

Circular economy applications of dredged sediments: from pilot experiments towards fulfilling the needs of the economy and the society

Tristan Debuigne¹, Arjan Wijdeveld², Bruno Lemiere³, Joe Harrington⁴, Zoubeir Lafhaj⁵, An Janssen⁶

¹ cd2e, Rue de bourgogne • Base du 11/19, 62750 Loos-en-Gohelle, France

² Deltares, Boussinesqweg 1, 2629 HV Delft, The Netherlands

³ BRGM, 3 avenue Claude Guillemin, BP 36009, 45060 Orléans Cedex 2, France

⁴ CIT, Rossa Ave, Bishopstown, Cork, Ireland

⁵ Ecole Centrale de Lille, Cité Scientifique, 59651 Villeneuve d'Ascq, France

⁶ BBRI, Avenue Pierre Holoffe 21, B-1342 Limelette, Belgium

Phone: +33 321130680,

t.debuigne@cd2e.com

Phone: +31 883358209

Arjan.Wijdeveld@deltares.nl

Phone : +33 238643504

B.Lemiere@brgm.fr

Phone : +35 3214335460

Joe.Harrington@cit.ie

Phone: +33 647 971898

zoubeir.lafhaj@ec-lille.fr

Phone: +322 655 77 58

an.janssen@bbri.be

Introduction: Sediment dredging is a permanent issue for harbour management and development, leading to the availability of huge volumes of minerals, most of which are currently disposed of at sea due to increasing disposal costs and to disposal site shortage in densely populated areas. In the meanwhile, civil works for coastal defence and for coastal urban areas development need increasing amounts of building materials. Circular economy options are thus desirable but have not been applied due to economic, regulatory and societal barriers. In Northern France, a regional and national strategy, SEDIMATERIAUX, supported innovation and pilot tests aimed at developing reuse and overcoming barriers [1]. In the Netherlands, regulation makes it possible to reuse sediments as long as there is a 'stand still' principle when it comes to the impact on water quality. This leads to different (and often large scale) solutions with sediments compared to France.



Fig. 1: Sediment used in concrete for coastal defence blocks. SEDIMATERIAUX, port of Dunkirk.

Methods: The CEAMaS project on the reuse of marine sediments aimed at filling gaps in innovative technology (on-site characterisation [2], Leontief I/O economic modelling of reuse and GIS-based decision support [3], etc) and providing decision support tools

to address economic, regulatory and societal issues. Pilot testing in Dunkerque had been carried out in the meanwhile on several applications under SEDIMATERIAUX, including coastal defence concrete blocks, a harbour road base, a cycle path, self-compacting grout for trench fillings, hydrocyl blocks for road base water storage, waterproofing layers [1]. In the Netherlands, the focus has been on beneficial reallocation at sea and compensation for subsidence on land (Lift up of Lowlands).



Fig. 2: Sediment used in harbour road base. Ibid.

Discussion: CEAMaS, and more generally, the SEDIMATERIAUX pilot projects, brought satisfactory technical solutions for reuse, and highlighted indirect benefits when compared to linear economy models [4]: natural resource extraction reduction, reduction of land needs for disposal sites, beneficial use of older disposal sites at the Euroregion scale. This cannot be achieved without a voluntary implementation of sediment reuse in larger demonstration projects.

Despite the relevance of sediments reuse towards the EU circular economy and waste reduction strategies, regulatory constraints in relation to the waste status and the waste holder responsibility or restrictions to transboundary applications are still barriers.

Regulatory and public acceptance need further environmental validation of applications.

Acknowledgement: INTERREG IV NWE 2007-2013 program, Nord Pas de Calais French region, Port of Rotterdam, Hoogheemraadschap Hollands Noorderkwartier.

References: [1] Brakni et al. (2015) *Sednet conference, Krakow*; [2] Lemiere et al. (2016), *I2SM conference, Montreal*; [3] Harrington et al. (2015) *Sednet conference, Krakow*; [4] Debuigne et al. (2015) *Sednet conference, Krakow*