Water Economics and Ecosystem Accounts

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Workshop Synthesis
Workshop on Water Resource Efficiency, 16-17.June 2011, Copenhagen

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Report submitted by:

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1. Background

The global ecosystem's capacity to provide resource inputs and assimilate emissions and waste is a crucial precondition for the functioning of our world economy. Once resources are used and/or pollutants emitted beyond the sustainable limit of ecosystems, the damage caused to the latter further deteriorates their services. As such, depleted freshwater resources lead to a decline in water quality which impacts freshwater and terrestrial ecosystems. Depending on the climatic region, inefficient freshwater use may lead to increased economic costs for sourcing new water supplies[1] and introducing emergency measures, deteriorating freshwater quality and consequent threat due to unavailable drinking water of sufficient quantity and quality to citizens and businesses. Resource efficiency (decoupling) is required to maintain economic growth in the long run.

The fourth Environment State and Outlook report (SOER 2010) released by the European Environment Agency in 2010, comprehensively assesses how and why Europe's environment is changing. Currently, Europe and the planet as a whole, are consuming more natural resources than is ecologically stable, with resource use increasing in the EU-12 by 34% between 2000 and 2007. SOER 2010 concludes that the transformation of Europe to a resource-efficient green economy can result in a healthy environment and simultaneously increase prosperity and social cohesion.

As a central point in the EU strategy for sustainable development, decoupling the linkage between economic growth and resource use is a central objective of the 6th EU Environmental action program. In March 2010, the European Strategy for smart, sustainable and inclusive growth 'Europe 2020' was released by the European Commission, which highlights – among others - the need of a *more resource efficient* economy. Particularly for water, the European Commission is expected to publish a 'Blueprint for Safeguarding Europe's Water' by 2012 to focus on water-savings, which builds upon a number of in-depth assessments of water scarcity and drought in the European Union. [2]

In a working paper (February 2010), the EEA introduced its ideas on the fast track implementation of simplified **ecosystem capital accounts** for Europe. With the emphasis on the production of physical accounts for a number of feasible elements of ecosystem capital accounting, the final draft of terrestrial and marine accounts shall be completed in 2012, while the first draft of terrestrial ecosystem capital accounts shall be available in 2010. This project will result in an indicator 'Total Ecosystem Potential' which is computed on the basis of six indices, among which a Water Index[3]. The Water Index reflects the available water resources, i.e. water quantity and quality,

[1] The development, treatment and distribution of water supplies is intrinsically linked to energy consumption (and vice versa) – this is also known as the water-energy nexus. It needs to be noted that changes relating to these water supplies measures, thus consequently also impact energy resources.

2 For example: Communication from the Commission to the European Parliament and the Council - Addressing the challenge of water scarcity and droughts in the European Union {SEC(2007) 993} {SEC(2007) 996}; (EC (2008) REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT - Follow up Report to the Communication on water scarcity and droughts in the European Union COM(2007) 414 final

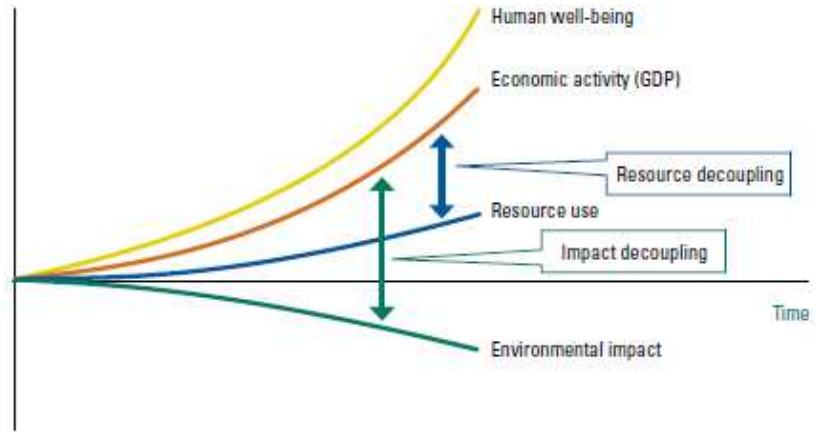
[3] The remaining indices are: Biodiversity Index, Carbon/Biomass Index, Landscape Index, Health Index, Dependency Index

river basins and ecological status[4]. The accounting table for the water index is combined in an ecosystem asset table and sector table, which are connected by flow accounts which balance withdrawals and returns, allowing for integration to the SEEA-W framework. Indicators in the flow accounts include e.g. withdrawals by activities, returns from water systems from activities, storage in the user system, and consumption/evaporation in the use system. This development may play an important role in the development of water resource efficiency indicators.

Resource efficiency describes the use of less overall resource inputs to produce the same amount of economic output, i.e. value of products or services, while decoupling takes this definition a step further and is described by UNEP (2011:4) as "reducing the amount of resources […] used to produce economic growth and delinking economic development from environmental deterioration". [5]

UNEP (2011) describes the two key aspects of decoupling as resource and impact decoupling (Graph 1) Resource decoupling means "using less resources per unit of economic output" while impact decoupling shall "reduce the environmental impact of any resources that are used or economic activities that are undertaken" (UNEP, 2011:8).

Graph 1 Two aspects of decoupling



Source: UNEP, 2011:8

[4] More specifically: Water protection and management; water resource, supply and use; water functions & ecosystem services; water bodies resource & abstraction; water quality and quantity.

[5] UNEP (2011) Decoupling natural resource use and environmental impacts from economic growth, A Report of the Working Group on Decoupling to the International Resource Panel. Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y., Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A.

2. Objectives of the Workshop

The EEA will contribute to the Blueprint for Safeguarding Europe's Water 2012 Report, which includes efficiency as a key element of the Water Scarcity and Drought Assessment. From this, the EEA is following three objectives which the workshop should seek to address:

1. Identify efficiency measures

What efficiency measures exist? Which EU-projects deal with efficiency measures relating to water management?

2. Address operational aspects

How can the process of collating, evaluating, developing WRE indicators be supported? What are the challenges in data collection including measurement of efficiency? What scales can be identified as appropriate? What are the challenges in the wider application of WRE (Europe)?

3. Address the role of economics

Issues shall cover tariffs and taxes (&transfers) for sustainable/full cost-recovery of water services and water pricing to provide incentives for more efficient water use. Specific focus shall be set on affordable pricing to vulnerable groups, innovative pricing (price changes with scarcity/season) and trade in water rights and entitlements.

3. Overview of presentations

A number of interesting presentations were held, touching upon water resource efficiency measures, the operational aspects of indicator development, as well as upon the role and potential of economics in the field of water resource efficiency.

Table 1 provides an overview of the presentations given during the workshop. The full power point presentations can be downloaded via Circa under:
http://eea.eionet.europa.eu/Public/irc/eionet-circle/water/library?l=/efficiency_copenhagen&vm=detailed&sb=Title

Table 1 Overview of presentations

Presenter	Presentation Title
Henriette Faergermann (DG Environment)	Water Resource Efficiency and the 2012 Blueprint
Stefan Speck (EEA)	Resource Efficiency within a Green Economy

Rob Collins (EEA)	EEA Perspective and Workshop Objectives
Mike Muller (UNESCO-WWAP)	The challenges of monitoring water efficiency – lessons from the World Water Assessment Program
David Zetland (Wageningen University)	The economics of the environment: markets vs. regulations
Lucas Porsch (Ecologic Institute)	Water Quality Indicators in the 'beyond GDP' process
Cor Graveland and Isabel van Geloof (Statistics Netherlands)	Economy wide application of Water Use and Resource Efficiency indicators derived from Water statistics and Accounts Dutch economy-wide application of water pollution indicators
John Maguire (Solventa)	Leakage reduction in distribution networks
Sabine von Wirén-Lehr (EWP)	EWP Water Stewardship Scheme: Guidance towards Sustainable and Effective Response Strategies in Operational Water Management
Jim Marshall (EUREAU)	Leakage reduction and catchment management from the utility perspective
Bo Jacobsen (EEA)	Efficiency of Urban Wastewater Treatment
Rudy Vannevel (Flemish Environment Agency)	Water Resource efficiency - Proposal for a decision matrix
Eric Hoa (BIOIS)	Water Performance of Buildings
Sandra Berman (BIOIS)	Water Savings in Agriculture
Maite Aldaya (UNEP)	Water productivity in the agricultural sector

4. Main messages from discussions

The participants raised a wide range of issues and questions, stressing:

- The complexity of addressing water resource efficiency issues (particularly scaling water information to a national scale);
- The different views one might get depending on disciplinary background, organizational mandates/roles;
- The importance of well defining the goals and objectives for looking at water resource efficiency.

Different concepts and terms are used to capture "water resource efficiency". While participants agreed on the difference between technical efficiency and economic efficiency, the discussions stressed the importance of 1) agreeing on common terminology 2) that can be easily shared and communicated and 3) that is based on a "system approach" specifying the boundaries and inter-relations between the different terms and concepts mobilized.

Different methods and indicators for investigating water resource efficiency issues have been illustrated. In particular:

- Presenting GDP information along technical information on pressures on water resources (total abstraction, total emissions, water deficit….);
- Water footprinting;
- Life-cycle analysis;
- Combining output values (€) with input (m3) for estimating water efficiency or water productivity indicators;
- System-wide approaches, e.g the model developed by the Flemish environment protection agency.

Clearly, the availability of data also in the future is a driving factor that will impact the very approach and indicator(s) chosen. With regards to country level indicators (be it global or sector-based), these should be used for assessing global trends and changes (ex-post) but not for inter-country and intra-country comparison that might have limited relevance and be misleading.

Whatever approach and indicator chosen for assessing water resource efficiency, it should be presented with sufficient information on its context and the "hydro-logic" that it represents as this will avoid misleading comparisons and limit misuse of data.

In particular:

- Some information on levels of water exploitation/water deficit should be provided along with indications of links between a given use and inter-connected parts of the water system that will need to be considered when assessing water resource efficiency.

- Water resource efficiency will be mostly relevant in river basins with water scarcity (when water is plentiful, it will not be an issue from a policy point of views, al-

though it can be an issue for private operators keen in reducing costs resulting from low technical water efficiency).

The discussions stressed the importance of addressing water and energy issues jointly or in an inter-connected manner (some presentations illustrated this aspect), although it was not clear for which specific purpose and how this should be made. The trade-off in thermal electricity generation between water use efficiency and thermal efficiency illustrates the interconnectedness of water and energy. Depending on whether the priority is on water saving or thermal/Co2 efficiency, the response of thermal electricity generation will change. The discussions also stressed the difference between water and energy when dealing with resource efficiency:

- There is no relevance to estimate an « EU wide » target as water resource efficiency is « context relevant » and any target will be site specific accounting for the specificities of the "local" water human & water system;
- Unlike the energy sector where energy efficiency target are defined and distance to target in terms of energy efficiency estimated, there is no "distance to target" for water resource efficiency. Indeed, the target is defined in relation to the state of the water (body, system, etc.) which references/targets are Good Ecological States (WFD), balanced water resources (e.g. abstraction = recharge) or "resilience of aquatic ecosystems" (to be further specified when made operational).

With regards to assessments at the EU scale (e.g. as part of the EEA report), a two step logic emerged from the discussions, if there is no sensible way to assess water resource efficiency at a national scale for international comparison:

- Step 1 – present the sustainability of the situation through Europe with a water scarcity (exploitation) index (seasonal or monthly?) along with information on the WFD status assessment (issue: river basin or water body scale?).
- Step 2 – for hot spot with high water deficit, estimate water efficiency or water productivity and «demonstrate » with case studies the logics and rationale behind « water resource efficiency » within the right « system's context ». These assessments will need to ensure that the "hydro-logic » and connected different uses are well accounted for, so society's (and not private) optimum can be investigated looking at economy, ecology, social issues.

More work will need to be done on the following issues:

- Clarifying the purpose/goal (or purposes/goals) behind investigating water resource efficiency
- Methods and tools for addressing resource efficiency issues for water and other resources (e.g. energy , biodiversity, etc.) in a joint framework and indicator;
- The potential for water trading and adequate pricing as mechanisms for improving « water resource efficiency » (once sufficient water is allocated to the environment and needs of ecosystems);
- Testing with real data « global » approaches: 1) GDP - natural capital, 2) Matrix combining GDP, water balance, emission

- The integration and role of virtual water and/or footprinting in areas of unsustainable water management, etc
- The relation between technical and economic efficiency – and the conditions and context under which this relationship is likely to be relevant/have some meaning;
- When (objectives, conditions, etc.) do we need to address water resource efficiency at the sector level ?

5. Annex I: Water Resource Efficiency Workshop – Agenda

Thursday 16th and Friday 17th June, 2011; EEA, Copenhagen, Fontana Room

Thursday 16th June		
10:00-10:30	Registration	
	Background and Context	*Chair: Beate Werner*
10:30-10:40	Welcome; Tour de Table	(EEA); (All)
10:40-10:55	Water Resource Efficiency and the 2012 Blueprint	Henriette Faergermann (DG Environment)
10:55-11:05	Resource Efficiency within a Green Economy	Stefan Speck (EEA)
11:05-11:20	EEA Perspective and Workshop Objectives	Rob Collins (EEA)
11:20-11:40	Coffee Break	
	Concepts and Challenges	*Chair : Pierre Strosser*
11:40-12:05	The challenges of monitoring water efficiency – lessons from the World Water Assessment Program	Mike Muller (UNESCO-WWAP)
12:05-12:30	The economics of the environment: markets vs. regulations	David Zetland (Wageningen University)
12:30-12:50	Water Quality Indicators in the 'beyond GDP' process	Lucas Porsch (Ecologic)
12:50-13:00	General Discussion	All
13:00-14:15	Lunch	
	Development of Water Resource Efficiency Indicators	*Chair: Rob Collins*
14:15-14:40	Economy wide application of Water Use and Resource Efficiency indicators derived from Water statistics and Accounts	Cor Graveland and Isabel van Geloof (Statistics Netherlands)
14:40-15:05	Dutch economy-wide application of water pollution indicators	

15:05-15:30 15:30-15:45 15:45-16:15 16:15-17:30 17:30 19:00	Leakage reduction in distribution networks Discussion Coffee Break **Working Group Sessions** A) Operational Aspects of efficiency information B) The role of economics End of First Day Dinner (restaurant to be confirmed)	John Maguire (Solventa) All All

Friday 17th June		
	Sectoral Perspectives	*Chair: Rob Collins*
09:00-09:15 09:15-09:40 09:40-10:05 10:05-10:25 10:25-10:45 10:45-11:00 11:00-11:15	Summary of first day including working groups EWP Water Stewardship Scheme: Guidance towards Sustainable and Effective Response Strategies in Operational Water Management Leakage reduction and catchment management from the utility perspective Efficiency of Urban Wastewater Treatment Water Resource efficiency - Proposal for a decision matrix Discussion Coffee	EEA/Pierre Strosser (ACTeon) Sabine von Wirén-Lehr (EWP) Jim Marshall (EUREAU) Bo Jacobsen (EEA) Rudy Vannevel (Flemish Environment Agency) All
	Sectoral Perspectives - continued	*Chair: Pierre Strosser*

11:15-11:40	Water Performance of Buildings	Eric Hoa (BIOIS)
11:40-12:05	Water Savings in Agriculture	Sandra Berman (BIOIS)
12:05-12:30	Water productivity in the agricultural sector	Maite Aldaya (UNEP)
12:30-13:00	Discussion	All
13:00-14:15	Lunch	
	Closing Session	*Chair: Beate Werner*
14:15-14:30	Concluding Messages from the Workshop	Pierre Strosser (ACTeon)
14:30-14:45	Remaining Issues, Closing Remarks	EEA/All
15:00	**End of Workshop**	

6. Annex II: List of participants

#	Name	Affiliation	E-Mail
1	Beate Werner	EEA	Beate.Werner@eea.europa.eu
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4	Eric Hoa	Bios	eric.hoa@biois.com
5	Henriette Faergermann	DG ENV	Henri-ette.Faergemann@ec.europa.eu
6	isabel van Geloof	Statistics Netherlands	'Geloof, mevr ir. E.W. van'
7	Jennifer Möller-Gulland	ETC	jennifer.moeller-gulland@ecologic.eu
8	Jim Marshall	Eureau/WaterUK	jmarshall@water.org.uk

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7. Annex III: Presentation Abstracts

(Please note: not all abstracts were made available)

***Author**:* Rudy Vannevel (FLEMISH ENVIRONMENT AGENCY (VMM))

Title: Water resource Efficiency – Proposal of a decision matrix

***Abstract**:* An example of the water abstractions and uses by an industrial plant illustrates the complexity of any environmental issue: a mixture of environmental impacts and policy and management (P&M) practices. The challenge is to use large datasets of individual basic physical data for common policy application and development. This needs a stepwise approach and streamlining of the decision-making process. To this end, matrices have been developed to link the environmental analysis to governance. DPSIR analyses applied to current P&M and the water chain-system allow policy evaluations and thematic assessment respectively. The information resulting thereof may provide in the content of environmental reports as well as in determining new P&M topics. Policy development consists of the identification and realisation of these topics according to a number of frameworks (beside DPSIR and governance, also the societal capitals, the ecosystem approach and the environmental information cycle). The output of this process – a number of concrete actions - may serve as a basis for further planning. Water resource efficiency is used as an example of policy development. The methodology is generic, which means that it is also applicable to other environmental domains than water.

***Author**:* Isabel van Geloof (Statistics Netherlands)

Title: Dutch economy-wide application of water pollution indicators

Abstract: Statistics Netherlands annually compiles water accounts for the Netherlands. As the water accounts are part of the environmental accounts we use the same concepts and definitions that are used in the national accounts. The focus is on two levels: the national level and river basins districts. Main user of the data is the Dutch government. They use the data to report for the European Water Framework Directive. The Dutch policy is in place to reduce water pollution and protect ground and surface water bodies. In line with that the Dutch water accounts consist of three components: i) a physical water account, ii) an emission account, and iii) an economic account. These three components together are known as NAMWA (National Accounting Matrix including Water Accounts). Purpose of the NAMWA matrix is to give an aggregated overview of all relevant macro-economic and physical information related to water.

Data from the emission account and economic account can be used as input to develop indicators on water pollution. The emission account provides information on the production and absorption of emissions to water by industries and households. With this information different indicators can be derived, like for example an indicator on eutrophication or an indicator on contamination of surface water with heavy metals. An indicator that directly compares physical information on emissions to water with economic information like value added is the

indicator for emission-intensity. This indicator monitors the environmental performance of industries over time.

Author: Mike Muller (WWAP/Global Water Partnership)

***Title*:** The challenges of monitoring water efficiency beyond the borders of Europe: Some lessons from the World Water Assessment Programme review of indicators

Abstract: The work of the UNWater-WWAP Expert Group on Indicators and Monitoring may be of value to EEA's review of water resource efficiency. The WWAP-EG was tasked, inter alia, to " *Draft a proposal on future work required to report on a useful, feasible and sustainable set of indicators on key water resources issues on an ongoing basis"*. The EG started from the assumption that data availability should inform indicator choice and consulted with both indicator users and data providers to produce a synthesis proposal. The process confirmed that for the WWAP community, the major issue was *data*, not indicators

One key recommendation was that "Since WWAP is a neutral platform, its output should be sufficiently generic that it can be used to provide a range of indicators relevant to the many different interest groups that seek to track trends in water resources. A focus on the production of core "data items", in addition to the core indicators that WWAP itself uses, would achieve this purpose."

The data items required for water use efficiency indicators are essentially, water use and appropriate associated output data (physical and/or economic),within a coherent sector and/or geographic frame. To guide the application of efficiency indicators, further information is needed about the context, specifically the extent of water scarcity and intensity of water use in the area considered, indicators that provide information about opportunity cost and externalities of water use in the particular circumstances. Examples from electricity, forestry and agriculture illustrate these issues. The danger of unintended consequences resulting from the application of inappropriate efficiency standards is also highlighted.

Author: Cor Graveland (Statistics Netherlands)

***Title*:** 'Economy wide application of Water use and Resource Efficiency indicators.

Dutch experience with Water indicators derived from Water statistics and Accounts'

Abstract: Statistics Netherlands compiles environmental accounts including water accounts for the Netherlands. For the compilation concepts, definitions and classifications (defined in SEEA and SEEA-W) are used being consistent to those for the national accounts (SNA'93 / SNA2008). This facilitates the analysis of wider impact of economic development, as for the impact on to the inland water resource system.

On physical water use (flows), both physical water accounts and monetary accounts are compiled. This consists of both physical and monetary supply and use tables and of water abstraction. In the accounts tap water, surface water and ground water are distinguished. Water use has a break down to industries and households, moreover a breakdown is made from the na-

tional level to (sub-)river basin district level. Asset accounts are under development. The water flow accounts and related water statistics serves several stakeholders, as the government at the different levels including the water boards and the EU as for example in context of the Water Framework Directive (WFD). The water statistics and accounts are being used in the different stages of the policy cycle.

Generally problems that have to be dealt with within the country related to water, next to water pollution and water quality are: i.excess of water, ii.lack of water / water resources and, iii.safety, as the protection against flooding. Both water accounts, water statistics and other statistics support stakeholders dealing with these issues.

From the water flow accounts a number of indicators can be derived. Examples include tap water use by industry, groundwater use by industry, tap water use by households.Examples of integrated environmental - economic or water - economic indicators are: ground water use intensity by industry, tap water use intensity by industry, per capita water use (households). Development of water use intensities over time for the economy (GDP, VA) as a whole. The time series allows for monitoring the 'progress' in decoupling socio-economic performance from resource use.

***Author**:* Lucas Porsch (Ecologic Institute)

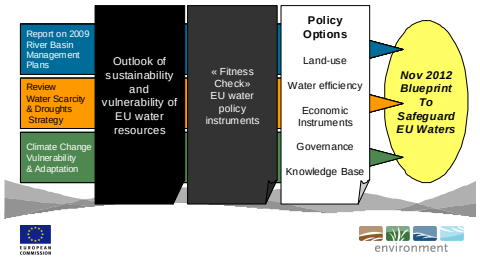
Title: Water Quality Indicators in the 'beyond GDP' process

Abstract: The presentation aims to showcase the links between the work going on relating to water quality indicators and the Beyond GDP process and summarizes some ideas how water quality indicators can be integrated into composite indices. First, the concept of "Beyond GDP" is introduced and subsequently relates this to water quality indicators. The presentation proceeds in introducing the involvement of the Ecologic Institute in this area and presents relevant interim results of two ongoing projects, namely IN STREAM and Environmental Pressure Index. The presentation concludes that the inclusion of water quality indicators into composite indicators of economic and environmental welfare requires still some data development but also a well chosen methodology on the side of the composite index to ensure that water quality issues are properly taken account off. For example, any composite indicator needs to include changes to stock to be able to take account for water scarcity and water quality issues in a robust way.

Author: Henriette Faergemann (DG Environment)

Title: Water Resource Efficiency and the 2010 Blueprint

Abstract:



The highlight of next year's water policy will be the delivery of the ***'Blueprint to safeguard Europe's Waters'*** composed of three interrelated pillars:

- a report on the implementation of the Water Framework Directive,
- a review of the Strategy on Water Scarcity & Droughts
- a review of the vulnerability of environmental resources to climate impacts and other man-made pressures.

These reviews will allow us to develop policy recommendations and proposals to further develop and enhance the effectiveness of EU water policy.

The **first pillar of the Blueprint**, the **implementation of the Water Framework Directive,** the Commission is currently assessing the contents of the Member States' River Basin Management Plans. This analysis will provide information on how Member States have implemented **integrated water management** and how Water Framework Directive **principles** such as cost-recovery, polluter-pays and water pricing have been incorporated into their legal, administrative and implementation practice. It will also give a picture of what Member States are doing to tackle the main threats and challenges for water such as chemical pollution; eutrophication; over-abstraction; water scarcity and droughts; climate change adaptation.

The **second pillar** of the Blueprint – **water scarcity and droughts** - the Commission is focusing on identifying incentives to increase **water efficiency**, in particular the potential for savings in buildings, leakage reduction in distribution systems, water efficiency in agriculture, and the potential applications of water footprinting. About 20-40% of Europe’s water is wasted and water efficiency could be improved by 40% through technological improvements alone. Changes in land use, behaviours and production patterns could increase savings further, supplementing in a more cost-effective way technological improvements.

The Blueprint will provide indicative **water efficiency targets** at EU level taking into account the great variety of situations across economic sectors and geographic areas. It will also aim at fostering the development of targets for water efficiency (and quality improvement) in the Member States at sectoral and river basin level by 2020.

The **third pillar** of the Blueprint will address the evolving **vulnerability of the water environment** through a vulnerability assessment focused on water management under the influence of climate change and the related uncertainty. We will try to improve our water related knowledgebase to be able to base choices on water allocation and use at river basin level on solid economic analysis to ensure a sustainable use of good quality water in the EU in the long term.

On the basis of these assessments and of a wider Fitness check of the existing water policy, the Blueprint will take a strategic approach to EU water policy and highlight the links with other EU policies, particularly **agriculture, regional, energy and industrial policies, to foster their contribution to water protection.**

The Blueprint **is closely linked to Europe 2020 priorities**, in particular promoting a more resource efficient economy.

Author: David Zetland

Title: The economics of the environment: markets vs. regulations

Abstract: In a time of scarce freshwater, it is important to find the best way to protect the environment at the lowest cost while directing remaining water to human uses that create the greatest value. This presentation will argue that a combination of market and regulatory mechanisms can deliver more benefits at lower costs than a pure regulatory framework.