



Human-induced alterations to the morphology of an urban Mediterranean watercourse from 1945 to 2022: transitioning from its natural state to phases of correction and restoration.

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Fluvial ecosystems are among the environments most significantly modified by human activities. Channelization, levee construction, floodplain disconnection from the riverbed, alteration of the fluvial regime and ecosystem, interruption of the sediment dynamics and alteration or destruction of the shape and morphology of the riverbed, are among the main effects of such interventions. Restoring or rehabilitating fluvial environments, including hydrological and geomorphological processes, is currently being undertaken in many river systems of the world given the benefits that these environments provide to mankind. However, depending on the magnitude of the human interventions and their impacts on the river system, reaching a restoration stage before human intervention cannot be fully achieved. In this context, the Congost River is a representative example of the evolution of the morphology of a river channel in the metropolitan area of Barcelona during the 20th and 21st century. The river flows through Granollers, a city of 60,000 inhabitants exposed to flood risk. During the 70s and 80's the Congost river was channelized, narrowed and disconnected from its floodplain to promote urban and industrial growth. The river channel was then fixed to avoid lateral migration by constructing sleepers (transversal structures), and fluvial landforms such as secondary channels and gravel bars were intentionally removed from the riverbed to create a drainage channel. However, to recover green riverine areas, sleepers in the peri-urban area of Granollers were demolished, whereas in the urban core area sleepers were conserved.

Analysis of aerial images of 1945, 1956, 1986, 1998, 2009 and 2022 shows the following transformation: the natural braided channel, adapted to slope, flood frequency and sediment load changed after the human intervention to a restrained channel. The result of the restored river stretches showed higher hydro-morphological characteristics than the urban section, but they are still far from the expected outcomes of a fully successful restoration of a braided river. Yet, the channel morphology improves natural river processes. At this point, however, it is not known how the riverbed will evolve in terms of incision or avulsion, and whether further river management measures will be necessary to implement. Monitoring of channel evolution is required to fully understand the human impacts on partially restored urban fluvial systems through time.