

ANNEX 1: LIST OF ACE STUDIES COLLECTED

Country	Geographical area covered by the CEA	Publication - Name	Authors	Year of Publication	Publisher or Contracting body
1 Belgium	Flemish region	Setting up a cost effective programme of measures to improve surface water status in the Flemish region of Belgium with the Environmental Costing Model	Broekx Steven, Meynaerts Erika, Wustenberghs Hilde, D'Heygere Tom, De Nocker Leo	2009 or 2010	Flemish Environment Administration (LNE) and the Flemish Environment Agency (VMM)
2 Belgium	Walloon region	Avenant à l'arrêté de subvention PIRENE (visa 00/52161) - Contribution de la modélisation à la mise en application de la Directive cadre eau	M. Bourouag, J.F. Deliège, E. Everbecq, A. Grard, J. Smits	2006-2007	Ministère de la Région Wallonne
3 Cyprus	Cyprus	Consultancy Services for the Implementation of Articles 11, 13 and 15 of the WFD in Cyprus RB - Draft PoM - Report No. 5 (Contact No. WDD 97/2007)	Water Development Department - Ministry of Agriculture, Natural Resources and Environment	2010	Water Development Department - Ministry of Agriculture, Natural Resources and Environment
4 Denmark	Three danish regions (West, Mid and East)	WFD: Jensen, P.N., Jacobsen, B.H.; Hasler, B. Rubæk, G. og Waagepetersen, J. (2009). Cost and measures in WFD (in Danish) .. Rapport udarbejdet til Virkemiddeludvalg II for By- og Landskabsstyrelsen.	Jensen, P.N., Jacobsen, B.H.; Hasler, B. Rubæk, G. and Waagepetersen, J.	2009	The report is written by representatives from Danmarks Miljøundersøgelser, Danmarks Jordbrugsforskning and Fødevareøkonomisk Institut.
5 Denmark	Denmark	Schou, J.S., Kronvang, B.; Birr-Pedersen, K.; Jensen, P.L., Rubæk, G.H., Jørgensen, U og Jacobsen, B.H. (2007) Measures for achieving the WFD target. Faglig Rapport fra DMU nr. 625. Aarhus Universitet. (UK summary)	Schou, J.S., Kronvang, B.; Birr-Pedersen, K.; Jensen, P.L., Rubæk, G.H., Jørgensen, U and Jacobsen, B.H.	2007	Danmarks Miljøundersøgelser (University of Aarhus)
6 Denmark	Denmark	NH3 Aaes, O, Andersen, J.M., Gyldenkerne, S., Hansen, A.G., Jacobsen, B. H., Kjær, H., Pedersen, P og Poulsen, H.D. (2008): Evaluering af det generelle ammoniakkrav, maj 2008. Rapport udarbejdet af repræsentanter fra Dansk Landbrug, Dansk Svineproduktion, Landscentret, Dansk Kvæg, Fødevareøkonomisk Institut (Københavns Universitet), Danmarks Miljøundersøgelser (Aarhus Universitet), Det Jordbrugsvidenskabelige Fakultet (Aarhus Universitet) og Miljøstyrelsen. Offentliggjort i maj 2009. (no English Summary, but 2 articles are on their way)	Aaes, O, Andersen, J.M., Gyldenkerne, S., Hansen, A.G., Jacobsen, B. H., Kjær, H., Pedersen, P and Poulsen, H.D.	2008	The report is written by representatives from Dansk Landbrug, Dansk Svineproduktion, Landscentret, Dansk Kvæg, Fødevareøkonomisk Institut (Københavns Universitet), Danmarks Miljøundersøgelser (Aarhus Universitet), Det Jordbrugsvidenskabelige Fakultet (Aarhus Universitet) and Miljøstyrelsen.
7 Denmark	Denmark	Iversen, T.M., J.S. Schou, P.N. Jensen, J. Waagepetersen og U. Jørgensen. 2007. Scenarieregninger. Udredning for Udvalg under Finansministeriet vedr. "Langsigtet indsats for bedre vandmiljø".	Torben Moth Iversen, Jesper S. Schou and Poul Nordemann Jensen (DMU), Jesper Waagepetersen and Uffe Jørgensen (DJF).	2007	University of Aarhus
8 Estonia	Harju	Harju sub-River Basin District Water Management Plan	E.F.L.M. de Bruin, F.J.L. Vliegthart, P. Schipper, T. Pallo, P. Antons, T. Botterweg, K.J. Reincke, R. van den Boomen, J. Kotta, A. Vassiljev, R. Perens, L. Vallner, A. Kivinukk	2006	Ministry of Environment of the Republic of Estonia
9 France	Seine Aval (Seine Normandie RBD)	Evaluation économique du programme de mesures de la Directive cadre sur l'eau sur le secteur Seine Aval du bassin Seine Normandie - Volume 1 : Méthodologie et chiffrage du coût du programme de mesures.	Aulong S., J-D. Rinaudo, C Hérivaux et L. Maton	2007 - 04	Agence de l'eau Seine Normandie
10 France	Charente river basin	Entre création de ressource et mesures réglementaires : quelle place pour la gestion de la demande en eau d'irrigation en Charente ?	Sebastien Loubier, Guy Gleyses, Marielle Montginoul, Patrice Garin et Fabien Christin	2007	LA HOUILLE BLANCHE
11 France	SAGE Estuaire	Etude économique SAGE estuaire Gironde	Eaucéa /Ecodécision		CLE SAGE Estuaire Gironde

	Country	Geographic area covered by the CEA	Publication - Name	Authors	Year of Publication	Publisher or Contracting body
12	France	Loire Bretagne	Evaluation des interventions de l'agence en faveur des économies d'eau	Setec/Asconit/hydratec/teleperformance consultancies	2009	Water Agency Loire Bretagne
13	Germany	Lippe	Auswahl von kosteneffizienten Maßnahmenkombinationen im Rahmen der Bewirtschaftungsplanung zur Erfüllung der EG-Wasserrahmenrichtlinie – Beispiel Lippe	Londong, J., Geiger, W.F., Meusel, S., Meyer, P., Werbeck, N., Hecht, D., Karl, H	2006	Environmental Ministry NRW
14	Germany	Steuer	Handlungsanleitung zur Ermittlung von kosteneffizienten Maßnahmen am Beispiel des Einzugsgebiets der Steuer	Planungsbüro Koenzen / Pro Aqua GmbH	2007	
15	Germany	North-Rhein-Westfalia (NRW)	Maßnahmenprogramm NRW		2009	
16	Germany	Lower Saxony	Hintergrunddokument Nachweis zur ökonomischen Anforderung der Kosteneffizienz von Maßnahmen gemäß EG-WRRRL für das Niedersächsische Maßnahmenprogramm bis 2015	Niedersächsisches Ministerium für Umwelt und Klimaschutz	2009	
17	Germany	Rur	Identifizierung der kosteneffizienten Maßnahmen bezüglich der Gewässerbelastung mit Schadstoffen zur Erfüllung der EG-Wasserrahmenrichtlinie unter Berücksichtigung der lokalen Randbedingungen – Beispiel Rur	Prof. Dr. H. Karl, Prof. Dr.-Ing. J. Londong Prof. Dr.-Ing. W. F. Geiger Dipl.-Ing. P. Meyer Dipl.-Ing. S. Meusel	2006	Ruhr Universität Bochum
18	Hungary	Upper Tisza	Cost-efficiency analysis of phosphorus load reduction measures	Clement, Adrienne, Kovács, Ádám, Rákosi, Judit and Ungvári, Gábor	2009	
19	Ireland	Blackwater North	Eastern River Basin Management Plan	Ministry of Environment, Heritage and Local Government	2010	WFDIreland
20	Ireland	Atbury Pilot Study in the Eastern River Basin	COST-EFFECTIVE PROGRAMMES OF MEASURES: THEORY VERSUS REALITY	S Blacklocke, A Hooper, M Rosenberg and R Earle	2006	SAC and SEPA, International Water Agency
21	Luxembourg	Luxembourg	Bericht zur Wirtschaftlichkeitsanalyse des Maßnahmenprogramms im Rahmen der Wasserrahmenrichtlinie 2000/60/EC	PWC, Ecologic	2009	Administration de la gestion de l'eau
22	Malta	Maltese Water Catchment District	Towards a draft programme of measures For restoring groundwater resources in Malta	Twinning Light Project	2007	Twinning Light Project Report
23	Netherlands	General Guideline exemplified in the case of the Meuse	In pursuit of optimal measure packages	Rob van der Veeren	2005	Ministrie van Verkeer en Waterstraat
24	Netherlands	Rhine	Kosteneffectiviteit van maatregelen en pakketten Kosten-batenanalyse voor Ruimte voor de Rivier, deel 2	J. Ebregt, C.J.J. Eijgenraam en H.J.J. Stolwijk	2005	Centraal Planbureau
25	Netherlands	Rhine	Kosteneffectiviteitsanalyse Kaderrichtlijn Water Deelstroomgebied Rijn Oost	Morselt, T., te Grotenhuis, R., Schomaker, T.	2005	
26	Norway	The Norwegian counties Østfold and Akershus	Refsgaard, K., Bechmann, M., Blankenberg, A.G.B., Skjøien, S., Veidal, A. (2010). Kostnadseffektivitet for tiltak mot fosfortap fra jordbruksarealer i Østfold og Akershus. Rapport 2010-2. Norsk institutt for landbruksøkonomisk forskning.	Refsgaard, K., Bechmann, M., Blankenberg, A.G.B., Skjøien, S., Veidal, A.	2010	NILF (The Norwegian Agricultural Economics Research Institute)
27	Norway	Exaples from different parts of Norway.	Magnussen, K., E. Romstad og D. Barton (2003). Eksempler på tiltaksanalyser og tiltakskostnader knyttet til vannforekomster – Forberedende arbeid i forbindelse med EUs rammedirektiv for vann. KM Miljøutredning, rapport 2003-01.	Kristin Magnussen (KM Miljøutredning), Eirik Romstad (Inst. for økonomi og samfunnsfag, Norges landbrukshøgskole), David Barton (NIVA).	2003	KM Miljøutredning (Norway)
28	Poland	Klodnica	SOCOPSE Report on Klodnica Case Study	Janusz Krupanek, Mohammed Belhaj, John Munthe, Eva Brorström-Lundén, Willy van Tangeren, Jaap van der Vlies, Ruud Baartmans, Urszula Zielonka	2009	EU
29	Portugal	Minho–Lima river	Cost-effectiveness analysis for sustainable wastewater engineering and water	S. Costa, L. Coutinho, A.G. Brito, R. Nogueira, A.P. Machado, J.J. Salas, C.	2009	Desalination and Water Treatment

Country	Geographic area covered by the CEA	Publication - Name	Authors	Year of Publication	Publisher or Contracting body	
	basins (Portugal)	resources management: a case study at Minho–Lima river basins (Portugal)	Póvoa			
30	Portugal	Ribeiras do Algarve River Basin (Portugal)	DSS Application to the Development of Water Management Strategies in Ribeiras do Algarve River Basin	Maia, R., Schumann, A.H.	2007	Water Resources Management
31	Slovenia	Krka	Elements of a river basin management plan for the Krka river subbasin	Beumer, L., Erzen, N., Gobec, S., Gole, A., Hehenkamp, M., Ignjatovic, M., Marvot, L., Hozjan, U., Prestor, J., Drapal, D., Strosser, P., Umek, T., Terpin, S.	2006	EU
32	Slovenia	Poljskava River	Economic guidelines for planning a programme of measures	Ahamer, G., Bizak, A. et al	2008	European Twinning Project SI06/IB/EN/01
33	Spain	Serpis basin (Jucar RBD)	Economic tools for selecting a programme of measures to meet the WFD standards. Application to the Serpis River basin, Spain.	Pulido-Velázquez, M., Hernandez-Sancho, F., Ferrer-Polo, J., Latorre, J.I.	2009	2nd International Conference on Water Economics, Statistics, and Finance. Alexandroupolis, Greece
34	Spain	Cidacos basin (Ebro RBD)	Cost-effectiveness analysis for the WFD	Gómez, C.M. , Garrido, A.	2006	Int. Workshop on Hydro-economic models and tools for the implementation of the EU WFD. Valencia, Spain.
35	Spain	Jucar river basin	CEA for selecting the programme of measures in the Jucar basin	Pulido-Velázquez, M., López, A., Andreu, J., Ferrer-Polo, J.	2010	Report for the Jucar RB Authority
36	Spain	general methodology (synthetic case)	A hydro-economic modelling framework for optimal management of groundwater nitrate pollution from agriculture	Peña-Haro, S., Pulido-Velázquez, M., Sahuquillo, A.,	2009	Journal of Hydrology
37	Spain	Guadalquivir basin, Spain	Cost-effectiveness analysis in the PoM in Spain (in Spanish)	Berbel, J., Mesa, P., Martin-Ortega, J.,	2009	Fundación Cajamar
38	Sweden	North Baltic river basin district (Norra Östersjön), Sweden	Åtgärdsprogram. Norra Östersjöns vattendistrikt. 2009-2015	The Swedish Water Authority (North Baltic river basin district)	2009	The county administrative board of Västmanland
39	Sweden	South Baltic river basin district (Södra Östersjön), Sweden	Åtgärdsprogram. Södra Östersjöns vattendistrikt. 2009-2015	The Swedish Water Authority (South Baltic river basin district)	2010	The county administrative board of Kalmar
40	Sweden	The Swedish West coast river basin district (Västerhavet), Sweden	Åtgärdsprogram. Västerhavets vattendistrikt. 2009-2015	The Swedish Water Authority (West coast river basin district)	2010	The county administrative board of Västra Götaland
41	United Kingdom	River Ribble (River Darwen)	Ribble Pilot Trial Report	Stout, Lisa and Fenn, Teresa	2005	RPA, Environment Agency
42	United Kingdom	Derwent catchment	WFD related agricultural nitrate and phosphate leaching reduction options: Cost estimates derived from farm level survey data & A cost-effectiveness assessment for the Derwent catchment	Ian J. Bateman, Amelie Deflandre-Vlandas, Carlo Fezzi, David Hadley, Michael Hutchins, Andrew Lovett, Paulette Posen, Dan Rigby	Revised February 12th 2008	work was part of the interdisciplinary research programme of the ESRC Research Centre for Social and Economic Research on the Global Environment (CSERGE)
43	United Kingdom	Humber	Futures Scenarios and Cost Effectiveness Analysis of Alternative Policy Options to Improve Water Quality in the Humber Catchment in the United Kingdom	Rachel Cave, Roy Brouwer, Emma Coombes, David Hadley, Kerry Turner and Irene Lorenzoni	2004	Eurocat
44	United Kingdom	general	ASSESSING THE COST-EFFECTIVENESS OF INTEGRATED MEASURES TO DECREASE LOSS OF NITRATE, PHOSPHORUS AND FAECAL	M Shepherd, S Anthony, P Haygarth, D Harris, P Newell-Price, S Cuttle, B Chambers and D Chadwick	2006	Scottish Agricultural College, Scottish Environment Protection Agency, International

Country	Geographic area covered by the CEA	Publication - Name	Authors	Year of Publication	Publisher or Contracting body
		INDICATOR ORGANISMS			Water Association
45 United Kingdom	general	Controlling Ammonia from Non-Agricultural Sources	Claire Handley Mike Holland Chris Dore Tim Murrells	2001	UK's Department for the Environment, Transport and the Regions
46 United Kingdom (Northern Ireland)	Upper Bann catchment	Testing of the Cost Effectiveness Methodology for the WFD in Northern Ireland	Kieron Callaghan, EHS (NI) Seamus O'Hare,	2006	Environment and Heritage Service
47 United Kingdom (Scotland)	Lunan Catchment	Cost-effective analysis of land management options for water quality: the case of buffer strips for P mitigation in Lunan Catchment, East Scotland	Bedru B. Balana1,†, Manuel Lago1, Andy Vinten1, Bill Slee1, Nikki Baggaley1, Marie Castellazzi1, Eleonore Guillem2, Martyn Futter1, Marc Stutter1	2010	Conference Paper ISEE International Society for Ecological Economics
48 United Kingdom (Scotland)	River Leven and Loch Leven	River Loch Leven Pilot Trial Report	Stout, Lisa and Fenn, Teresa	2005	RPA, Environment Agency

ANNEX 2: LIST OF EXPERTS INTERVIEWED

Country	Name	Organisational Affiliation
Austria	Rober Fenz	Lebensministerium.at - Sektion VII - Wasser
Cyprus	Prof. Dr. Phoebe Koundouri	Athens University of Economics and Business Director of Research on Economic, Social Environmental and Ecological Sustainability (RESEES)
Czech Republic	Ivo Kokrment	VRV Water Management Development and Construction joint stock Company
Germany/Eider	Dieter Grett	Ministerium für Landwirtschaft, Umwelt und ländliche Räume
Germany/Elbe	Buchs, Ann Kathrin	Niedersächsisches Ministerium für Umwelt und Klimaschutz
Denmark	Brian H. Jacobsen	Institute of Food and Resource Economics, Copenhagen University
Finland	Antton Keto	Finnish Environment Institute
France	Gorin Olivier	Agence de l'eau RMC
France	Blanquart Stéphanie	Agence de l'eau LB
France	Courtecuisse Arnaud	Agence de l'eau AP
France	Feuillette Sarah	Agence de l'eau SN
Hungary	Ungvari, Gabor and Rakosi, Judith	Corvinus University of Budapest
Latvia	Fedorovica	Latvian Environment, Geology and Meteorology Centre
Luxembourg	Dworak, Thomas	Fresh-Thoughts
Netherlands	van der Veeren, Rob	Rijkswaterstaat
Norway	Silje Holen	NIVA
Slovakia	Drulova, Erika	Water Research Institute Bratislava
Spain	Wolfgang Krinner	Cima Consulting, working as an adviser on economic issues for the Subdirectorate for Water Resources Planning of the Spanish Ministry for Environment
Spain	Ferrer Polo, Francisco Javier	Jucar River Basin District Authority, Planning Office
Sweden	Dag Lestander	The Competent Authority of South Baltic River Basin District
UK	Salvetti, Maria	Independent consultant
UK	Le Quesne, Tom	WWF
UK/Scotland	Eory, Vera	Scottish Agricultural College Resource Economics

ANNEX 3 : QUESTIONNAIRE FOR EXPERTS

INTERVIEWS



Bilan etude d'utilisation de l'analyse cout-efficacité

Questionnaire Phase 3 –Understanding the Conditions for effective use of the Cost Effectiveness Analysis

Deadline for response is 6th of December, to be send toXXX.

Please also contact this Email address if you require any clarifications.

Thanks for participating!

Background and objective: The research and consultancy ACTeon is currently conducting research for the French National Agency for Water and Aquatic Environments ('Office National de l'Eau et des Milieux Aquatiques'). This study concerns the use of Cost-Effectiveness-Analysis (CEA) in the realisation of the Water Framework Directive in Europe. The overall aim of this study is to investigate the methods applied, the scale of implementation and the relevance of the CEA in EU countries to get a comprehensive overview. We have already gathered some basic information on CEA use in your country and we are now doing a more thorough investigation. In this third step of the study we are specifically interested in exploring the conditions that enable/hinder the effective use of this economic tool in the political decision making. The questionnaire is mainly composed of open questions, so please elaborate your answers.

Your data:

Name:	
Organisational Affiliation:	
Country:	
Contact details (Email, Telephone)	

1. Methodological choices of the Cost Effectiveness Analysis

1. a) What were the main motivations for implementing a CEA in your country (WFD obligations, arguing choices, support decision making ...)

--

--

1. b) How has the CEA been applied in the WFD in your country (systemic use, confined to pilot basin studies, only applied to certain themes, other)?

--

1. c) Are there efforts on national level (e.g. prescribed procedures, guidelines) that advise how to use the CEA in the WFD context? Are mechanisms in place in order to simplify the CEA process (screening out of measures/ transfer/feasibility study or pre-analysis, databases of measures and their costs)?

--

1. d) In hindsight, what were the steps of the CEA implementation?

--

1. e) In your experience, what are the main constraints for developing a proper CEA?
Please explain

Access to data/Availability of data?	
Quantification of costs? (Please specify)	
Quantification of Effectiveness?	
Uncertainty regarding the previous data?	
Scale?	
Time constraints?	

Human – skills constraints	
Other constraints?	

1. f) How were the stakeholders involved in the CEA itself? (co-construction, information, etc.) If no involvement: Why?

1. g) At what level was the CEA applied? (water body, district level, river basin, etc)

1. h) Is CEA linked with other economic tools (line Cost Benefit Analysis) used to help decision making in the context of the WFD?

1. i) Was there any model used for the CEA?

1. j) Were transactions costs (administrative costs, information costs, reporting/monitoring costs, negotiation costs and compliance costs), generated by the implementation of the measures, considered in the CEA process?

2. Institutional and cultural context

2. a) Do you think there is enough personal/institutional capacity to carry out a CEA in your country (national/sub basin level)? If not, do you have explanations why?

2. b) Have you perceived horizontal and vertical communication deficits in and between relevant institutions and organisations?

--

2. c) Are the relevant institutions open for innovative instruments brought in from the EU?

--

2. d) Is there a cultural perception in favour of this kind of economic tools in your country?

--

3. Decision making

3. a) How have the results of the CEA been taken into account in the decision making process of the final Programme of Measures? Was the CEA an integral part of the measure selection? Why?

--

3.b) Is it the case that measures proposed by CEA are not used? If yes, please explain why

Budget limitations	
Time constraints	
Political acceptability/ political constellation/ lobbies	
Results not consistent with scientific evidence or	

expert judgement	
Other	

3. c) Was the CEA used in a transparent way for decision making?

3. d) Is it generally perceived amongst the relevant institutions that the CEA approach helps the decision-making?

3. e) Would you use a CEA for the selection of the measures in the second river basin management plans in 2015? If yes, which improvements would you apply i) to the method ii) to the institutional process?

ANNEX 4: SYNTHESIS ON CEA USE AND IMPLEMENTATION PER COUNTRY

Country	CEA Used
Austria	CEA has been implemented. It was part of waste water planning since 1980s. With the WFD the scope was extended to other water issues and now (also driven by the EU) the issue becomes more and more common for other env. policies. Not very important as decision are more based on political agreements. The effects have been more important than the cost issue. Costs become more important on the project level.
Germany	CEA was used - based on a handbook the different "Länder" developed their own approaches. Germany has no national commonly applied approach, but CEA was used in all Länder. The efficiency part was more important until now as the main aim was to select measures which deliver in time and ensure that the water status will be improved. However due to the uncertainty related to the effectiveness of certain measures a conservative approach was used during the selection. Conservatory means that measures with well known effects have been peritonised. The cost part becomes more important now when implementing the measures and the ground and various variants of a measure could be implemented. Than costs and the distribution of costs among polluters becomes more relevant.
Luxemburg	One CEA has been conducted. In LU the main sources of pollution come from urban areas and agriculture. LU does not fully comply with the UWWTD, so several measures in the RBMP are aiming to close this gap. However CEA in this case is less important as LU has to follow the implementation rules of the UWWTD. CEA might become more relevant on the project level (e.g. several option on how to built a sewer system). For agriculture CEA was considered as a tool for future CAP negotiations, in particular new measures under the Rural Development program. For the moment measures have been selected based on "part of the current public funding shame" and farmers acceptance. For other pressures not enough alternative measures exists to tackle the problem (e.g. chemical pollution) or the cost effectiveness ratios are to similar (e.g. fish leader and removal of the barrier) allowing to take a final decision yet. In the case where cost effectiveness ratios are to similar more detailed studies on the project level will be required.
Bulgaria	No CEA use was found in the documents relating to the WFD. The Bulgarian expert affirmed the absence of CEA in the WFD implementation.
Latvia	While preparing the Programme of Measures for the River basin districts in Latvia several criteria were taken into account for the selection of measures, inter alia cost-effectiveness of measures. CEA was undertaken using the CEA tool (Excel based model), that was elaborated for the needs of Latvia by a Flemish company in

	<p>cooperation with "Estonian, Latvian and Lithuanian Environment" Ltd. and Latvian State Geological Survey. The CEA tool was elaborated taking into account the requirements of the WATECO guidelines and the circumstances in Latvia. But the options of this CEA tool are limited. It is developed to produce the most cost effective combination of measures that could be applied to tackle nitrogen and phosphorous problems within a surface catchment area. Therefore it only deals with pressure that generate diffuse and point source discharges of these nutrients (Yet in Latvia eutrophication of surface waters due to biogens is one of the main reasons of mismatching the requirements of WFD for a lot of water bodies). The basic methodological approach of this CEA is based on financial costs of measures (as a proxy for economic costs); it uses the discounted yearly costs of measures. Using this CEA tool the selection of the measures was made for each water body separately, taking into account the linkage of water bodies - the flow direction and the mutual interaction of measures. Short display of CEA in the RBMPs, no English version was found.</p>
Lithuania	<p>A CEA was used, with the following methodology: The relevance of specific measures was scrutinised in terms of practical, technical, environmental and economic feasibility. The CEA was a requirement to employ and submit indicators for each measure. Then, these cost-effectiveness ratios were used when investigating the possibilities to apply them in the river basin management plan. Measures were then rated according to CEA but also according to some practical aspects (legal issues, acceptability, practical feasibility etc.). This resulted in a set of more or less cost-effective measures. CEA has been mainly used for measures in the agricultural sector. Hereby it was used to determine the effects and cost of reducing N and P with various measures. No documents with CEA in English could be accessed.</p>
Slovenia	<p>CEA has been found in five Pilot Basin Case studies: on hydromorphological Issues (Poljskava and Drava), on groundwater quality (Dravska kotlina) and general water quality (Krka), as well as in a conference poster (Net Present Value of Poljskava measures). A Slovenian generic catalogues of measures exists (hydromorphology, agriculture) and guidelines have been set up as part of a twinning project with Germany and Austria. Three of the case studies have also emerged out of the twinning project. The Krka project was undertaken with a Dutch consultancy.</p>
Poland	<p>Guidelines (2005) and recommendations for WFD have been found, in frame of the realisation of the Polish-French Twinning Project. Thus, a CEA should be conducted based on pre-screening of effectiveness and realistic likeliness of measures as well as dimensioning of the selected combination of measures (physical quantification) and the evaluation of the effectiveness of combinations of measures. However, the guideline states methodological challenges that need to be solved, mainly the harmonisation of the calculations for different water bodies (scale) and the display of effectiveness in one single unit. Possible cases in the CEA are exemplified and a bottom up approach is advocated. Furthermore, the organisation of a database is advised, in order to enable different</p>

	<p>kinds of aggregations (geographical, by topics, etc.) and to share information and refine assumptions between various organisations involved in the WFD PoM process. Two CEA were found (in English), a 2002 example from a research paper and the Klodnica case study as part of the international SOCOPSE project. Accord to a Polish expert CEA in Poland is mainly implemented in nature conservation management, especially in national parks and Natura 2000 sites management as well as in wetland restoration projects. Works in regard to the Water Framework Directive implementation in Poland are still in the initial stages. An institutional problem for proper implementation of CEA in water management in Poland is the very technical (anti-ecological) approach of many water managers, educated in the socialist period.</p>
Estonia	<p>A detailed and exemplary CEA has been conducted in a Pilot River Sub Basin (in English by a Dutch consultancy consortium) using the Internal Rate of Return in combination with a Cost Benefit Analysis. No other documents have been found as replies have been meagre.</p>
Czech Rep.	<p>No proper CEA was found in English, although there was one case study conducted in Ploucnice. The decision on choosing the measures is based on expert knowledge on the side of the river basin authority, regional authorities and water users to set priorities in proposed measures. Both ministries - Ministry of Agriculture and Ministry of Environment - were also involved in refining the Programme of Measures. In cases of measures addressing contaminated sites like small municipalities (below 2000 inhabitants) not connected to the WWTP, river restoration priorities were set on the basis of:</p> <ul style="list-style-type: none"> -Importance/Urgency of the measure (e.g. small municipality without WWTP in or close to NATURA site, or close to drinking water source) -Status of preparation (to be able to meet 2012 deadline) -Strategic importance for regions, municipalities, water users (strategic objectives in regional strategic documents, etc.)
Romania	<p>CEA was used on sub-basin level, but with methodological difficulties (e.g. no cost effectiveness ratio). An analysis of additional measures was performed on the grounds of cost prioritisation in regard to the likelihood of implementation of measures by 2012. A logical report was developed that shows what investment for environmental objectives can be achieved in time. The prioritisation of cost efficiency criteria does not reveal a uniform situation across the sub-basins, due to the specific cost of different measures. Identifying a single optimal solution has proven difficult as some costs and targets can only be assessed qualitatively.</p> <p>No public document (RBMP) in English was found using a CEA .</p>
Netherlands	<p>The Dutch strategy seeks to institutionalise CEA into the WFD process by creating procedures, methods and guidelines where the selection of measures happens on the basis of reciprocity between action and analysis on national and regional level, with mixed success. The supplementary local and regional measures, where CEA is mainly relevant, are exercised at the following levels: The</p>

central government is responsible for an effective regulatory framework, including the implementation of European directives. It also sees to effective coordination with other policy fields, so that any measures taken in other areas can contribute to improving the water quality. The water management authorities are responsible for most of the programme of supplementary measures. Rijkswaterstaat manages the main water system, the water boards manage the regional surface water system and shallow groundwater, and the provinces manage the deep groundwater system. Municipalities are responsible for measures relating to sewers, the disconnecting rainwater from the sewer system, and the management of urban water. Provinces and municipal councils also play a key role in the spatial incorporation of measures.

On the national level the main overall measures (hydromorphological change, reduction of agricultural pollutants) were determined in 2006 with a strategic social cost-benefit analysis (Maatschappelijke Kosten-Batenanalyse/MKBA). Research, pilot projects and working groups (e.g. Afwegingskader) support the regional and national analyses and evaluation of measures. A national online information database system and exchange platform (The Measures Knowledge System) gives detailed Cost Effectiveness information for measure selection in order to support the regional water managers in the implementation of the cost-effectiveness analyses. Furthermore, for the agricultural sector a best practice database was constructed, defining cost effective measures for reduction of fertiliser and pesticides while another databank (Groslijst maatregelen Kaderrichtlijn Water) lists possible measures in the agricultural sector, displaying the cost and cost effectiveness. Another study determined cost effectiveness for measures aimed at improving techniques in waste water treatment plants. A handbook defines the procedures of CEA and served as guidance for regional action.

Regional participation meetings were held under the leadership of the Waterschappen, where measures for the geographic area (Stroomgebiedbeheerplannen) were chosen. This decision was taken on the basis of costs, feasibility and implementation and acceptance with the attending groups (regional officials, NGO, agricultural sector,..). Ultimately, the decision is in the hands of the regional water managers implementing the cost-effectiveness analysis. On national level projects (like big rivers) the Rijkswaterstaat took these decisions. The measures generally concentrate on the national priorities (hydromorphology, nutrient reduction). Regional measures are integrated with national measures.

An Ex-Ante report scrutinised and evaluated the final measure package. After presenting them to Parliament these measures get implemented.

The politico-cultural background of the NL is favourable for CEA. In the

	<p>Dutch ministries, efficiency and effectiveness are general requirements. Article 20 of the Government Accounts Act (Comptabiliteitswet) states that Ministers shall be responsible for the effectiveness and efficiency of the policy underlying their budgets. This includes conducting regular audits of the effectiveness and efficiency of the policy, and reporting back to the Ministry of Finance. Guidance for this requirement is presented inter alia in the draft “guidance for ex post evaluation research”.</p> <p>Given the large amount of background documents, relatively few CEA undertaken were found. As described before, the Netherlands use a generic approach where the measures in the national databanks have undergone a CEA and thus a pre-selection. Furthermore, according to Dutch experts, CEA in NL have been carried out, but mainly 'in the background' by water management authorities. It is thus hard to find concrete examples of 'formal' CEAs as these were often put in internal documents. The formal Water management plans only present the chosen measure package, information on which measures were dismissed (and why) is scarce. Governance issues between national and local (Waterschappen) level were also mentioned as well as the fact that the Netherlands have a highly artificial geography which implies heavy (disproportionate) costs for WFD implementation.</p>
Slovakia	<p>A CEA-Methodology has been developed (Cost-effectiveness is expressed as the relationship of ecological effectiveness and so-called cost indicator), yet the procedure outlined there could not be used consistently. CEA has been carried out only for the proposed hydromorphological measures. In the first phase measures were proposed and analyzed for the water bodies delineated on the large and middle watercourses (with catchment size above 100 km²), in the next step the other water bodies on the small watercourses were taken into account. The cost estimates of combinations of measures served for the comparative purposes. For the costs estimation for individual types of hydromorphological measures (8 types of measures have been used in Slovakia) the unit prices have been used, which were derived from the long-term experiences of the main investment organisation of the measures - Slovak Water Management Enterprise (main administrator of the significant water management watercourses in Slovakia). The testing of measures was performed by the expert groups (established individually for each sub-unit) comprised by hydromorphologists, biologists, ichthyologists, economists and also water management experts from the Slovak Water Management Enterprise. CEA have only been undertaken in Slovakian language.</p>
Ireland	<p>Following publication of Ireland’s national summary characterisation report (River Basin Districts) in 2005, key pressures were identified. These pressures were outlined in the public-consultation documents <i>Water matters</i> (WFD Ireland 2009a), published by each river basin district (RBD) in 2006, and the approach received general consensus during the public participation process. Case studies were initiated, including addressing different facets of cost effectiveness analysis in</p>

	<p>Programme of Measures. To provide a solid scientific basis to evaluate effectiveness of basic measures and identify any additional supplementary technical measures required, national studies into the key pressures and measures were undertaken by the RBDs, in collaboration with national institutions (2008). Out of this series of studies completed by river basin districts a comprehensive list of measures assisting in achieving Water Framework Directive objectives have been derived. Each study addressed a key pressure on the water environment. The most relevant and cost-effective measures were chosen from the list for implementation. The measures were available for public consultation in the draft river basin management plans, and the final set of measures for each water body was determined in the final plans.</p> <p>The water framework directive master plan (WFDMP) in Ireland is being developed jointly by the Department of the Environment, Heritage and Local Government (DEHLG), the Environmental Protection Agency (EPA), the River Basin District (RBD) competent authorities (namely lead Local Authorities) and stakeholders including the relevant public authorities. A guidance document on how to assess the cost effectiveness of WFD measures was developed and was applied by individual River Basin Districts in developing the River Basin Management Plans and in selecting the measures to be included in the plans. A River Basin Management System provides access to all data, assumptions, measures, how and why measures have been selected and the cost and effective estimates of those measures for all water bodies</p> <p>In order to save time and reduce costs Irish authorities have developed a generic approach. Inclusion of national level measures in a management plan presents issues as such measures have to be subject of a policy decision and or legislation at central government level. Governance related to finance / allocation to local authorities to implement measures is a major constraint in Ireland.</p> <p>For each status deficient water body measures are sifted and screened as appropriate. A discount rate is applied for time consideration in the measurement of costs. Then cost-effectiveness ratio is calculated for all alternative measures or strategies. Then they are ranked and a disproportionate cost analysis is undertaken for the chosen measure.</p>
<p>UK (England, Wales and Northern Ireland)</p>	<p>The Cost Effectiveness Analysis (CEA) in regard to the Water Framework Directive is dealt with at the ministerial DEFRA level, where a large number of activities have been arranged (top-down) to prepare a clear and efficient application of the CEA. Accordingly, the Collaborative Research Programme (CRP) on River Basin Management Planning Economics was set up to develop the methodologies needed to undertake the WFD economic analysis and to provide the guidance on these methodologies for use in the UK as well as the selection of key groups of measures, a cost calculation</p>

tool, a cost database and the completion of a National Water Environment Benefits survey to provide information about the overall scale of benefits from WFD implementation. The national preliminary cost effectiveness analysis (pCEA) considered the scope and scale of measures on a national basis, and their costs and effectiveness for the first round of river basin management plans. It specifically dealt with

- what should be done in the first planning cycle using consistent national measures, and what happens if it takes longer to meet objectives;
- the types and costs of measures to be decided at national or river basin district level, reducing the need for further detailed analysis;
- the overall costs and affordability;
- the role of industry and other organisations in implementing measures;
- what measures could be ruled in or out of the first cycle from a national assessment.

The UK methodology encourages the identification of general measures that could be taken at regional or national level and be applied in multiple cases at the local level in a forward-looking manner. Thus, Pre screening of measures can be done on the basis of catalogues of generic measures and mechanisms.

The findings of the pCEA and the other preparatory actions meant that very little additional work on cost effectiveness was needed at a more local level as the selection and appraisal process is quite prescribed. It was stated that the CEA methodology developed enables simple assessment and doesn't allow too much subjectivity.

At the river basin level this results in choosing from possible measures with already embedded CEA. The river basin management plans (RBMP) relate to this extensive preparatory work. That is why no RBMP with explicit CEA has been found, with the exception of pilot study basins.

The UK methodology does not narrow down the results in a single indicator (Cost Effective Ratio) which would oversimplify the process. It therefore has a strong qualitative component in its approach which allows non-quantified effect assessment, encourages uncertainty analysis and transparency. However, two general problems are seen in cost assessments: firstly, O & M costs are not analysed in anything like the same detail as capital costs; secondly, reliability is usually assumed.

Part of the WFD process was also the restructuring of Government Bodies in regard to the river basin level.

The UK has a strong tradition of economic assessment of policies.

	<p>The Treasuries Green book outlines that “all new policies, programmes and projects, whether revenue, capital or regulatory, should be subject to comprehensive but proportionate assessment”, mentioning the CEA as one instrument. Yet in general, the focus in UK is more on Cost Benefit Analysis (CBA). CBA has so dominated the field in the UK that CEA has not emerged as a distinct issue (CEA is CBA without the benefit assessment). According to British experts, everything in water (e.g. OFWAT price reviews, new legislation requires an accompanying Regulatory Impact Analysis) is governed by a CBA and has been for years.</p> <p>Research now explores the improvement of CEA, e.g. through Landscape based CEA models (http://www.knowledgescotland.org/briefings.php?id=160).</p>
<p>UK (Scotland)</p>	<p>Scotland follows a similar approach to England using DEFRA’s preliminary cost-effectiveness analysis for the Water Framework Directive, WFD Supporting Plans for Priority Substances or BERR documents which form the basis for the estimation of the costs of different technical measures. There are also ‘domestic’ research databases for measure effectiveness in Scotland like the one outlined in the ADAS diffuse rural pollution mitigation report to the Scottish government (2008). The idea is therefore to choose amongst measures with an embedded CEA which explains the absence of any documents displaying a CEA (other than a pilot study).</p>
<p>Hungary</p>	<p>CEA has been undertaken in Pilot River Basins. Guidelines, decision support system and database of measures have been developed. The methodology to apply CEA was prepared in the WFD process. It was applied to a set of typical yet not exhaustive number of problems in order to give guidelines for the further planning. These guidelines contain rankings of measures that cope with a given problem. In these rankings CEA results were considered as well. The CEA case studies were conducted in 8 pilot areas. These case studies covered the topics of:</p> <ul style="list-style-type: none"> - Restoring hydromorphological problems along middle size rivers and streams with flood protection considerations - Controlling sub-surface water levels - excess water and diffuse nutrient load in mixed - artificial-natural water systems - Controlling diffuse nutrient load of streams on an intensive agriculture area in hilly terrain - Restoring hydromorphological problems, water supply and controlling water quality problems of water bodies in converted flood-plain areas. <p>The formal CEA methodology was however not used in the second phase of WFD planning when the sub-district river basin management plans were prepared. No English documents were found displaying a CEA other than a research paper and the final report of "Promoting the implementation of Water Framework Directive Phase II". The lack of use of CEA is due to the inappropriate allocation of decision rights,</p>

	<p>namely lack of subsidiary, which gives no place to subsequent financial planning at lower level of the state administration. So there is no real interest to use CEA results as stake-holders are not the cost-bearers. And without clear interest in a development process there is no efficient multi-criteria planning. There is also a methodological issue: While the economic information to carry out cost-effectiveness assessments is sufficient the information on the effectiveness of the measure is not. In general, the situation is better, then some years ago, but the role of economic analysis is still quite weak.</p>
<p>Belgium</p>	<p>CEA was used in Belgium, in both Flanders and Wallonia. In Flanders, two approaches were used : i) a qualitative¹ approach which was applied on all water aspects (groundwater, surface water, quality-quantity, hydromorphology, water soils) and a ii) quantitative approach that was performed by with the use of a model (MFM) for surface water quality (VITO and ILVO , 2007). This model – MFM - allows working a sub-basin level. CEA proved to be relevant in Flanders; the results were used in the decision making process to build the Program of Measures and Flanders Region foresees to extend the quantitative approach on other water aspects. A similar quantitative approach was performed in the Walloon region (VITO and ULB, 2007). However, the results were not believed to be robust enough and hence were not really used in the building of the Program of Measures. Another study using CEA was carried out in Walloon region (CEME and Université de Liège, 2007), using a CEA module added to the Pegase model that is used to estimate the effectiveness of measures on the status of water and the ecosystems. Again, the outcome of the study was not totally used in decision making.</p> <p>Information on costs is quantitative, information on effects is quantitative and qualitative (through water quality modelling). These data are not easily compiled. Mostly there is a great uncertainty about costs and/or effects. This results in large ranges in estimations of costs and/or effects. For a number of important water quality parameters the development of an environmental costing model was outsourced to external experts. The development of a database and the collection of data needed to fill in the database require a lot of time and money.</p> <p>A common linguistic usage had to be developed. This wasn't obvious since eg. the composers of the program of measures weren't used to</p>

¹ experts indicated scores 1-7 for both costs and effects and divided the two scores to estimate an indicator on cost effectiveness

	<p>think in terms of cost effectiveness and benefits. Consequently it wasn't easy to gather all required information on CEA, CBA and the assessment of disproportionality. Demonstrating the purpose and added value of economic underpinning required persuasiveness.</p> <p>Points of interest for future research: How to deal with the comparison and ranking of measures of which the effects are not directly comparable? How to estimate better the effects on e.g. biological elements. How to weigh cost-efficiency elements with other arguments (acceptability, experience, ...</p>
Malta	<p>A CEA was performed during a twinning project with French experts in 2007 to help building the program of measures for Malta. This analysis targeted both qualitative and quantitative issues. It is not clear how the results were used to effectively build the RBMP and its Program of Measures.</p>
France	<p>CEA has not been applied systematically in the WFD implementation. A test and comparison of Cost effectiveness and Cost Benefits approaches has been implemented in 2005 on a pilot basin in the "Bocage Normands" basin (Seine Normandy District). A national document: "Seven questions and answers on the role of economic analysis in defining a programme of measures", summarizes the official position of France on Economic analysis (Nov 2005).</p> <p>The French choice consists of building combinations of measures that reach a given level of effectiveness ("good status") and then to evaluate and compare the costs of each combination. This means, that the cost-effectiveness of each measure is not evaluated separately and that the methodology does not give any indication on how the individual measures can be prioritised in a combination. Moreover, the methodology acknowledges that building combinations of measures with the same level of effectiveness can be difficult, especially as those measures may have side effects on other parameters</p> <p>Thus, the measures included in the PoM have been selected mainly through experts judgements, Cost Benefits analysis and Disproportionate cost analysis. The Water agencies have worked based on a catalogue of measures (Thesaurus) elaborated at national level. Few initiatives of CEA can be nevertheless identified while implementing WFD at sub-bassin level: <i>Evaluation économique du programme de mesures de la Directive cadre sur l'eau sur le secteur Seine Aval du bassin Seine Normandie - Volume 1 : Méthodologie et chiffrage du coût du programme de mesures.</i> (Aulong S., J-D. Rinaudo, C Hérivaux, L. Maton, 2007) ; <i>Détermination et analyse coût-efficacité des mesures hydromorphologiques visant à atteindre le bon état des eaux en 2015 dans le bassin Loire Bretagne - Application au bassin versant de l'Yèvre Auron</i> (S. Peigney, 2006) ; <i>Evaluation de l'impact économique du projet de SDAGE sur le marais Poitevin et analyse comparée des mesures d'accompagnement</i></p>

	<p>(ACTeon / CACG 2008). <i>Other CEA have been implemented under non WFD context: Hydropower (Isère Amont), Dams project (Charlas), SAGE Estuaire Gironde, SAGE Ardèche, SAGE Allier aval.</i></p>
Denmark	<ul style="list-style-type: none"> CEA has been used in the WFD implementation and the analyses have served as one (of several) bases for formulating the PoMs. The most concrete CEA application concerned physical conditions in Danish streams, for which only one effect parameter was specified. The use of CEA has also been quite advanced in the sense that CEA has been carried out both <i>ex ante</i> and <i>ex post</i> with respect to measures included in the Danish Action Plan II. Links to CEA reports related to WFD implementation are available from answers to the screening questionnaire.
Finland	No reply yet of the experts contacted
Norway	There are guidelines for how to carry out CEA in the WFD implementation, and the use of CEA is at least partly required by the Norwegian national guidance. However, the CEA work actually carried out so far is very limited and has had little impact. Projects improving economic analyses including CEA are however about to start soon. [Note: Norway is not a Member State but will still implement the WFD.]
Sweden	<ul style="list-style-type: none"> CEA has been quite successfully applied in those cases where sufficient data have been available in terms of effects and costs of competing alternatives measures. This means that CEA has mostly been used for evaluating measures against eutrophication in inland and coastal water bodies. The way to apply CEA has varied somewhat among the five Swedish river basin districts, mainly due to different data availability. CEA largely remains to be applied to other water environmental problems and its application to eutrophication problems have to be improved. Links to CEA reports related to WFD implementation are available from answers to the screening questionnaire.
Spain	<p>Official documents/guidelines for CEA in the implementation of the WFD in Spain.</p> <ul style="list-style-type: none"> MARM, 2007. Regulations of Hydrologic Planning in Spain (decree-law) [Reglamento de Planificación Hidrológica]. Spanish Ministry of Environment (MARM). MARM, 2008. National guidelines for the RBMP [Instrucción de Planificación Hidrológica]. Spanish Ministry of Environment. MARM, 2009. Guidelines for the characterization of measures in the WFD (versión 3.0). Spanish Ministry of Environment.
Italy	No feedback from the experts
Portugal	No feedback from the experts
Cyprus	<p>Referring only to the CEA performed on the draft PoM</p> <p>No. of Studies: One</p> <p>Approach: In the framework of implementing article 11 of the WFD in Cyprus, originally a Cost Effectiveness Analysis was carried out for each</p>

	<p>proposed measure per water body.</p> <p>For the purpose of determining the economic benefit from the application of measures, estimated values from available studies were researched. The studies selected apply methods of contingent valuation (Contingent Valuation Method- CVM) or Choice experiments to evaluate the benefit in terms of social welfare from the transition from the lower than good condition of waters to the good (or to high condition for the surface waters). Using suitable transfer logic (Benefits Transfer Model) the results of these studies were exploited for the assessment of the benefit from the application of the measures of the Program of Measures in Cyprus. The values were modified suitably to reflect the economic characteristics of Cyprus but also updated to present values.</p> <p>Scale: Each proposed measure has a different time horizon both concerning the implementation cost as well as their expected outcome. For this reason, the CEA had to analyze these measures in depth of time. In the specific case, as per the WFD, the measures were examined for the period of 2009 – 2015. Analysis was carried out for each proposed measure per water body.</p> <p>Sectors: Water</p> <p>How have the results been used? :</p> <p>The analysis provided valuable information in regard to the needs of each water body and of the effectiveness of each measure to each one of them. Subsequently, a ranking of the measures was made on the basis of their contribution to the improvement of the condition of the water bodies for all Cyprus weighing the measures on the basis whether these are locally targeted or whether they concern the more general management of the water resources in the island. This was performed in order to reach a combination of measures that brings about the desired target, which is the achievement of the good condition until 2015, at the smaller possible cost.</p> <p>First limits identified:</p> <p>The WFD requires that implementation of measures with disproportionate costs should be deeply examined. For such measures a CEA could not be performed as it is important to be able to define „disproportionate” in terms of the various social groups and their affordability to pay the cost of these measures. For this purpose assessment studies should be realized for the various social and income groups, and their ability to contribute to the covering of the cost of measures should be examined, before being able to execute the CEA for these measures.</p>
Greece	No feedback from the experts

ANNEXE 5 : FICHES DE LECTURES