITALY), (2) Eumechanos, Via La Marmora 22, 50121 Firenze (ITALY) f.caparrini@eumechanos.it

A cost-effective design of projects in developing countries requires that a detailed preliminary territorial analysis is conducted in order to select the optimal sites for interventions and adequately plan the fieldwork. In most cases only large scale cartography is available, which does not provide adequate information on environmental and morphological parameters. For this purpose, remote sensing techniques can supply large amount of data with high spatial and temporal resolution, and are therefore a very useful mapping tool especially in areas where very little information is available such as most developing countries. In this work, we present a methodology for the assessment of the suitability of sites for the installation of small dikes (barrages), a technology widely used for water harvesting in arid climates. The selection criteria are defined both in a qualitative and quantitative way, and are based on a territorial analysis using satellite data (images, digital elevation models) and hydrological and climatological information that are easily and freely available. Qualitative criteria imply the identification of suitable valleys, wadi beds and rock formations, based on visual interpretation of satellite images and large scale available cartography. Quantitative criteria are expressed in terms of indexes that synthesise the effectiveness and feasibility of the possible interventions: a) alluvial plan index, calculated as a benefit/cost ratio in terms of volume of water that can be stored versus volume of the dam, b) Hydrologic index, based on the analysis of the contributing watersheds to each site and the pluviometric patterns in the area, c) Soil water holding capacity, estimated from the analysis of vegetation patterns using satellite indices. Other selection criteria concern the distance from settlements and infrastructures. The methodology has been applied for the pre-selection of sites for the installation and/or rehabilitation of

barrages in the region of Kidal, Mali. Twenty possible sites were pre-selected using the qualitative criteria, and a score was assigned to each of them on the basis of the indices described above. The results served to organize the subsequent field survey, which was conducted on the six sites that had obtained the higher score, thus considerably reducing the time and costs of the survey. Finally, three 'optimal' sites were selected, and the further phases of the design implemented.