

SCIENCE DAY – BENEFICIAL USES OF WASTE

SUSTAINABLE REUSE – RECYCLING SOLUTIONS IN FRANCE FOR DREDGED SEDIMENTS

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CONTENT

- Cerema in a nutshell
- French context and waste policies
- What are the uses ?
 - 1) Road construction
 - 2) Land use planning
 - 3) Maritime construction works
 - 4) Agriculture
 - 5) Concrete formulation
- Experimental project



CEREMA IN A NUTSHELL

- France's leading public agency for adapting to climate change and environmental transition, urban development, buildings, mobility, transport infrastructure, natural hazards and sea & coastal engineering.
- Over 2,500 agents across 25 sites in mainland and overseas France.
- Cerema is the trusted third party of choice for public and private sector stakeholders, delivering services through.
 - Development of benchmarks to integrate dredged sediments into recovery sectors as road construction, maritime works, agricultural uses, etc.



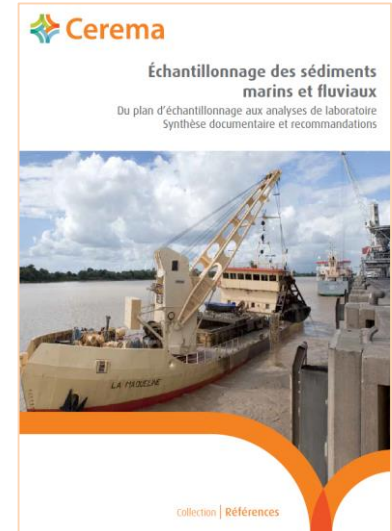
FRENCH CONTEXT AND WASTE POLICIES

- An average of 32 million of tons per year (since 2013), (*)
- 90% are dredged by the 11 majors seaports,
- Less than 2% are managed on land.

- Waste prevention must be prioritized : Non-hazardous sediments can return to water,
- Waste treatment hierarchy : direct re-use, recycling, re-use after operation, backfilling and landfilling,
- Characterize before using in order to be assured of environmental friendly and safe for health,
- Ensure the traceability of sediments managed on land.

- Assessment and sampling strategy (**)

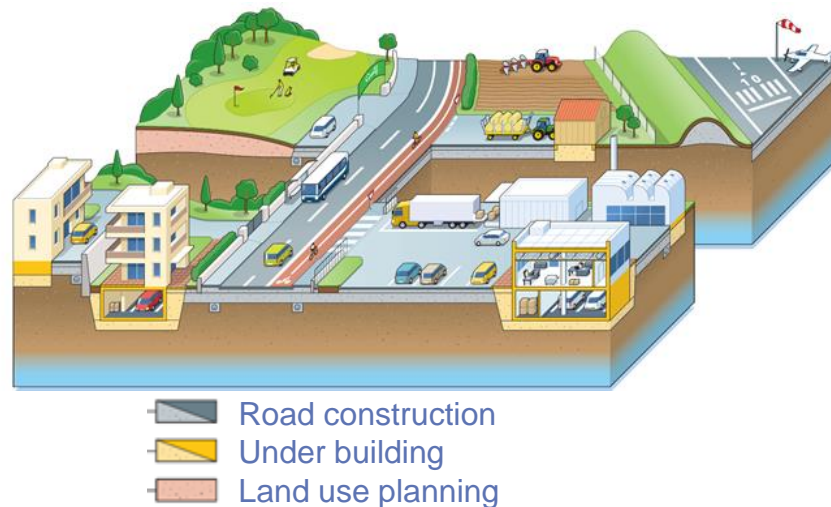
(*) *Dragages 2017, Cerema 2020*



(**) *Cerema (2018)*

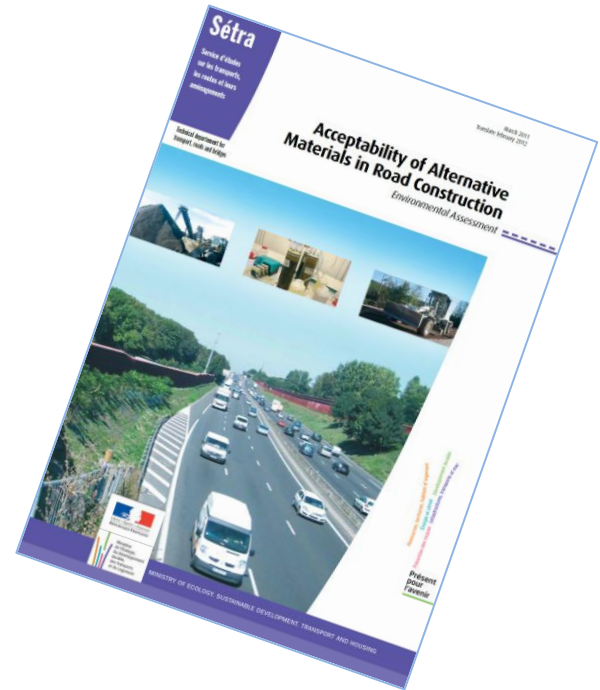
DREDGED SEDIMENTS IN FRANCE : THE USES

- Operations performed on land and management modes :
 - ✓ Road construction,
 - ✓ Land use planning,
 - ✓ Maritime construction works,
 - ✓ Agriculture,
 - ✓ Concrete formulation,
- Experimental projects.
- The prime contractor of the dredging operations :
 - ✓ manages the sediments from dredging up to their final destination or,
 - ✓ transfers the sediment to a third party which treats the sediment on land.



ROAD CONSTRUCTION

- Dredged sediments are considered as an alternative materials,
- [Acceptability of alternative materials in road construction \(SETRA, 2011\)](#),
- Characterization based on leaching and/or percolation behaviour
- Several road uses can be envisaged :
 - ✓ Uses in road underlays or paved shoulders,
 - ✓ Uses of technical backfill related to the road and shoulder infrastructure.



LAND USE PLANNING

- Artificial beach nourishment,
 - Creation of new wildlife habitat on a river or coastal sea,
 - Supplementing parks, restoring coastal wetlands, stabilizing eroding waterfront and reestablishing dykes.
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- Identify the quality of dredged sediments,
 - Prove the non-impact on the environment and human health,
 - Study the geotechnical properties.

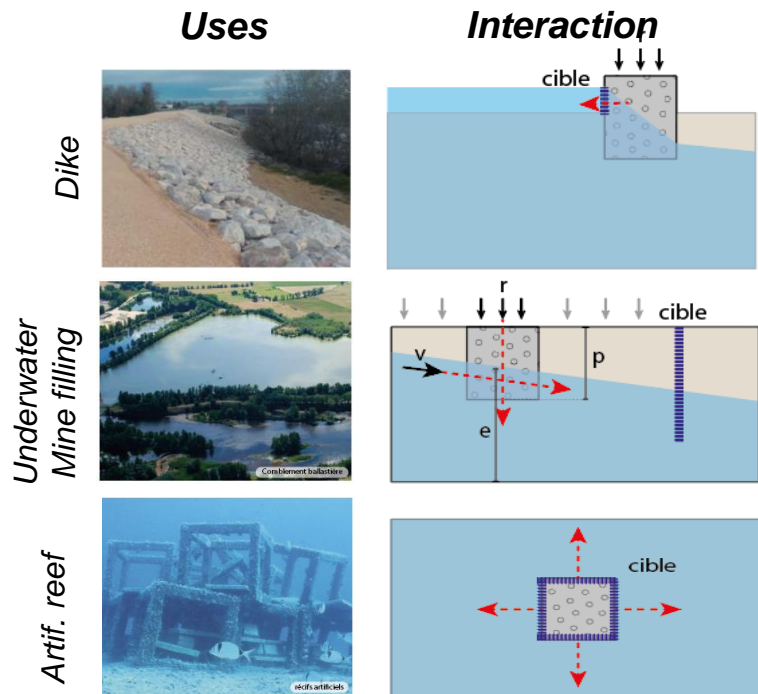


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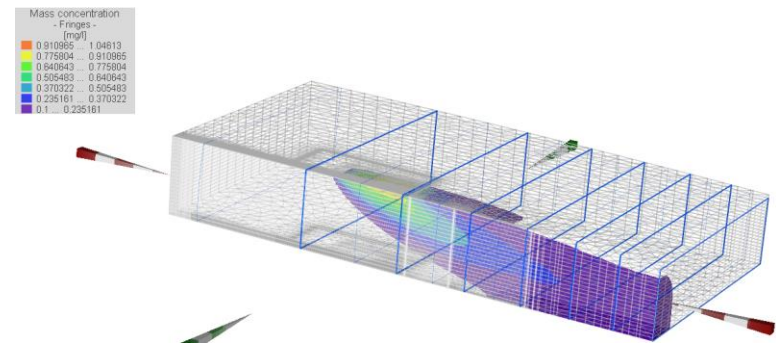


MARITIME CONSTRUCTION WORKS

- Definition of national guidelines regarding the re-use of alternative materials in maritime fluvial construction :
 - ✓ quality of water bodies must be maintained,
 - ✓ quality threshold must be defined



- Numerical modelling is used to define environmental acceptance criteria in accordance with geochemical backgrounds (chlorides and sulphates in coastal areas)



AGRICULTURE

- Agronomic qualities of dredged sediments : restructuring skeletal soils, balancing soil texture
 - Environmental quality : trace metals, total hydrocarbons, polycyclic aromatic hydrocarbons and tests to determine potential toxic effects,
 - Agronomic quality including organic matter, Kjeldahl nitrogen, ammonium, potassium, phosphorus etc.
- Experiments demonstrate that sediments can be used as fertilizer.
- Assess the eventual environmental and sanitary impacts.



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CONCRETE FORMULATION

- The french standards allow use for alternatives materials in concrete (*) ; sediments can be substituted for the granular part of concrete,
- Sediment can be used as aggregate for concrete in construction products :
 - ✓ without standard as tripod (1), accropod (2),
 - ✓ with low mechanical performance as sidewalk, street furniture.



(*) *Standard NF EN 12620, June 2008 and standard NF P18-545, October 2021 for classification of the constituents of coarse recycled aggregates.*

EXPERIMENTAL PROJECTS

- Relevancy of the use has to be demonstrated,
- Further research to improve beneficial re-use for dredged sediment,
- Projects to supply futur national operational guide

- Some french experimental projects :
 - ✓ National research project : terracotta brick (SEDIBRIC), treatment solutions (SEDITERRA),
 - ✓ Regional research project : re-use in local projects around Arcachon Bay (SOLVALOR)

- French law for blue economy will set up a threshold ban on dumping dredged sediment, this will strengthen the management on land.

- It's possible to re-use dredged sediment to develop a circular economy.



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