

The impact of damming in sediment delivery to coastal zones – case of mainland Portugal

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Conference theme number(s): 3

Introduction:

Coastal sediment budget is highly dependent on the supply from fluvial solid discharge. The amount of sediment capable of reaching the coast is dependent on the productive capacity in relation to water erosion and the efficiency of transferring the produced sediments to the coast. Nowadays, the fluvial systems are, in general, heavily intervened. Dams constitute one of the most limiting alterations to the normal functioning of the fluvial systems in what concerns sediment supply to the coast. This work aims at detailing and updating the work done by [1], within the scope of characterising the state of fluvial sediment considering the impact of dam construction, where a reduction of more than 85% of the area that drains to the Portuguese coast was estimated. This exercise was conducted to the coast of Portugal and this work intends to present the results and implications of such quantification.

Methods:

The delimitation of the area draining to the Portuguese coast with and without dam interference was conducted with the following procedures: 1) the drainage network and individual watersheds were estimated using a Global Digital Elevation Model with 30 m resolution [2] and the methods used in [3]; 2) dams were identified using the information provided by [4], using only the ones located further downstream of the drainage systems. A total of 58 dams were identified (57 in Portuguese territory and 1 in Spain – Chanza).

Results:

The results obtained (Fig.1) show that from a total area of 297 000 km² draining to the Portuguese coast (which includes watersheds in both Portuguese and Spanish territories), only 40 000 km² (13%) is free from the interference of dams. This means that only about ~10% of the potential sediment is capable of reaching the coast. Regarding the different sediment cells (SC), SC1 presents the biggest reduction in area with a 91% reduction of the original area, representing a loss of 120 000 km². In contrast, SC3 that does not show any signs of dam influence.

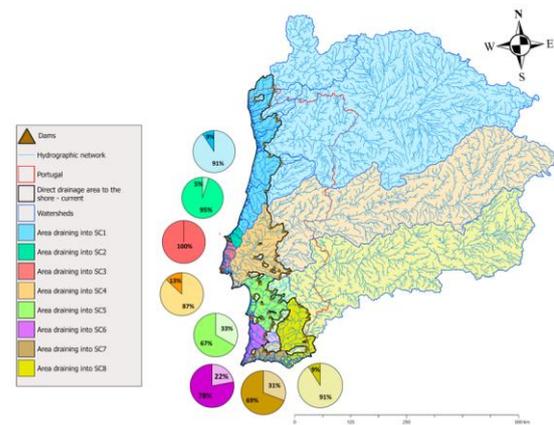


Fig. 1: Changes in the drainage areas before and after the construction of dams.

Discussion and Conclusion:

The influence of dam construction in the study area reveals a decrease in the potential area for sediment production of about 87%, which is quite considerable when comparing the current scenario with the undisturbed one. Also, one of the most productive watersheds in terms of sediment compatible with beach sediments that drains to SC1 – North of Portugal presents a reduction of 91%. This result confirms the link between the reduction delivery to severe coastal erosion problems (hotspots of erosion) that have already been suggested by previous authors (Santos *et al.*, 2014).

Acknowledgements:

This work was funded by the Portuguese Fundação para a Ciência e a Tecnologia (FCT) I.P./MCTES through national funds (PIDDAC) – UIDB/50019/2020.

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