

# A management of port sediment in a *Working with Nature* context to achieve a zero residues generation

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**Introduction:** The harbor of Seville is the only inner harbor in Spain. Along 89 km ships navigate from the river mouth in Sanlúcar de Barrameda (Cádiz) to the center of Sevilla, through de Guadalquivir River, one of the most turbid rivers in the world.

The harbor operates a lock that allows to regulate tidal levels both sides of it. The lock connects and levels the river and the dock port.

The Guadalquivir estuary is subdued to a tidal regime, so the tide is noticeable even at the dock, 89 km far away from the river mouth.

The river and its valley support several and different uses: rice and citric crops, aquaculture and fishing, population, tourism, etc.

The discharge regime of the river is highly regulated. The last dam downstream is Alcalá dam (Alcalá del Río) close to the harbor.

In order to ensure a safe navigation, the Port Authority of Seville (PAS hereinafter) must dredge almost every year about 350.000 m<sup>3</sup> of sediment in different sections of the navigation channel. Before 2015 almost all the sediment was disposed of on a marine sump, but from that date the PAS has started several research lines and is giving a new life to most of the dredged sediment, such as, beach regeneration, protection of erosive margins, use in public works and even brick construction. All these initiatives are framed in a Working with Nature context according to PIANC philosophy and the PAS has even been awarded by the regional government.

**Methods:** the Guadalquivir River is periodically dredged using a suction hopper dredge (TSHD hereinafter). The auxiliary equipment of the operation: suction pump, drive pipe and ship are used to dispose the sediment and distribute it to the purpose it has been conceived. Land machinery gives support to the process.

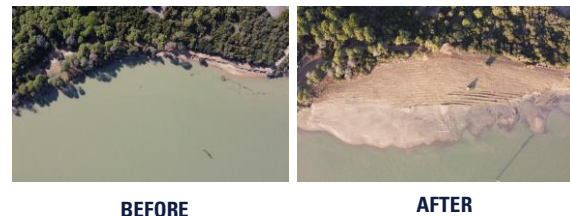
**Results:** Among the different uses given to the dredged material there are the remodeling of the terrestrial dumps of the PAS to favor the breeding and reproduction of birds, creating inner islands with the dredged material and maintaining the pumped water level during spring through a water box system. This

practice was awarded the Environmental Award in 2020 from the Regional Government (Junta de Andalucía).



**Fig. 1:** Artificial wetland in Harbor land. Source: PAS, 2021.

The regeneration of Sanlúcar de Barrameda beaches or several erosive margins, such as the one executed last year in Doñana, one of the most important natural areas in Europe, a Biosphere Reserve, UNESCO.



**Fig. 2:** Regeneration of an erosive margin in Doñana. Source: DRAVO, S.A., 2022.

The construction of ceramic material to be used in cities is another investigation line currently under study.

**Discussion:** In a working with nature context the PAS is managing the dredged sediment each maintenance campaign to give it different and productive uses to improve the resilience of the natural system and produce benefits for all the stakeholders in relation to the river, which is undoubtedly a good practice in line with the circular economy criteria.

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**References:**[1][https://www.csic.es/sites/www.csic.es/files/01julio2020aves\\_vaciaderos.pdf](https://www.csic.es/sites/www.csic.es/files/01julio2020aves_vaciaderos.pdf)