Perspective
Volume 6:3, 2022

Journal of Environmental Hazards

ISSN: 2684-4923 Open Access

Sustainable Management of Soil-Water Systems

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Description

Quality of life is significantly influenced by the systems of soil, groundwater, surface water, and sediment. Politicians, the general public, and scientists have been concerned about the negative impacts of chemical pollution of such systems for decades. The chance to abstract some intriguing social response trends and how they connect to efficient research and management methods is provided by more than 50 years of experience in managing soil and groundwater quality. The problem of soil, sediment and groundwater contamination became clear in Europe and North America by a series of local pollution situations directly affecting the quality of human life. . Soon after, further incidents started to emerge, such as heavy metal pollution near mining and metal production sites, which has a detrimental impact on fisheries, agriculture, and public health.

The quality of groundwater resources, which are used to produce drinking water or for other purposes, has begun to be threatened by petrochemical contamination in the vicinity of industrial production areas, energy and transport hubs, and former gas producing plants. All of these incidents raised a lot of public awareness and led to calls for quick legislative and mitigating changes. Regulations needed to be implemented and site remediation programs had to be initiated, however, a mature scientific and technological knowledge base had not yet been developed to support such measures. States in North America and Europe responded by implementing protection laws and major soil quality inventory projects in the 1980s and 1990s. Since then, millions of sites have been determined to be toxic, and it is predicted that restoration would cost hundreds of billions of euros. Regulators' requirements for multifunctional remediation goals coupled with a very limited technology portfolio (pump and treat, excavation, ex situ thermal treatment, and soil washing) led to unmanageable restoration programmes with budgets that were too high for EU-member states and polluted site owners to bear.

At universities, institutes, ministries, environmental protection agencies, industrial sites, and private sector environmental firms, research programmes were sponsored to create a new knowledge foundation supporting cost-effective solutions and a scientifically educated community. In order to share knowledge and the most recent advancements in policy, science, technology, and management of soil, sediment, and groundwater quality among all stakeholders, these newly formed networks established two of the world's top conference series, ConSoil (now AquaConSoil) in Europe and On Site and in Situ Soil Reclamation of Batelle in the United States. Risk-based receptor-oriented protection replaced multi-functional threshold and target value oriented methods in policy. Questioning of the practise of remediating at any cost began. Natural attenuation and in situ bioremediation have become more widely used because of improved understanding of the potential and limitations of the self-purification ability of soils, sediments, and groundwater systems. The acceptance of ex situ and in situ based mitigations is now equal. In many countries, environmental regulations and policies now take the functional use of soil and groundwater to frame reclamation measures. was thoroughly researched. Assessments of chemical fate and transport were combined with their Eco toxicological effects. This showed that a variety of chemicals can have an impact on ecosystems and human health when they are ingested or inhaled along with soil or dust particles and bio-absorbed through food and water. This resulted in the creation of REACH in Europe (Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals) Site-specific solutions of all sizes have sparked the development of fresh ideas and technologies.

Many of these topics, including functional and ecosystem services based site redevelopment, green remediation, subsurface energy storage combined with groundwater remediation, zero-valent iron nanoparticles for in situ bio reactive barriers, and biphasic remediation, were presented during the previous three AquaConSoil conferences. Another promising development is the use of molecular techniques to assess microbial populations in soils and groundwater, and natural biological and geochemical capacities for self-purification and engineered chemical or biological remediation (Sutton et al., 2014). These approaches may prove to be very important for new types of chemicals, categorized as organic micro pollutants, recently discovered in surface water and groundwater systems, for which their environmental effects are largely unknown This exemplifies the positive outcomes of investing in stakeholder to science interactions in developing cost-effective approaches to dealing with such large scale environmental problems as soil, sediment and groundwater quality. Four important developments need near future attention of the soil and groundwater quality managing community to prevent new costly crisis situations and support fast adoption of Science Based Responses. As more representatives from various locations attend AquaConSoil, the contacts among them will be more intense, facilitating scientifically based solutions everywhere. ii) Organic micro-pollutants from industry, domestic waste water effluents (personal care products, medication and hormone residues), and agriculture (life stock related medicine residues, and pesticides) constitute a diffuse organic chemical cocktail in the nano- to microgram per litre range that permeates all human-impacted surface water - groundwater systems [1-6].

Acknowledgement

We thank the anonymous reviewers for their constructive criticisms of the manuscript. The support from ROMA (Research Optimization and recovery in the Manufacturing industry), of the Research Council of Norway is highly appreciated by the authors.

Conflict of Interest

The Author declares there is no conflict of interest associated with this manuscript.

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Date of Submission: 04 May, 2022, Manuscript No. jeh-22-75136; **Editor assigned:** 05 May, 2022, PreQC No. P-75136; **Reviewed:** 17 May, 2022, QC No. Q-75136; **Revised:** 22 May, 2022, Manuscript No. R-75136; **Published:** 29 May, 2022, DOI: DOI: 10.37421/2684-4923.22.06.170

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How to cite this article: Martin, Robin. “Sustainable Management of Soil-Water Systems.” J Environ Hazardage 6 (2022): 170.