

## An Economic Approach to Appraise the Restoration of Coastal Resources by Water Reuse

*I. Heinz<sup>1</sup>, S. Koo-Oshima<sup>2</sup>, J. Mateo-Sagasta-Dávila<sup>3</sup>, M. Salgot<sup>4</sup> and J. Winpenny<sup>5</sup>*

<sup>1</sup>University of Dortmund (em.), Germany

<sup>2</sup>U.S. Environmental Protection Agency, Office of Water, Washington, USA \*

<sup>3</sup>Food and Agriculture Organization of the United Nations (FAO), Land and Water Division (NRL), Rome, Italy

<sup>4</sup>University of Barcelona, Facultat de Farmàcia, Barcelona, Spain

<sup>5</sup>Wychood Economic Consulting Ltd, The Cross, Taston, UK

The conference paper aims to demonstrate that water reuse and exchange of water entitlements between farmers and cities can play a vital role in the reduction of wastewater pollution of enclosed coastal seas. Such schemes can confer benefits to farmers and municipalities, while also creating benefits for the natural environment.

One of the main sources of pollution of enclosed coastal seas are the excessive loads of nutrients. Drastic examples can be found at the Baltic and the Mediterranean Seas with occasionally extreme algae levels causing losses for the fish industry, impairment of aquatic ecosystems and degradation of recreation values. Reclaimed wastewater use in agriculture is a promising way to solve nutrient-related problems as the effluents from treatment plants are recycled for irrigation purposes and the nutrients are used rather than being discharged to water bodies. The ecologically minimal flow of rivers can be restored and the overuse of groundwater can be ceased. Farmers enjoy better reliability of water, save costs in fertilizing and in water pumping, and get additional incomes. Cities can benefit if freshwater resources from aquifers, rivers or reservoirs are made available for potable uses by farmers' willingness to use reclaimed water. Expenses in developing remote resources can be reduced.

This is a part of a recently published UN Food and Agriculture Organization (FAO) study, which showed that both the farmers and cities can win by exchanging treated wastewater with freshwater: freshwater resources are reallocated to uses with considerably higher values and the farmers involved can share in the economic gains of the cities. Case studies at the Tordera River Delta and the Costa Brava in the North of Spain show that the wastewater outflows and the loads of nutrients in the Mediterranean Sea can be lowered by water reuse: [www.fao.org/docrep/012/i1629e/i1629e00.htm](http://www.fao.org/docrep/012/i1629e/i1629e00.htm). These cases have the potential of triple outcomes, including various environmental benefits. The terms on which the effluents are made available to farmers, and the degree to which they are subsidised, should take account of this broader balance of social costs and benefits. The study provides a methodological framework to appraise water reuse projects that can contribute, among others, to the restoration of coastal resources in a cost-effective way.

\* This work is not a product of the United States Government or the United States Environmental Protection Agency, and the authors are not doing this work in any governmental capacity. The views expressed are those of the authors and do not necessarily represent those of the United States or the US EPA.

**Contact Information:** Ingo Heinz, formerly of the Environmental Research Institute (INFU), University of Dortmund, Bierstraße 9, 58239 Schwerte, Germany; Phone: 0049-2304-74831, Email: [ingo.heinz@uni-dortmund.de](mailto:ingo.heinz@uni-dortmund.de)