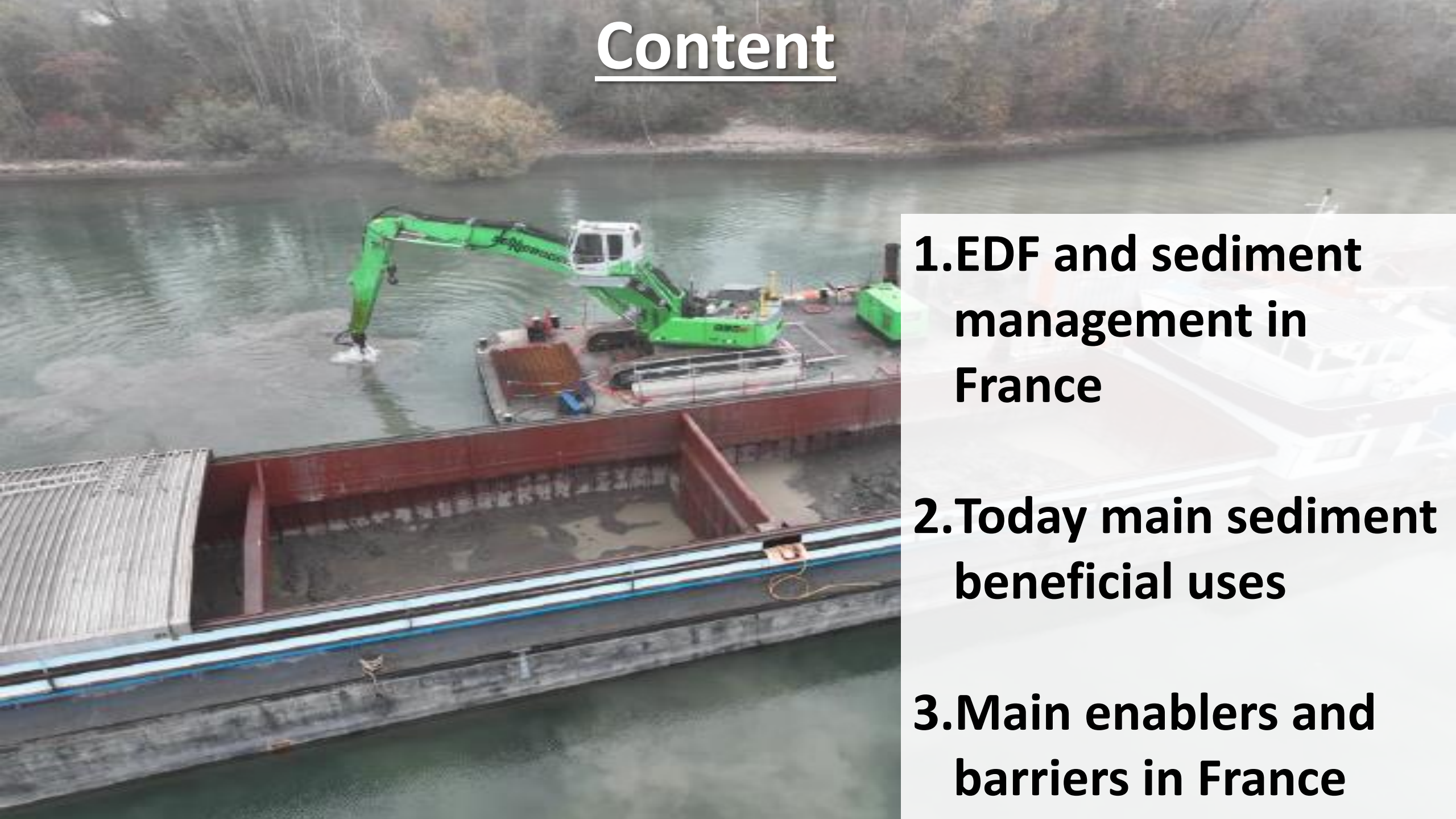
Beneficial use of dredged sediments from hydropower reservoirs in France: Recent experiments highlighting current enablers and barriers

SEDNET Conference 2025
« Healthy Sediments »
Madrid, Spain (6-10 October 2025)

Theme 3 : Nature Based Solutions and Beneficial Use

Emmanuel BRANCHE
EDF Hydro / E&S

Content



1. EDF and sediment management in France

2. Today main sediment beneficial uses

3. Main enablers and barriers in France

1. EDF and sediment management in France

EDF Hydro and sediment management in France

Key figures

- 20 200 MW (installed capacity)
- 10% (average annual power generation)
- 50 000 ha reservoirs
- 34 000 ha land property
- 433 hydropower generation units

Sediment management issues

- *Ensure continuity*
- *Ensure safety to infrastructures*
- *Avoid generation losses*
- *Maintain navigation*
- *Manage flood (& droughts)*

EDF hydro's missions

- Renewable energy, CO2 free, flexible & storage
- Working with territories (manager of 75% of the surface water)

Sediment management

- Priority continuity (i.e. leaving sediments in the watercourse) …
- … otherwise, land management (waste)

Main issues associated to dredged sediment

- *Waste status*
- *Regulatory changes (and more complex)*
- *Increased dredging and landing costs*
- *Difficulties to deliver industrial beneficial use*

Dredged sediments at EDF Hydro

~500 000 m^3/year annually

- ➢ Gravel main part : no issue
- ➢ Fine : main issue (even if 90% characterised as inert and non-hazardous)

Sediment beneficial use: todays main ways tested

Mineral beneficial use

- Concrete
- Cement
- Clay (ceramic / raw earth)
- Road techniques

Agricultural beneficial use

- Soil restructuring / soil construction
- Growing support / topsoil
- Amendment

Hybrid beneficial use / environmental

- *Filling quarries*
- *Backfilling civil works*
- *Covering waste disposal facility*

2. Today main sediment beneficial uses

Only for non-hazardous and inert sediments

Agricultural beneficial use: topsoil creation

Replace an asphalt parking by a wooded area in the city

Site expérimental

mixture of sediments with composted green waste (of the city)

Beneficial use of dredged sediments

EDF

Monitoring protocol

CHAMBRE D'AGRICULTURE ISÈRE

VILLE DE GRENOBLE

Make the soil permeable again

Mise en forme des sédiments sur le terrain

Plantation des arbres sur le sol préparé avec les sédiments

Mineral beneficial use: concrete

organic matter content

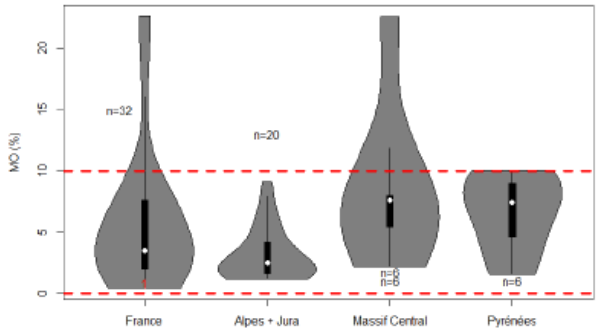


Figure 3 La teneur optimale en matière organique pour l'addition minérale pour les bétons / mortiers est inférieure à 1%. La teneur maximale est de 10%

Blue value (geotechnical analysis)

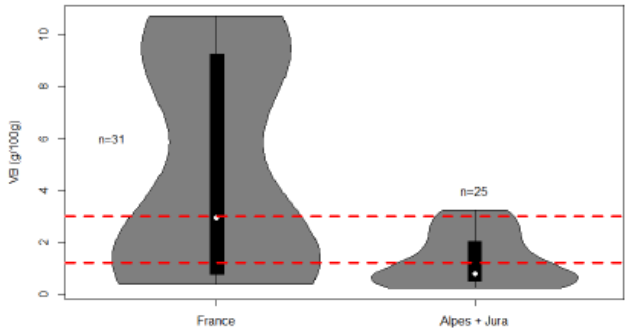


Figure 5 La valeur au bleu optimale pour l'addition dans les mortiers/bétons est inférieure à 1,2g/100g. La valeur maximale est de 3 g/100g

median diameter of sediments

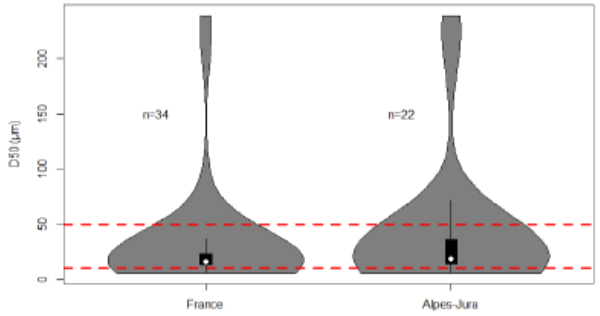


Figure 4 La teneur optimale dans les ajouts de Mortiers/Bétons est inférieure à 10 µm. La teneur maximale est de 50 µm.

phyllosilicate content

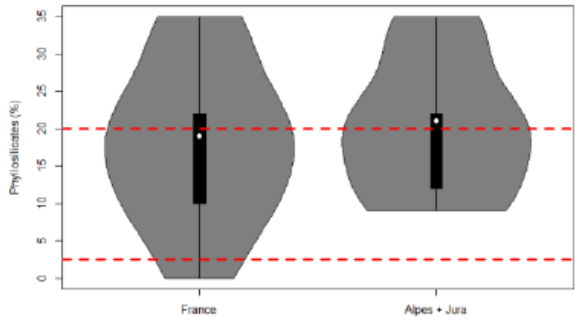


Figure 6 La teneur optimale pour l'addition dans les mortiers/bétons est de 2,5%. La teneur maximale est de 20%

Use of **untreated sediments**:

- Partial substitution of sand
- Partial substitution of cement as an inert filler

➔ High CO2 impact

Use of **sediments after heat treatment** (if kaolin content)

- Partial substitution of cement as a pozzolanic additive

➔ High CO2 impact

Replacing filler with sediment to create precast concrete blocks

Pros & cons beneficial use: a summary

Agricultural beneficial use	Pros	Cons
Topsoil / technosoil	💰 Economical & local solution 🌿 Improving soil quality (inc. water reserve) 🌍 Reducing carbon footprint 🌱 Beneficial use for inert materials 🛠️ Regulatory compliance for circular economy	Sediments are not in the list of inputs (standards)
Soil restructuring		Lacking operational guides Texture and stability issues Costs and complexity of treatment
Amendment		Sediments like “sewage treatment plant sludge”

Mineral beneficial use	Pros	Cons
Concrete	💰 Economical & local solution 🌍 Reducing carbon footprint 🌱 Beneficial use for inert & non-hazardous materials 🛠️ Regulatory compliance for circular economy	Sediment variability, organic matter
Cement		Sediment humidity, mineralogical composition variability, size particle variability
Road techniques		Organic matters, clay presence
Tiles & bricks (clay)		Limestone & impurities presence

3. Main enablers & main barriers in France

Main enablers in France

Reducing the environmental footprint (limit use of natural resources)

Compliance with regulatory developments

Climate change

Job creation and stimulation of the local economy

Technical innovation and applied research

These issues converge to promote sediment beneficial use, transforming a constraint into a lever for a transition towards a more circular and sustainable economy, in theory …

Main barriers in France

Waste status

Public Perception and Social Acceptance

Lack of operational guides or/and effective norms/standards

Lack of structured industry for beneficial use

High management and processing costs

… However, in practice, these combined barriers hinder the development of an efficient/effective beneficial use for sediments!

The way forward

- ❑ Regulations must really be there to facilitate circular economy
- ❑ Effective Guides and Standards should be developed for an effective and operational sediment beneficial use, managers must be involved and listened to
- ❑ Harmonise sediment perception across Member States in Europe (waste status)

➢ Technical challenges can be met! The other challenges are more difficult …

Thank you for your attention!

Muchas gracias

Merci beaucoup

Emmanuel BRANCHE

Expert Circular Economy

Senior Economist Engineer

Renewable Energy Division – EDF Hydro
Social and Environnemental Unit
4 allée du lac de Tignes – Savoie Technolac
73290 La Motte Servolex - FRANCE

www.edf.fr

Mobile : +33 6 47 86 35 65
E-mail : emmanuel.branche@edf.fr

Any questions?