

17th International Conference on

Environmental Toxicology and Ecological Risk Assessment

36th International Conference on

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Environmental Chemistry & Water Resource Management

September 24-25, 2018 | Chicago, USA

A sustainable integrated water and energy production plan to meet future requirements: A case study of Pakistan

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Due to increasing demand for fresh water; water resource management is undergoing a major paradigm shift because of limited resources of water. In 2015, water scarcity was mentioned as the largest global risk by the World Economic Forum. If water resources are not managed properly, about 30 to 40% of the world population will be affected by the shortage of water by 2020. In recent years certain cities/states of Spain, Australia, Israel, Cape town, even the USA had faced a scarcity of water. The same problem is expected to be faced by Pakistan by 2025. An Integrated Water Resource Management (IWRM) approach is required to resolves this serious issue. IWRM focuses on protection of available water resources and exploration & development of alternative water resources. This paper describes Reverse Osmosis of seawater as an alternative water resource. One of the major issues in introducing Reverse osmosis plant in Pakistan is cost overruns. Financial analysis of power consumption for the plant along with membrane construction and maintenance make its installation very difficult even impossible for developing countries like Pakistan. A method for installation of a reverse osmosis plant by economizing power factor to reduce process cost has been developed. For this purpose, electricity is generated by introducing wind turbines and solar panels along the coastal belt of Pakistan. This reduced freshwater production cost to 0.07 rupees per gallon along with electricity supply to Karachi at a production cost of 0.288 rupees per watt.

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