Sustainable Urban and Environmental Management Restoration Applications Using Sediment Treatment Systems with Beneficial Use

Eric A. Stern[1], Keith W. Jones[2], Michael A. Kruge[3], Huan E. Feng[3], and Lisa A. Baron[4]

[1]US Environmental Protection Agency, 290 Broadway, New York, NY, 10007 USA Phone[1]: 212.637.3806
[2]Brookhaven National Laboratory, 57 Cornell Avenue, Upton, New York, 11973 USA E-mail: stern.eric@epa.gov
[3]Montclair State University, 1 Normal Avenue, Montclair, New Jersey, 07043 USA
[4]US Army Corps of Engineers, 26 Federal Plaza, New York, New York, 10007 USA

Strategies for sustainable management of contaminated sediment systems have been in development over the last several years. One example is the European Union Sediment Research Network (SedNet) that links contaminated sediment assessment and impacts to economic, and social policy challenges in watersheds and river basins within the EU. Similar challenges exist in the United States within sediment impacted urban waterways and ports. The US Environmental Protection Agency (USEPA) /US Army Corps of Engineers (USACE) Urban Rivers Restoration Initiative (URRI), and the USACE Regional Sediment Management National Demonstration Program (RSM), have components addressing sustainable sediment management within riverine, coastal and urban aquatic environments focusing on both (non) and contaminated sediments. The nature of urban watersheds and ports impacted by contaminated sediments, has evolved RSM further from a national environmental management focus to regional estuarine and coastal targeted watershed initiatives in the urban New York/New Jersey (Port) harbor region. Environmental management in these multi-complex urban settings requires a coordinated cross-programmatic – interdisciplinary approach. This pertains to sediment management that may require remediation and restoration on a regional and community scale level taking into account a watershed approach. Management of contaminated sediment remediation and restorstion projects is a long-term challenge in assessing, designing, building and monitoring over the long term to determine sustainability especially where sites suitable for placement of sediments are limited. One component of an integrated sediment management program is the application of innovative in and ex-situ sediment treatment technologies coupled with beneficial use and restoration opportunities. Treated sediment may be used beneficially as manufactured soil, construction-grade cement, lightweight aggregate, and geotechnical structural fill. The economic benefits derived from their manufacture may serve as an economic driver in the redevelopment of adjacent environmentally / socially impacted communities. Furthermore, sustainable utilization of beneficial use products from treatment processes spares consumption of non-renewable resources. USEPA, NJ Department of Transporation, and Brookhaven National Laboratory working in partnership with the private sector has integrated a *treatment train* concept based on the results of projects and demonstrations (bench through full-scale) that have taken place regionally and internationally over the past decade (1994-2007). A full-scale *treatment train* was demonstrated during 2005-2007 using navigational dredged material from the Port and the Passaic River, NJ Superfund site. Sediment washing and thermo-chemical technologies with beneficial use endpoints were employed. Integration that includes both navigational and Superfund sediments from urban environmental restoration projects are critical to accomplish enough flow-through capacity for these technologies to succeed economically on a large scale. Other programs that may benefit from sediment treatment technologies include brownfield cleanups (soils, sediments, and demolition and construction debris), which coupled with in-situ capping technologies can promote habitat and wetland terracing restoration opportunities allowing enhanced public access in an urban environment such as in Gowanus Canal, NY. Integration of technologies as part of a multi-media regional processing facility could provide long-term sustainable infrastructure in conjunction with confined disposal facilities (CDFs) and confined aquatic disposal (CADs) to provide active storage capacity to make these facilities renewable. Estimates of natural topsoil left worldwide range from 50-100 years. Manufacturing landscape topsoil from a sediment washing process and manufacturing construction-grade cement with electric power co-generation from thermal technologies coupled with beneficial use / environmental manufacturing materials perhaps makes these innovative technology applications an environmental sustainability program – advancing from mere *remediation* to complete environmental restoration. A summary of the results and conclusions for demonstrated individual projects (Passaic River and Gowanus Canal) will be presented and the implications for a possible regional treatment facility discussed. This is a promising pathway for creating a commercially viable, sustainable *environmental manufacturing* industry.