Polluted Sites, 340,000 Reasons to Choose In-Situ Remediation Instead of Ex-Situ and Mass-Transfer

In-situ remediation and site specific risk assessment procedures will greatly increase ecological and economical efficiency of environmental remediation

HELSINKI, FINLAND, April 5, 2018 /EINPresswire.com/ -- In Europe, there are approximately 340 000 contaminated sites which likely require remediation according to the European Environment Agency (EEA).

Hans Bruyninckx, EEA Executive Director, said: "Managing contaminated land in Europe costs an estimated €6.5 billion per year. Much of this is paid by companies but there is also a high public cost. The largest cause of soil contamination is poor waste management, so preventing waste in the first place could reduce the burden on society."

Because of the vast number of polluted sites requiring cleaning, the high cost of cleaning, and because remediation procedures themselves can be harmful to the environment, choosing the most effective, ecological and cost-efficient cleaning technology and method makes a big difference on a global scale.

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The Alternatives: In-situ, Ex-situ and Mass-transfer

Generally, cleaning methods are categorized into in-situ, on-site and off-site ex-situ and into a traditional mass-transfer and landfill containment.

Ex-situ remediation methods involve excavation of affected soils from its original location and subsequent treatment on-site or off-site as well as extraction of contaminated groundwater and further treatment at the surface. In-situ remediation methods mean treating the contamination in its original place, without removing the soils or groundwater from its original location.

Within ex-situ and in-situ remediation, the contaminated material can be cleaned by several methods usually categorized by their treatment mechanism: physical, chemical, electrical, thermal and

biological. Alternative categorization would be by the intended effect on the pollutant: degradation, collection, insulation or stabilization. Due to the complex nature of many polluted soils and contaminants, more than one remediation technique is usually required to reduce the total or available concentrations of targeted pollutants to acceptable levels.

In addition to ex-situ and in-situ remediation methods, a more traditional remediation approach consists of mass-transfer methods. In the case of polluted land site, soil is excavated and disposed to a landfill and substituted with soil material from another location. If groundwater is polluted, the so called "pump and treat" method is commonly used to block contaminant transfer and spreading off site and gradually capture the contaminant from the pump and treat well system.

Choosing the Optimal Method

Once a site is suspected of being contaminated, an assessment of contamination is required. Many parameters will guide the selection of the remediation methods: the contaminants discovered, physical and chemical qualities of the contaminated media, historical use of the site, the materials used and produced on site and the result of the chemical analysis.

Usually, the whole range of technologies and methods are available. However, many factors, not typically considered within contamination assessment, limit the selection of available remediation methods. Here are the most common road blockers for those more resource-intense remediation methods such as ex-situ and mass-transfer.

High and Unpredictable Cost of Mass-transfer

Soil excavation, disposal and containment to landfill is a fast method that provides often indisputable and easily determined results. However, it comes with a high, and at worst, an unknown price tag due to the costs associated with physical excavation, transportation of polluted soil out to a landfill and transportation of replacement fill back to the site. Dumping polluted material at a landfill is subject to high and rising admission fees and taxes. Consequently, remediating sites with large contaminated volumes using off-site ex-situ or mass-transfer impose a high cost.

Furthermore, the exact volume to be excavated is not in many cases forecasted accurately in advance. As a result, the costs of excavation and transport may prove manifold compared to the original estimation.

Disruptions on Business, Public Service and Infrastructures

When the polluted soil, ground-water is situated for example under a road or a railroad track, at an airport, underneath an active industrial building or other type of civil infrastructure, remediation methods such as excavation are practically impossible to apply because of physical limitations, or because they could cause harm or even create a long-lasting disruption of traffic, business operations, or on other vital processes. In such cases, modern in-situ technologies and methods are the only possible treatment method as many can be applied without affecting surroundings.

As an example, in 2015, the soil beneath a busy railway yard in Sao Paolo in Brazil was contaminated by polycyclic aromatic hydrocarbons (PAH). Remediation through ex-situ or mass-transfer was ruled out due to resulting disruptions on rail traffic. Eventually the site was successfully remediated using the electrokinetic oxidation method without interruption to daily rail operations.

Environmental Protection Regulations

Protected or conservation areas are regulated because of their recognized ecological or cultural values. Removing contaminated soil by excavation in such areas can be limited by regulations to avoid causing harm to surrounding health and environment values. In such scenarios, in-situ remediation methods remain the best options. In-situ solutions can be carried out with minimal environmental impacts including very low carbon footprint.

Mass-transfer Disturbs, Creates Noise and Emissions

Environmental remediation should be reconciled with the commonly-adopted objectives of lowering greenhouse gas emissions and operating in a sustainable manner. Mass-transfer remediation generates material disturbance to people, the environment and generates CO2 emissions. As an example, a remediation site with 10,000 cubic meters of soil produces roughly 16,000 tons of material which then requires 400 truck loads to be transported away and roughly equal amounts of truck loads back to the site.

Conclusions

Societies need to move forward with soil and groundwater remediation procedures. In-situ remediation and site specific risk assessment procedures will greatly increase ecological and economical efficiency of environmental remediation in the near future.

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