

# Water for life and livelihoods

River Basin Management Plan  
Dee River Basin District

Annex K: Economic analysis of  
water use

## Content

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## K1 Economic Analysis of Water Use

Department for Environment, Food and Rural Affairs (Defra), Welsh Assembly Government (WAG), the Environment Agency (EA) and partners<sup>1</sup> have been engaged in a comprehensive economic analysis of water use to support the implementation of the Water Framework Directive. At the highest level this involved participation in the [Common Implementation Strategy for the Water Framework Directive](#) (WATECO) group and subsequent drafting groups (ECO1 and ECO2). These groups were given a remit by the Water Directors under the Common Implementation Strategy to develop information and guidance materials to assist in interpreting the requirements of Article 5 and Annex III of the Directive as well as provide methodologies and share experiences in relation to cost-effectiveness assessment and disproportionate cost assessment.

One of the earliest contributions was a series of economic analysis reports to support the reporting under Article 5 of the economic analysis of water use. Four reports were developed with the help of the Economic Steering Group and the Economic Advisory Stakeholder Groups for England and Wales; these were<sup>2</sup>:

- Report on the Economic Importance and Dynamics of Use for River Basin Characterisation
- Report on Cost Recovery and Incentive Pricing
- Report on Cost-Effectiveness Analysis and Developing a Methodology for Assessing Disproportionate Cost
- Report on Private Water Services

These reports provided the basic information with which to develop the Article 5 reports, details of which can be found at the following link:

<http://webarchive.nationalarchives.gov.uk/20080305115859/http://www.defra.gov.uk/environment/water/wfd/economics/index.htm#eco>

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<sup>1</sup> Of special note has been the work of the Collaborative Research Programme on River Basin Management Planning Economics which undertook a programme of research between 2003 and 2007. Work by the Cross Government Economics Steering Group and the Economic Advisory Stakeholder Group should also be noted.

<sup>2</sup> Available at <http://webarchive.nationalarchives.gov.uk/20080305115859/http://www.defra.gov.uk/environment/water/wfd/economics/index.htm#eco>

Each Article 5 report provides information relevant to the reporting guidance of the Water Framework Directive. It takes account of various guides and other documentation produced through the Common Implementation Strategy (CIS).

In line with this guidance, the following areas are covered by each report:

- Driving forces: This section sets out the socio-economic characteristics of each river basin district and provides forecasts for population, number of households, output (in gross value added terms) and employment to 2015;
- Pressures: This section reports on the attempts to link economic information with the most important activities for the characterisation of water bodies and associated risk assessment;
- Water services and cost recovery: This section presents information received from the The Water Services Regulation Authority (Ofwat) on the financial cost of public water supply and sewerage services within each river basin district. Details are also provided on the level of environmental expenditure by the water and sewerage companies in the river basin district;
- Cost-effectiveness: This section details the progress made towards ensuring cost-effectiveness in implementing the programme of measures (PoMs). The gaps that exist are also identified; and
- Improving knowledge and the information base: The final section sets out the research programme needed to support further work under the Water Framework Directive.

The Article 5 reports represented a landmark in terms of undertaking a comprehensive, river basin district-based, economic analysis of water use. However, they represented only a beginning of a much longer and more in depth analysis. Each of the Article 5 reports and their supporting economic analysis was accompanied by a draft programme of research to take forward the main analytical gaps. This was based on the development of a research programme to be taken forward by the Collaborative Research Programme on River Basin Management Planning Economics (CRP)<sup>3</sup>. The main outputs of the CRP were:

Project 1a – Economic Analysis and Decision Making for programme of measures under the Water Framework Directive – Initial Identification of Processes and Issues. This project was instrumental in developing an approach which built as far as possible on existing analysis and decision making processes.

Project 1b – Consistent Economic Appraisal Approaches with respect to the Water Framework Directive river basin management plans. This report examined in detail the appraisal frameworks to determine the extent to which they developed the analysis required for decision making for river basin planning.

Project 1c – Screening of water pricing policies, cost recovery mechanisms and economic instruments for inclusion in programme of measures and in relation to Article 9 of the Water Framework Directive. This report looked in detail at possible measures that might be needed to fulfil the requirements of Article 9 and the aims of the Directive in terms of Incentive Pricing.

Project 2a/2b – Development of a methodology to determine the cost effectiveness of measures and combinations of measures for the Water Framework Directive. This project developed an initial methodology for undertaking cost-effectiveness analysis.

Project 2c – Benchmark costs database and guidance on the application of the cost-effectiveness methodology. This provided a database of unit costs for use in cost-

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<sup>3</sup> Outputs of the CRP can be accessed here: [www.wfdcrp.co.uk](http://www.wfdcrp.co.uk)

effectiveness analysis. Two detailed associated reports were prepared for the Water Industry entitled:

- Water Framework Directive: Economic analysis of water industry costs, and
- Review of econometric cost modelling of chemical phosphorus removal works

Project 2e – Deriving the Costs and Effectiveness of Delivery Mechanisms. This extended the 2c cost database to cover delivery mechanisms as well as measures.

Project 3 – Report on guidance on the evidence required to justify disproportionate cost decisions under the Water Framework Directive. This Project provided guidance on what information should be provided and how it should be presented in order to use the exemptions in the Directive related to disproportionate costs.

Project 4a – Workshop report on CRP Strategic Approach to Benefits. This report set out the approach to the assessment of Environmental and Resource Costs which was to be taken for the first planning round given the absence of information on benefits generally and limitations of the science of assessing status against standards and predicting improvements from measures. It dealt in particular with the problem of quantifying benefits of a national programme versus site specific improvements.

Project 4bc – Report on The Benefits of Water Framework Directive Programmes of Measures in England and Wales. This report presented the finding of a stated preference study into the benefits (measured as willingness to pay) for Water Framework Directive objectives. As a measure of achieving good status it represents a measure of the environmental and resource costs of water bodies which are at less than good status. It presents a national picture of benefits and hence an envelope within which action to meet the objectives of the Directive can be regarded as being proportionate.

Project 4d – Prioritisation. Project 4bc provides an envelope for the total benefits estimate; however, further information is required in order to undertake prioritisation of actions within that envelope. This project attempted to examine possible rules for this type of prioritisation to aid the Environment Agency and partners in developing the most value for money programmes of measures.

Project 4e – Direct Market Benefits. While Project 4bc looked at total non-market benefits, this study addressed direct market benefits. A range of potential benefits were examined although most were found to be significant at the national level.

Project 4f – Valuation of recreational benefits of improvements in water quality – potential benefits and data requirements. This project provides a blueprint for future benefits valuation for the Water Framework Directive. Demonstrating the data requirements of possible approaches to developing a revealed as opposed to stated preference approach to benefit estimation, with a view to improving the robustness of future benefits estimation for river basin management planning.

A series of related reports were prepared during the period of operation of the CRP. These included: reports looking at whether and how differences in the cost of capital should be taken into account for the purpose of cross-sectoral cost-effectiveness analysis (where availability of financing might be a relevant consideration in judging the cost-effectiveness of measures. These reports were entitled Economic analysis for the Water Framework Directive Discounting and the calculation of the present value (Phase 1 – Theory and Phase 2 – Practical methods).

Following on from the work to prepare a cost-effectiveness analysis under the CRP a related study was undertaken for transitional and coastal waters. This study was entitled Scoping of Economic Impacts and Issues in Transitional and Coastal Waters.

Related work on agriculture was undertaken as part of the development of policies related to Catchment Sensitive Farming. This includes a cost-effectiveness manual and work related to the benefits of agricultural measures<sup>4</sup> Similarly an analysis of potential measures to control non-agricultural diffuse pollution was also undertaken<sup>5</sup>.

A detailed study was undertaken during the period of operation of the CRP into baselines and trends. This study was entitled: Water Framework Directive Economic Analysis: Information On Trends To Improve The Baseline Scenarios. It provided a substantial synthesis of information regarding possible baseline issues and trends which could be incorporated into river basin management planning.

Further economic analysis was performed in relation to the Daughter Directives on Groundwater and on Priority Substances including Impact Assessments. Information from these analyses was integrated into the overall economic analysis of water use through the National Impact Assessment<sup>6</sup>.

The above represents a fairly comprehensive analysis of the economics of water use in England and Wales, although it is the use of this analysis which is perhaps most relevant. The following paragraphs attempt to explain the main ways in which this information was used in preparing the river basin management plan (RBMP) documents.

The main use of the above information was to inform two sets of guidance to the Environment Agency as the competent Authority for river basin management planning<sup>7</sup>. This guidance provided the framework within which river basin management planning could take place. The second volume of guidance was accompanied by an Impact Assessment. This National Impact Assessment used the outputs of the economic analysis of water use discussed above to consider a series of strategic options for the first set of river basin plans. The Guidance required the Agency to perform similar analysis (Impact Assessment) for each of the River Basin Management Plans.

The National Impact Assessment was the first time that the cost, benefits and other impacts of the Directive had been considered in full since the transposition of the Directive and the publication of the Water Framework Directive regulations in 2003<sup>8</sup>. Transposition of the Directive was accompanied by a Regulatory Impact Assessment (RIA) which was the first comprehensive attempt to assess the potential costs and benefits of the Directive. The key finding of this RIA was that the Directive could be cost-beneficial for the UK but this depended to a large degree on finding a way of targeting requirements to areas where actions were most cost-effective and benefits highest.

Prior to the National Impact Assessment a Preliminary Cost-Effectiveness Analysis (pCEA) was undertaken. The pCEA was carried out by Defra with technical inputs from the Environment Agency and significant stakeholder involvement, starting in autumn 2006 and continuing until summer 2007. The pCEA to the extent possible used the outputs from the CRP analysis and built on this wherever necessary. The pCEA aimed to identify the most cost effective package of measures across sectors that will achieve the requirements of the

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<sup>4</sup> <http://www.defra.gov.uk/foodfarm/landmanage/water/csf/programme.htm>

<sup>5</sup> <http://www.wfdcrp.co.uk/pdf%5CNADWP%20pCEA.pdf>

<sup>6</sup> <http://www.defra.gov.uk/environment/quality/water/wfd/daughter-dirs.htm>

<sup>7</sup> See <http://www.defra.gov.uk/environment/quality/water/wfd/management.htm>

<sup>8</sup> <http://www.defra.gov.uk/environment/quality/water/wfd/transposition.htm>

Water Framework Directive, taking into account the level of uncertainty associated with the different packages, their distributional and affordability implications and the potential for phasing implementation over the three river basin planning rounds, from 2009-2027.

The National IA used information from the pCEA together with a model of benefits developed from Project 4bc of the CRP to undertake a national assessment of options for implementing the Directive. Two main options were considered:

- Option 1 'Not Phased' – all technically feasible measures are initiated with the aim of meeting Water Framework Directive good status objectives by 2015 and to meet the progressive reduction/cessation requirements for chemical status, or as soon as possible due to natural conditions. This implies that provisions in the Water Framework Directive to extend deadlines and set less stringent objectives when costs are disproportionate are not used at all.
- Option 2 'Phased' – phased implementation to ensure an adaptive, cost-effective and proportionate long term approach meeting all Water Framework Directive requirements by 2027 or as soon as possible thereafter given feasibility, proportionality and natural conditions. It assumes that alternative objectives (less stringent objectives and extended deadlines) are set to meet Water Framework Directive good status requirements by 2027, where appropriate, and to meet the progressive reduction/cessation requirements.

The National IA also provided an analysis of the consequences of introducing the environmental quality standards and associated methods developed by the United Kingdom Technical Advisory Group (UKTAG) to support good status. The main conclusion of this analysis was that, given the standards, there was a clear case for phasing the costs of the Directive in order to ensure that its implementation was proportionate. Numerous measures were ruled out as either technically infeasible or likely to be disproportionate. This information was subsequently used by the Environment Agency to prepare the more detailed Impact Assessment which accompanies the RBMPs.

## **K2 Key points about the economic analysis of water use**

The following provides a commentary on key issues relating to the economic analysis of water use to assist in interpreting the work done and the way in which it has supported river basin management planning.

### **2.1 *Have Member States prepared a comprehensive economic analysis including all elements of and being consistent with the Directive?***

The United Kingdom has provided a comprehensive economic analysis. This is demonstrated through:

- the Article 5 report economic analysis supporting documents,;
- preliminary cost effectiveness analysis;
- collaborative research programme reports; and
- various Impact Assessments that have been undertaken on the Water Framework Directive.

Further details of this information can be found on the Department for Environment, Food and Rural Affairs website at the following link:

<http://www.defra.gov.uk/environment/quality/water/wfd>

*2.2 Where necessary, have estimates of the volume, prices and costs associated with water services been provided?*

Estimates of the volume, prices and costs associated with water services have been used within the economic analysis at various stages. In particular this information was used to determine the extent of recovery of the costs of water services as set out in the report on cost recovery and incentive pricing<sup>9</sup> and the associated Article 5 Economic Analysis supporting documents<sup>10</sup>. Up to date information on these financial costs and revenues is provided by water companies annually to the economic regulator for the water industry in England and Wales (Ofwat) in a report called the June Return. This is available on the Ofwat website at the following link: <http://www.ofwat.gov.uk>. Information on the prices, costs and volumes for private water services is provided in the report on private water services.

*2.3 Where necessary, have estimates of the relevant investment including forecasts of such investments been provided?*

Estimates of investments and forecasts of investments have been used at various stages during the economic analysis of water use. In particular this information was relevant to the production of the various reports on water industry costs for the CRP cost-effectiveness work (see above) and also the water sector reports for the pCEA.

*2.4 How has long term forecasts of water supply and water demand been taken into account in the principle of the recovery of the costs of water services?*

In the United Kingdom water service providers recover the costs of providing water services from customers within their water service areas. Revenue in the companies arises from the provision of a range of services that make up the overall water service. These are measured and unmeasured water and sewerage charges, trade effluent charges, large user charges and other sources. The cost recovery mechanism is slightly different in each case but for each source of charge, prices are broadly cost-reflective. The process of recovery of costs guarantees that financial costs are recovered and the five yearly periodic review process internalises environmental costs through the prices paid by customers. The price setting process for the Water Industry (Periodic Review) is the mechanism through which costs are recovered and cost-recovery is on the basis of efficiently incurred costs which are allowed to finance necessary investments as determined during the periodic review process. Details of this process and how it relates to cost-recovery calculations can be found in the report on cost-recovery and incentive pricing (see above).

*2.5 Have approaches been identified showing that the economic analysis was used to assist in judging cost effectiveness?*

The cost-effectiveness of measures used information developed during the economic analysis of water use. This included information from the pCEA (sector and pressure reports) and the CRP's development of benchmark cost-effectiveness information on measures and mechanisms. In addition the Environment Agency developed further cost-effectiveness information during the development of the RBMP and the IAs (see IAs and Annex E for more detail).

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<sup>9</sup> See

<http://webarchive.nationalarchives.gov.uk/20080305115859/http://www.defra.gov.uk/environment/water/wfd/economics/pdf/crpreport.pdf>

<sup>10</sup> See

<http://webarchive.nationalarchives.gov.uk/20080305115859/http://www.defra.gov.uk/environment/water/wfd/economics/index.htm>

## 2.6 *What progress that has been made since 2005 to address the uncertainties and data gaps in the economic analysis?*

Each of the 2005 Article 5 supporting economic analysis reports contains information on improving the knowledge and information base. These sections detail how the proposed work of the CRP aimed to address uncertainties and knowledge gaps. Hence the CRP and associated outputs represent the main response to the uncertainties and data gaps revealed by the initial economic analysis.

## 2.7 *Have Member States ensured that the measures to implement Article 9 address all three main elements of Art 9: i) incentive pricing; ii) adequate contribution to cost-recovery including environment and resource costs, iii) polluter pays principle?*

The main way in which the measures to implement Article 9 have considered the three elements of Article 9 has been through the analysis to screen potential water pricing policies and cost-recovery mechanisms. The original work to undertake this screening is summarised in the report: Screening of water pricing policies, cost recovery mechanisms and economic instruments for inclusion in programme of measures and in relation to Article 9 of the Water Framework Directive.

This report screened water pricing policies, cost recovery mechanisms and economic instruments which may be included in programmes of measures to achieve compliance with the Water Framework Directive in England and Wales. This included:

- Compliance of candidate mechanisms with cost-recovery and incentive-pricing objectives set out in Article 9 of the Water Framework Directive;
- Cost-effectiveness in furthering Article 4 objectives, that is in mitigating environmental pressures arising from abstraction, point-source pollution, diffuse pollution, morphological impacts and alien species.

In terms of compliance of candidate economic mechanisms with Article 9 the report screened charging policies and cost-recovery mechanisms against the Article 9 requirements that they provide for, i.e.:

- Adequate incentives for users to exploit water resources efficiently and thereby contribute to Article 4 objectives (Article 9.1., 2nd sentence, 1st indent);
- An adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture, to the recovery of costs of water services, based on the economic analysis conducted according to Annex III and taking account of the polluter pays principle (Article 9.1., 2nd sentence, 2nd indent).

The analysis found that most, if not all, mechanisms were broadly aligned with or not immediately relevant to Article 9 obligations. It was noted however that questions may arise in relation to a number of mechanisms in particular abstraction charging arrangements; changes for industrial discharges to sewer; surface water drainage charges and metering/volumetric charging measures. In all cases further work was recommended following the screening exercises.

In terms of compliance with cost-effectiveness with regard to Article 4 environmental objectives, the study examined economic mechanisms based on polluter pays principles and incentive pricing approaches that might be used to drive necessary measures. The starting point was a compilation of a list of economic mechanisms used or which had previously been considered and rejected in England and Wales or Scotland to address each of the five pressures identified in the Water Framework Directive, i.e. abstraction, point-source pollution, diffuse pollution, physical change and alien species. The initial assessment of mechanisms

proposed or implemented in the UK suggests that further work was needed in relation to: abstraction and discharge charging regimes, surface water charging and metering and volumetric charging.

Since the publication of this report further work has been ongoing in these areas. The issues raised by this initial screening as part of the economic analysis of water use were included within Government's proposed strategy for water (Future Water)<sup>11</sup> in particular in relation to charging for water, competition and surface water drainage policy. Future Water announced two independent reviews to take forward these issues in the form of the Cave and Walker Reviews.

Professor Martin Cave led an independent review of competition and innovation in water markets between March 2008 and April 2009. The Review published its final report on 22 April 2009 with recommendations to the UK and Welsh Assembly Governments and sectoral regulators (Ofwat, the Environment Agency and the Drinking Water Inspectorate). The Cave Review<sup>12</sup> aimed to:

- deliver benefits to both business and household customers. This could be through lower bills, better service and more responsive products; and
- increase the efficiency and sustainability of water use; through assessing the scope for competition and innovation throughout the water and sewerage industries.

As part of the Review Cave examined abstraction and discharge policy and made a number of recommendations which Government is currently considering how to take forward. The outcomes of this work will have important implications for future river basin management planning and are likely to provide a range of alternative mechanisms which may be used to meet Water Framework Directive targets.

Anna Walker led an independent Review of Household Charging and Metering for Water and Sewerage Services in the UK. Terms of reference for this review were to:

- examine the current system of charging households for water and sewerage services;
- assess the effectiveness and fairness of current and alternative methods of charging; and
- consider and make recommendations on any actions that should be taken to ensure that England and Wales has a sustainable and fair system of charging in place.

The Review looks at social, economic and environmental concerns. An interim report was published on 29 June 2009<sup>13</sup>. Government is currently awaiting the final report from the Review which, as with the Cave review, will have important implications for future river basin plans in relation to Article 9.

Both the Cave and Walker Reviews commissioned research on cross subsidies, price structures and competition in the water industry<sup>14</sup>.

Together these reports show that the UK is taking the issue of incentive pricing seriously and demonstrate the UK's commitment towards a continual process of improvement. This will ensure that water prices in the UK more fully reflect the true environmental and social cost of

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<sup>11</sup> <http://www.defra.gov.uk/environment/quality/water/strategy/pdf/future-water.pdf>

<sup>12</sup> <http://www.defra.gov.uk/environment/quality/water/industry/cavereview/documents/cavereview-finalreport.pdf>

<sup>13</sup> <http://www.defra.gov.uk/environment/quality/water/industry/walkerreview/documents/walker-call-for-evidence.pdf>

<sup>14</sup> <http://www.defra.gov.uk/environment/quality/water/industry/cavereview>

abstraction and provide greater incentives for water to be used efficiently, thus satisfying the aims of Article 9.

Agricultural diffuse pollution was explicitly outside the scope of the initial screening research as all measures related to agricultural diffuse pollution were under consideration during the development of the Catchment Sensitive Farming Initiative. This considered the balance between voluntary, regulatory and economic incentive based approaches. It began with an initial screening of potential measures<sup>15</sup> and concluded that the most appropriate package was a combination of advisory services, use of agri-environment schemes and the development of a new mechanism based on Water Protection Zones<sup>16</sup>. During the development of this policy a substantial evidence base was developed relating specifically to the economic analysis of agricultural water use<sup>17</sup>.

## *2.8 How has the definition of water services and uses been implemented in practice?*

In the United Kingdom the definition of water services encompasses the Water Industry: i.e., services provided by the water and sewerage industries.

## *2.9 How have water pricing policies provided adequate incentives for users to use water resources efficiently?*

The economic analysis of water use has examined the way in which pricing policies provide adequate incentives for users to use water resources efficiently. The main analysis has been with respect to CRP Project 1c (as detailed above). The outcomes of this screening of pricing policies and cost-recovering mechanisms were incorporated into the Future Water Strategy and further work undertaken as part of the Cave and Walker Reviews (see above).

## *2.10 Which approach was taken to ensure that water uses are providing an adequate contribution to the recovery of the costs of water services?*

The methodology for undertaking cost recovery of water uses is explained in each of the river basin district Article 5 reports and in more detail in the report on cost-recovery and incentive pricing. Further work in relation to the need for changes to cost-recovery mechanisms is summarised in the CRP Project 1c report.

## *2.11 Whether future plans have been put in place to address any continuing uncertainties and data gaps on the recovery of the costs of water services?*

Further work on the recovery of the costs of water services will take place as a result of the Cave and Walker Reviews. In addition there are plans to undertake further longer term work on benefits assessment. This will provide better evidence on what the level of environmental and resource costs relevant to the recovery costs of water services. This research is being scheduled by Defra to deliver answers in time for the 2<sup>nd</sup> river basin management planning process.

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<sup>15</sup> <http://www.defra.gov.uk/foodfarm/landmanage/water/csf/document-archive.htm>

<sup>16</sup> <http://www.defra.gov.uk/foodfarm/landmanage/water/csf/documents/diffuse-consult-govresponse.pdf>

<sup>17</sup> <http://www.defra.gov.uk/foodfarm/landmanage/water/csf/document-archive.htm>

## K3 Data to be provided

### 3.1 Volumes abstracted/discharged per water service

This information is available for water company areas but not on a river basin district basis. Data are contained in the relevant Article 5 report or can be obtained from the Ofwat website at the above link.

### 3.2 Estimated investments for water services

The estimated investment costs for water services relevant for the Water Framework Directive are set out in the river basin district impact assessment documents that will be published at the same time as the plan documents on 22<sup>nd</sup> December 2009.

### 3.3 Costs of water services

This information is available on a water company basis not on an river basin district basis. Data is contained in the relevant Article 5 report or can be obtained from the Ofwat website at the above link.

## K4 Other information

*Hyperlinks to more detailed supporting documents including references to legal documents or methodology documents should be provided.*

Article 5 reports for the UK River Basin Districts:

<http://webarchive.nationalarchives.gov.uk/20080305115859/http://www.defra.gov.uk/environment/water/wfd/economics/index.htm#eco>

River Basin Management Planning guidance document:

<http://www.defra.gov.uk/environment/quality/water/wfd/documents/riverbasinguidance.pdf>

Ofwat website:

<http://www.ofwat.gov.uk>

Department for Environment, Food and Rural Affairs website on WFD

<http://www.defra.gov.uk/environment/quality/water/wfd>

Cave report findings:

<http://www.defra.gov.uk/environment/quality/water/industry/cavereview/documents/cavereview-finalreport.pdf>

Walker review interim report

<http://www.defra.gov.uk/environment/quality/water/industry/walkerreview/documents/walker-call-for-evidence.pdf>

The UK would like to work with the Commission to produce common methods for reporting on economic analysis across Member States. This is relevant in the context of the planned workshop for next year to consider methods for improving the process.