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Modeling and sediment study in the watershed Medjerda, Tunisia

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Water projects have experienced a major expansion in the late 1980s, and we now have sufficient perspective to assess their actual performance and their socio-environmental impacts (Payan, 2007). This study focuses on the great watershed of Tunisia namely Medjerda which has an area of about 23,600 km^2. In the main river of Medjerda some dams have been created for water retention: Sidi Salem Dam (the largest in the country), El Aroussia dam, and others on tributaries Mellegue Bouhertma, Siliana, Beni Mtir, Lakhemess and Kasseb. Since the construction of dams, essentially Sidi Salem and Siliana, the Medjerda river has undergone significant changes in morphology. The monitoring of the flow of the major hydrological stations in the pre-estuarine zone downstream from Sidi Salem dam is used to measure the impact of the constructions on hydrological regimes: reduction in average rates, reduction in volumes sold, altered seasonal pattern, and most of all reduction of the sediment transport, which the highest values are related to extreme events. In this context, the balance of sediment monitoring appears indispensable for the quantification of sediment transport at the outlet.

Our approach is to calculate a specific flow rate relative to the area of the basin for every structure built in the Medjerda watershed, from the information available on transport and sedimentation rates known, combined with contours of each sub watershed. There are about ten dams spread throughout Medjerda watershed. The methodology is primarily developed for the Mellegue dam because we have at this station a long data set from 1955 until 2005. Other stations will be studied later on. The main objective of this study is to provide a series of annual variation of theoretical contributions. These calculated values will be compared with the actual measured sedimentary series. Two cores in the sediments of the pre-estuarine area are performed to determine past variability in sediment inputs over a time series than should be about one century. The cores' analysis results show a succession of sedimentary layers that likely correspond to different flood deposits that succeeded on this site, and especially the datation of the cores shows that the selected area is a very important deposition area. This sedimentary study will help estimate the sediment dynamics to major estuaries, which is poorly known for most of the rivers of Maghreb. The reduction of the sediment supply to the sea is tipped as a major factor to be taken into account for a better understanding of the dynamics of coastal areas in the context of global climate change and sea level rise.

Keywords: sediment core, Medjerda watershed, dam, hydrology, modeling, Tunisia