

# Environmental Assessment of Road Materials Including Marine Dredged Sediments from Dunkirk Harbor (North Sea, France)

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**Background/Objectives.** The current context of dredged sediments is paradoxical in Europe because regulatory guidelines stipulate that everything must be done to develop the reuse of non-immersible dredged sediments as secondary raw material, whereas there is no official rule to develop this practice. Many economic factors, including producers of sediments and potential users of secondary raw materials (industrials, region and local authorities), must face up to these constraints. Some regulatory, normative and technical projects have been launched in European countries to promote the beneficial reuse of this waste but without significant achievement for those whose expectations are huge and growing. In this context, the industrial research chair on “Circular Economy of Sediments” launched in 2014 by “Institut Mines-Télécom Lille Douai” aimed at contributing to the development of industrial beneficial reuse practices at the French level. In the present communication, a part of research work is displayed by the results from the study carried out on the emissions of inorganic pollutants during the life of construction products by means of the standardized monolithic dynamic leaching test as part of the implementation of the European Regulation on Construction Products.

**Approach/Activities.** The present study is the first to assess the leaching of hazardous substances from monolithic road construction materials including non-immersible marine dredged sediments. The data provided in this work may serve as a basis for identifying the amounts of chemical substances that these construction products may release in waters during their use in road infrastructures. The applied approach for the assessment of the leaching behavior of construction products is based on leaching tests at the lab scale following the horizontal standardized assessment methods for harmonized approaches relating to hazardous substances under the European Construction Products Regulation. Products were prepared at the industrial scale by COLAS and EQIOM using marine dredged sediments sampling from Dunkirk harbor (North Sea, France). Road sub-base formulations were prepared using three different commercial hydraulic binders from the products range of EQIOM. The road materials include 50% of marine sediment in substitution for the sand fraction of the final product. In the same way, compacted road concrete formulations were prepared by including 20% of marine sediment in substitution of the sandy fraction.

**Results/Lessons Learned.** Leaching test results highlight that highly soluble chemicals such as barium, chlorides and sulphates are systematically detected in all road material leachates while some other elements (such as copper, vanadium, and zinc) may occur only punctually in the monolithic dynamic leaching test. The amounts of chemical substances released from all road materials comply with the limit values for monolithic construction materials proposed by the Netherlands in its Soil Quality Decree. Such results are satisfactory from the point of view of the environmental quality of the products because no adverse effect is to be expected for human and environmental health. The strong trapping of the most hazardous substances such as metallic and metalloid elements within the cement matrices can be explained by the fact that the use of hydraulic binders is recognized as a treatment process that effectively reduces their environmental availability. These data about environmental performances of road construction materials including marine dredged sediments are the first to be published, and may serve as a

basis for identifying the amounts of hazardous substances that such construction products may release in waters. They are of great interest for potential users of secondary raw materials and required for CE-marking procedure of construction products.