A Brief Method for the Calculation of Payments for Ecosystem Services (PES): wetlands in Europe

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Introduction

Wetlands are critical ecosystems for urban areas and farming in addition to their key regulatory role in nature conservation and flood regulation. The ecosystem services of them are many and so diverse. Wetlands have been assessed. However, local ecosystem services assessments may fail in including their additive value in national environmental accounts of each EU country in Europe.

Besides such externalisations the mapping approach may fail to reveal their values complete as the hetereogenity of their special *In situ* values for each case. In other words, typically selected and most frequently valued wetland ecosystem services and the intensity of problem they compensate differ almost in each case throughout Europe. However, still detailed and more specific, focusing on small scale wetland valuation cases would still be beneficiary to the society. Without taking into considering this side of the valuation grid mapping of wetland assessments would be useless at the European scale.

Wetlands may be the initial and the most easier to understand stage of EU ecosystem valuation challenge which should be followed by Payments for Ecosystem Services (PES) as EU Common Agricultural Policy (CAP) implementation, future water shortages, and farmers's global level impacted farming are the leading challenges for the EU. In fact, OECD has launched such PES working groups.

Wetlands in Europe currently need a simple valuation method for a possible convenient PES programme beyond making solely assesments:

Wetland ecosystem degradation mainly originates from

A. Improper land use,
B. Natural resource (Ecosystem Service, ESS) use which is not sustainable

Lost of original wetlands.

Lost of wetland acreages: By evaporation due to drought (climate changes). In this case valuation of ecosystem services will change due to environmental climatic and hydrological conditions, combined with improper use.

Destruction of inland freshwater wetlands: Consequences of degradation only interfere with farming, but not tourism.

Destruction of coastal wetlands: Wetlands dispersed more diffuse, impacts interfere with coastal tourism

Conversion from forested wetland to other wetland types: Wetland use opportunity costs. ,

Wetland conversion to agricultural use (drainage of wetland for agricultural use): Benefit transfer may be used to prove the value of natural and untouched intact wetlands in comparison,

Urbanisation: The relation between high quality drinking water provision in cities and original wetland conservation

As shown in the above general assessment of wetlands they also may include forestry, farming, urban sprawl, and other similar anthropogenic uses, thus may need further elaboration. For the time being, only isolated wetland assessment and valuation is preferred.

If possible, macro level and big scaled impacts should be examined, tested, measured by means of elaborating ecosystem services afterwards.

Payments for Ecosystem Services (PES) by Farmers Using Water Obtained by Wetland Ecosystems in Europe:

In only three out of 10 countries (France, Crotia, and Hungary) farmers are normally charged for water use, while in the other countries this obligation applies only in isolated cases (for example irrigation districts) or never. (1) (***Source:*** WWF's Water and Wetland Index: Critical issues in water policy accross Europe, November 2003).

The lack of water metering is another problem which causes lack of information regarding water consumption level by each farmer. So in some countries in Europe (e.g. in Turkey) the farmers therefore could not adjust their irrigation consumption in order to balance a self sustaining and satisfying water use at national level on the territory.

The ways wetland ecosystem services mitigate undesired impacts

Wetland ESS	Impacts
River self cleaning	River pollution by NPS and diffuse pollution
Heat absorbtion of aquatic environments (water)	Abrupt changes in climate, temperature of the water body in wetland

Water provides continuation of physiological processes occur in animals, plants, humans and every kind of organisms living on the earth, therefore vital to continue live in the world. Moreover it regulates various climatic and ecological processes ongoing at both micro and macro level in ecosystems. Water is an essential natural resource for farming, industry, rural, and urban areas,

(2) (***Source:*** Wetlands Loss and Degradation, Water Sheds, NCSU Water Quality Group, North Caroline State University, 1976, http://www.water.ncsu.edu/watershedss/info/wetlands/wetloss.html)

The ways wetland ecosystem services mitigate undesired impacts should be included to any water valuation component of wetland assessments, and valuations. These natural factors though not generated by the farmers themselves in Europe can increase the payments calculated to be allocated for farmers. Accordingly part of externalisation originated by the lack of biodiversity valuation can be improved in each EU country.

A PES Calculation Proposed for Wetlands: habitat's ecosystem properties method

Proposed Indicators for Wetland Ecosystem Assessment Followed by PES:

By taking one or a couple of below indicators for a given specific biogeography, naturalness degree, water quality degree, water salinity level, and the facts the given country faced due to EU CAP measures, etc., one can first assess, then valuate wetlands they own or their country own til to calculate PES for their wetlands. This single PES calculations in future may assist EU, in particular EUROSTAT, JRC, EEA, DG Environment, and, DG Agriculture.

Habitat hetereogeneity (Can be demonstrated by landscape ecology)

Changes in land use:

- Time,

- Geography,

- Landholders' land scale (land owners)

Hydrological capacity of wetlands (Measurable physically)

Pollution rate of wetland versus crop production efficiency relation

Pollution rate of wetland versus biodiversity, status of waterfowl bird species populations

(Article 17, EU Ministerial Conference "Environment for Europe" EU Environment ministers: securing biodiversity has its price)

Physical distance of wetland to diffuse pollution areas

(Genetic distance between species in relation to wetlands and use of wetland providd natural resources might also be involved in some cases. This will be probably dealt with by an a priori exploration in a future study by me).

Density of bird, aquatic species (density of biomass, organic Carbon amount found in biomass of wildlife population)

The pattern and alignement of boundaries of wetland ecosystem

Supporting ecosystems found in the surroundings of the wetland ecosystem

- **Ecosystem type,**
- **Number of ecosystems,**
- **Frequency of ecosystems on the land,**
- **Closeness of each ecosystem**

A Pool for Different Wetland Ecoystems to be Used for Each Particular Wetland Ecosystem Payment Services (PES):

For wetlands crowded by bird populations frequently or seasonally (High biodiversity of birds)

DR_s = Diversity range of species distributed on the wetland

AF_w = Availability of food for species in the wetland

$d/dt\ C_{rw}$ = Clearance rate of wetland after introducing an improved infrastructure

(e.g. in Turkey, Köyceğiz-Dalyan big protected area, after Köyceğiz Lake is cleared the Turkish protected area organisation EPASA, an abrupt increase in the size and diversity of the bird populations was observed)

Wetland under drought, water extraction, and climate change risk

$\int (r_1 - r_n)$ = The risks probably faced by the wetland ecosystem

(definite integral)

C_p = Commodities obtained from wetland (or raw materials to be manufactured later Preferentially exploited by the public)

C_{np} = Commodities (provisional services) not preferred by the public to use

I_{cc} = Impact of climate change on the wetland, e.g. drought or floods (Two sided phenomenon)

C_{wf} = Contribution of wetland on farming practice and crop practice and crop Production, (e.g. whether rice paddy used)

(IRENA indicator report may be referred this. I shall later on elaborate this)

F_{crw} = The degree at which the wetland certain food for feeding human beings and other living organisms)

For Wetlands on which Farmers Does not Properly Implement EU Policies

F_{ccw} = Cross-compliance factor for the wetland (can be used interchangeably according to situation)

Introduced in 2003, this mechanism ties EU support for farmers to compliance with standards of environmental care and public/animal/plant health and animal welfare. It covers direct payments and certain rural development and wine sector payments (EU web page).

Cross Compliance is a system that requires farmers to fulfil certain requirements if they are to receive their payments under the Common Agricultural Policy. It sets the baseline standards that you must meet to receive your payment (UK Government web page).

cross-compliance penalises farmers who infringe EU law on environmental, public and animal health, animal welfare or land management – by reducing the EU supportthey receive.

The size of the reduction depends on the severity of the infringement (EU web page).

F_{saw} = Factor for set-aside in wetlands

$d/dt\ E_{sw}$ = Rate of erosion and sediment pouring into wetland)

For the wetlands of higher importance in the eyes of society can increase the amount of paymet to be paid for farmers

R_w = Reputation factor of being recognised well by the society (e.g. in protected areas, UNESCO world natural heritages, famous and crowded tourist areas, primary water provider wetlands for big cities, etc.)

For the wetlands in which biophysical parameters are prominent such as dams, flood absorbing wetlands, wetlands providing hatching lagoons for off-shore fishes, and high quality and quantity crop production farming

V_{cw} = Velocity (rate) of cleaning capacity of wetland

d/dt H_w = Heat absorbtion capacity of wetland (Measurable, a thermodynamic parameter)

C = Organic Carbon content of the wetland (Measurable by experimental techniques)

Discussion

In my eyes, compared to US and China, the European countries usually fail in wetland restoration. In a wy they are merely in the early stages of wetland restoration and valuation with respect to global progresses and conflicts. Externalisations in biodiversity conservation interefere with ignorance of diversification of wetland valulation and PES for wetlands in Europe. Comprehensive explorations of wetland ESS coul so far not provide a smoothly working PES in Europe to cope with a realistic biodiversity conservation. As a result methods to valuate wetland ecosystems and determining their corresponding PES oversimplification and choice of indicators receiving data from measurable biophysical data should be required as much as possible. Inter species mutual relations will probably be assesses as well.

As the rate of water consumption has increased in the World and Europe, it is time to prepare and use wetland valuation and corresponding PES wherever required. Besides OECD Europe, other EU institutions still are not familiar enough to PES development of wetland resorces. It would be better to integrate PES and CAP measures in conserving wetlands as well.

References

1. WWF, 2003, "WWF's Water and Wetland Index: Critical issues in water policy accross Europe",
2. (Source: Wetlands Loss and Degradation, Water Sheds, NCSU Water Quality Group, North Caroline State University, 1976, http://www.water.ncsu.edu/watershedss/info/wetlands/wetloss.html)