

Ecology, functioning and management of wetland systems

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This special issue of Environmental Science and Pollution Research highlights selected papers presented at the 8th Society of Wetland Scientists (SWS) European Chapter International Conference “Wetland Systems: Ecology, Functioning and Management”, which was held in Padova, Italy, from 1st to 4th September 2013, under the patronage of the Department of Agronomy, Food, Natural resources, Animals and Environment—DAFNAE of the University of Padova.

The SWS series of conferences, which began in Bangor, Wales, in 2006, has a history of being interdisciplinary, covering a range of environmental and technical aspects for the conservation, management and sustainable use of wetlands. In this line, the 2013 Conference brought together academics, professionals and policy makers to discuss the most recent advances, approaches and strategies in the fields of ecology, functioning and management of wetland systems.

The conference agenda included the following sessions: pollution removal and geochemistry, wetlands and global change, wetlands vegetation, wetland management, peatlands and pollution.

The topics are in the frame of the “wise use” concept of wetlands, defined by the Ramsar Convention (1971) as “the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development”. The wise use has therefore at its heart the conservation and sustainable use of wetlands

and their resources, for the benefit of humankind. It is evident that experts of different disciplines have to be involved in the delineation of the steps towards the best utilisation of wetlands. In this sense, the contributions presented at the 8th SWS European Chapter Conference provided new findings in basic knowledge on vegetation, geochemistry cycles, inter relationships between wetlands and climate change as well as on applicative aspects regarding management and pollution control. This multidisciplinary approach gives continuity to the spirit of the International events organised by wetland experts of the DAFNAE Department, started in 2007 with the International Conference on “Multifunctions of Wetland Systems” held in Legnaro, Italy (Borin et al., 2009), and followed by the co-organisation of the IWA 12th International Conference on Wetland Systems for Water Pollution Control, held in Venice, Italy, in 2010.

Among all the works presented at the 8th SWS European Chapter Conference, 12 papers were accepted and included in this special issue. These papers highlighted current research on greenhouse gases emissions, peatlands management and evolution, use of plants in micropollutant removal, potential of wetland systems to treat sludge and liquid fraction of digestate, possible use of wetland plants as renewable energy sources and application of a standardised method to assess the ecologic impact on planning projects.

In particular, Mander et al. (2014) presented results on greenhouse gas emissions by riparian buffers in relation to groundwater table manipulation and age of grey alder stand in Estonia, finding that flooding significantly increases CH₄ emissions, but decreases CO₂ and N₂O emission. The age of grey alder did not affect CO₂ and methane emissions, while older alders induced higher N₂O emission than younger due to higher N concentration in soil. Barbera et al. (2014) produced original information on CO₂ and CH₄ emissions working in Mediterranean environment on subsurface horizontal flow-constructed wetlands vegetated with *Cyperus papyrus*,

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Cryzopogon zizanoides and *Miscanthus x giganteus*. Considering emissions and C accumulation in the biomass during the growing season, all the three species sequestered C, with best results with *Miscanthus* (4.26 kg m^{-2}).

A couple of papers were focused on peatlands, presenting contributions from quite different environmental conditions. Yustiawati et al. (2014) reported the consequences of fires on the humic acids composition of peat soils in Indonesia, showing that the burning process increased the aromatic fraction and decreased the molecular weight. Giannini et al. (2014) investigated the utilisation of two turfgrass C4 plant species in a phytotreatment system in a drained peatland in Tuscany, obtaining high potential in N removal.

The new frontier of micropollutant removal by plants from water and soil has been presented by four groups of researchers. Different plant species and pollutants were considered. In particular, Macci et al. (2014) studied the abatement of Cu, Zn, carbamazepine and linear alkylbenzene sulfonates in lysimeters vegetated with ornamental plants and common reed, finding that *Canna indica* and common reed had the highest concentrations of pollutants in their tissues. Mechora et al. (2014) highlighted the capacity of duckweed to remove selenium from water. Grifoni et al. (2014) evaluated the possible utilisation of *Brassica juncea* for the removal of As from a contaminated soil, finding that the addition of P and S enhances the As translocation from root to shoot, a process that can be exploited in the phytoremediation of As-contaminated soils. A similar study was presented by Vamerali et al. (2014) with the purpose to enhance the Cu, Pb and Zn uptake of *Brassica carenata* by applying the chelating EDDS as amending agent to soil. Only some limited advantages were obtained for phytoremediation purposes and the major benefits were achieved by low doses of EDDS.

Peruzzi et al. (2014) studied sludge stabilisation over a period of 7 years, monitoring heavy metal bioavailability and toxic organic compounds evolution; the research highlighted the positive contribution of common reed in the stabilisation process. Pavan et al. (2014) approached the problem to treat the liquid fraction of the sludge coming from anaerobic digestion with a screening of 18 wetland plant species. It emerged that only *Cynodon dactylon*, *Typha latifolia*, *Elytrigia atherica*, *Halimione portulacoides*, *Salicornia fruticosa*, *Artemisia caerulea*, *Spartina maritima* and *Puccinellia palustris* were able to survive under the experimental conditions, characterised by a high level of salinity.

Van Puijenbroek et al. (2014) applied to water bodies a standardised index used to evaluate projects with terrestrial impact. They worked on two case studies in the Netherlands considering the criteria of both the EU Water Directive and Nature 2000 showing that the method can be applied on water ecosystems to show the potential impact of planning projects.

Finally, Pappalardo et al. (2014) studied the energy potential of wetland vegetation growing along the minor hydrographic network of a reclamation area in Northeast Italy. Results highlight that biomass from riparian zones could represent a significant source of bioenergy for combustion transformation turning the disposal problem to cut and store in situ wetland vegetation into an opportunity to produce sustainable renewable energy at local scale.

The topics covered in this special issue are diverse, and they reflect the quality of the research presented at the Congress. The guest editors hope that this issue will stimulate constructive discussions and interdisciplinary research to open up new perspectives in this exciting field.

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