

Methodology and case study
for The Economics of Ecosystems & Biodiversity,
in progress at the EEA - May 2008

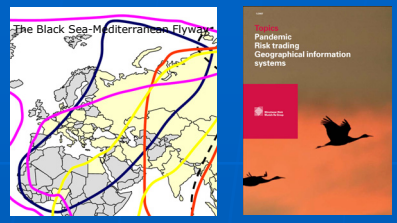
Accounting for Wetland Socio-Ecological Systems in the Mediterranean Region

Stocks, Flows, Resilience, Services, Benefits, Costs

"The benefit of conserving a species for future generations is global, whereas costs for its conservation are local and uncompensated, and therefore it goes extinct."

The Economics of Ecosystems & Biodiversity, Chapter 4, 2008

Global scale



Wetlands & Bird Flu Prevention

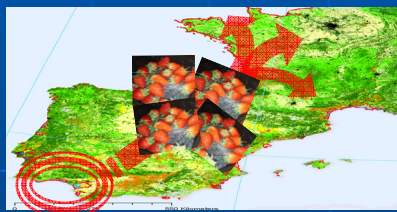
"Wetland depletion has direct implications for migrating wild birds. Wetland habitat worldwide continues to decline, primarily due to agricultural expansion and urban development, resulting in fewer staging areas for migrating birds. In these situations, remaining wet areas associated with rice paddies and farm ponds would be expected to be increasingly attractive to wild birds that lack sufficient natural habitat during staging, nesting and migration activities."

David J. Rapport et al. report to UNEP/DWEA, 2006

Wetlands supply a "regulation" service essential for limiting present and future risk of bird flu pandemic. This service can be measured and valued according to insurance practices, taking into account population exposed, risk factors and unitary costs of treatment. Maintenance and restoration of healthy wetlands in the Mediterranean and Black Sea migratory birds flyway may contribute preventing huge sanitary costs. Munich Re Group, one of the largest world reinsurance company has published a "Topics 1, 2007" on "Pandemic Risk trading, Geographical Information Systems". In a box entitled "To be treated with caution - Forecasts vary widely" they present costs estimates for pandemic varying between 1 and 10% of GDP.

Map: Wetlands International, WHO, FAO - Cover: Munich Re Group

Meso scale



Doñana, Spain: Water & Strawberries

"Yet Coto Doñana is still under threat. In a country beset by droughts on a regular basis, the main problem in Doñana is the misuse of water. In recent years, strawberry farms have sprung up in areas around the park, growing the fruit out of season in response to the demand from northern European consumers for a year-round supply of strawberries. Strawberries are a thirsty crop, and farmers have to extract massive quantities of groundwater, often illegally, to irrigate their plants. This is having a severe impact on the park. Many of the rivers and streams running into Coto Doñana, including one of the most important ones, La Rocina, have experienced reduced flows of up to 50%, leading to a drying out of the wetlands."

The explosion in the number of strawberry farms has also led to a loss of natural habitat, as many are set up on public land, with the farmers simply clearing the forest illegally to make room for their plants. This is a particular problem when the fields are grown in migration corridors - corridors of natural habitat which provide a vital link for the wildlife of Doñana, including the Iberian Lynx, to other natural areas.

Source: WWF/ One Europe More Nature.

Local scale



Amvrakikos, Greece: Water & Fish

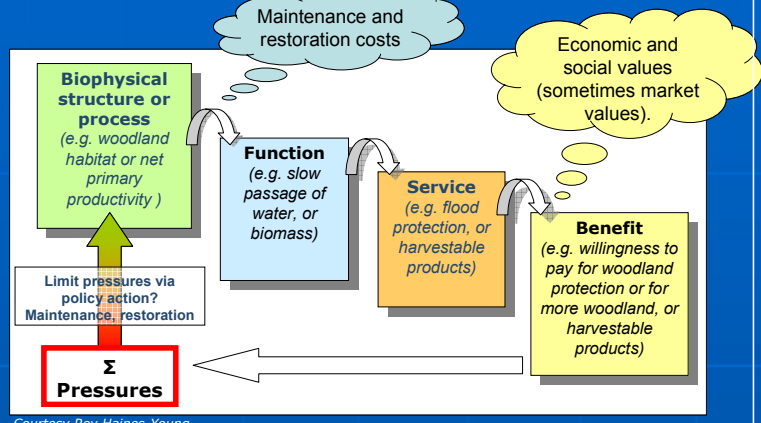
In the Amvrakikos water catchment, Greece, area water balance has been calculated twice (1985 and 1997). Water requirements for drinking water, irrigation, industry and tourism were subtracted from the total annual river water calculated run-off, leading to the conclusion that increased use of fresh water was compatible with conservation targets of this important wetland. However, this water account was incomplete, ignoring the specific requirements of the ecosystem as well as the intra-annual variability of the water cycle. In 1998 several events were correlated to these deficits, including loss of lagoon habitat diversity due to increased salinity, decrease of lagoon fisheries production, and decrease in numbers of certain bird species.

On 27 February 2008, between 500 and 700 tons of fish were reported dead, in the fish cages of three of the ten existing fish/culture units in the marine waters of Amvrakikos. The total annual yield of these ten fish farms is 1.100 tons. Scientists have suggested that the fish died of anoxic conditions due to sudden water stratification in combination with cold temperatures. The amount of €350.000 has been spent so far just to remove the dead fish from the sea, and it is most likely that these 3 fish farms will not generate any income for this year. It may well be proven that the reduction of freshwater inflow into the gulf is related to the incidents of these massive deaths of fish in the marine waters of the Gulf. The cost of actions proposed to restore some of the ecosystem functions related to freshwater in the lagoons is estimated to €7 million and the investment needed to restore some of these functions in the marine waters of the Gulf is estimated to €70 million.

"Because National Accounts are based on financial transactions, they account nothing for Nature, to which we don't owe anything in terms of payments but to which we owe everything in terms of livelihood."

Bertrand de Jouvenel, Arcadie, 1968

Assessing & Valuing Ecosystems



Courtesy Roy Haines-Young

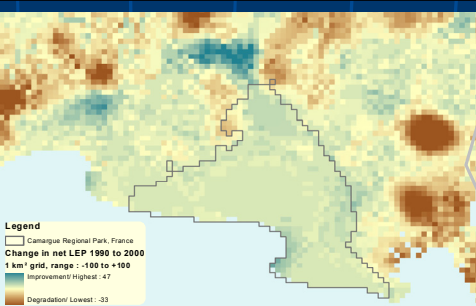
Mapping & Monitoring Wetlands



Sources: EEA and GlobCover2005 - courtesy European Space Agency
Ramsar database - courtesy Wetlands International

Accounts in physical and monetary units, tables and maps

Wetland Socio-Ecological Systems	Units	AMVRAKIKOS GREECE	CAMARQUE FRANCE	DANUBE DELTA ROMANIA	DONANA SPAIN
Surface of coastal Wetland SES	km ²	1802	827	5858	1473
Urban temperature 2000	0-100	1.6	0.3	1.3	0.5
Change in Urban temperature 1990-2000	0-100	0.0	0.0	0.0	0.1
Intensive Agriculture temperature 2000	0-100	15.8	25.0	11.8	13.4
Change in Intensive Agriculture temperature 1990-2000	0-100	0.1	1.0	0.2	0.7
Landscape Net Ecological Potential 2000	0-100	n.a.	39.5	n.a.	48.2
Change in Landscape Net Ecological Potential 1990-2000	0-100	n.a.	-0.7	n.a.	-1.1
Nature designation index (combined N2000 & national)	0-100	21.5	96.1	90.7	80.0
Mean Effective Mesh Size in SES 2005 (log(ME/FF))	n.a.	n.a.	150.8	n.a.	189.1
Population Density (inhab/km ²) 2000	inhabitants	57.9	26.5	7.5	7.5



The net Landscape Ecological Potential, an aggregate indicator produced by the EEA combines data on land use intensity, natural value of land and fragmentation. The overall rating of Camargue shows up a slight mean degradation, the improvement resulting from three decades of conservation and management efforts - which is confirmed by most field indicators analysed for producing the first ecosystem accounts of this site being balanced by a brown spot on the North-West of the area. This spot is identified by the "land cover change account" as the effect of conversions to agriculture. The appreciation of this particular wetland can be compared to the rather contrasted evolutions in the surrounding region. The nLEP "macroscopic" is working now for 14 countries in Europe and is generalised with the availability of missing road data. It can be implemented at the global level for rating ecosystem potentials.

Doñana, Spain: Valuation of Ecosystem Services (provisional)

Type of Ecosystem Services	Annual value (2006 €)
Provisioning services	
Agriculture	239 982 510
Sustainable crops	31 102
Cattle	69 445 529
Crayfish fishing	2 811 378
Coastal marine resources (onshore and offshore fishing)	11 431 027
Estuary fishing	13 076 100
Wedge shell fishing	1 407 164
Beekeeping in National Park	127 221
Pine cone harvesting	92 160
Other forest resources	66 405
Total Provisioning Services	338 439 700
Regulating services	
Grazing	12 598
AIS control	229 495
Other regulating services	26 004 344
Total Regulating Services	26 102 447
Cultural services	
Tourism	
Beach tourism	5 940 623
Cultural tourism	21 011 629
Nature tourism	36 741 776
Aesthetic values	85 840 612
Total Cultural Services	206 062 000
Detected Economic value	570 604 646

Source: Martin-Lopez et al. 2008

Doñana, Spain: Maintenance & Restoration Costs - Investments (provisional)

Conservation	Investment expenditure €	Years
Protection of biodiversity (species)	7 987 011	2004-2006
Biodiversity	2 903 020	2004-2008
Research		
Alien invasive species	923 354	1990-2006
Water quality (aquifer)	1 895 000	2000-2007
Wetland restoration - water quality	108 000 000	1998-2005
Watershed restoration (eradication and control of invasive species)	165 396 261	1998-2003
Restoration		
Fauna and flora (eradication and control of invasive species)	3 765 457	1988-2006

Source: Martins-Lopez et al. 2007



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