

# The outcomes and results of the Water Security Knowledge Exchange Programme

Kay Heuser, Graham Leeks, Isabella Tindall

Centre for Ecology and Hydrology, Wallingford, Oxon OX10 8BB

## Abstract

*This paper will describe the background, challenges and outcomes of implementing the Water Security Knowledge Exchange Programme (WSKEP). The 3 year programme was set up by the Natural Environment Research Council (NERC) in April 2011 and it will come to an end in March 2014. The programme has carried out a number of activities including holding seminars, conferences, and workshops, preparing literature review and reports and developing a series of web tools. This paper reports on all these activities and the actions being taken in order for the web tools to continue into the future.*

## 1. Introduction

The Water Security Knowledge Exchange Programme (WSKEP) is a 3 year programme (April 2011 – March 2014) funded by the NERC. NERC-funded research produces knowledge, expertise and skills that can provide significant benefits for the environment, for the economy and for the general well-being of society. Knowledge exchange (KE) plays an important role in delivering these benefits.

Increasing water demand due to growth in population, per capita water consumption, requirements for food production, combined with the effects of a changing climate, present some of the greatest challenges facing mankind. Currently these challenges, both in the UK and around the world, are being met by an unsustainable exploitation of water resources. Hence, water security is now a major concern of governments, industry and civil society. To meet the challenges, the water community needs to:

- Better understand how to manage water resources and quality to meet the needs of different water users, including the environment;
- Improve prediction of and preparation for floods and droughts;
- Develop partnerships between government, industry and the public to effectively apply best practice in water management;
- Integrate more reliable climate science into management of the water cycle and its related ecosystems.

This paper will describe the aims and background of the WSKEP and discuss in more detail the WSKEP workshop process, Westminster reception, and a series of activities carried out with key institutions involved in water. The paper also provides

information on engagement with business and the programmes other outreach activities.

## **2. Overall aims of the programme**

The aim of the WSKEP has been to accelerate the uptake of research and help inform the direction of future science to ensure sustainable use of our water in the future. In particular, the KE programme has focussed on specific areas where NERC's investments have produced considerable scientific strengths that meet key business, policy and societal needs.

At a more intangible level, one of the main outcomes of this programme has been to strengthen personal and organizational relationships. Individuals with responsibilities for research and innovation in government departments, industry and NGO's have built working relationships with researchers who understand and can deliver their research and innovation requirements. The WSKEP is intended to strengthen the mechanisms by which organizations relate to each other and participate in the wide range of networks which perform KE functions. The programme therefore has had to be compatible with existing KE activities across the UK.

## **3. Background**

Across the water industry and academic community it is now widely recognized there is a need to maximize the impact and benefits of knowledge being generated by the research base and the need for user requirements to shape many research funding priorities. This two way exchange of ideas is an essential element in the innovation needed to address environmental challenges and to generate new markets. NERC, through the water related research that it funds, can play an important role in reducing the risk associated with the pressures of population growth, increasing urbanisation and subsequent land use pressures in addition to possible impacts resulting from climate change. This is achieved partly through transferring research outputs to users in such a way that they can integrate them into their own working procedures for managing water resources. The WSKEP supports and sustains the interactions between researchers and users within this area.

## **4. Results and Discussion**

The WSKEP has carried out a number of different activities over the 3 years of the programme to facilitate Knowledge exchange of water research. Several parts of this multilayered approach are described in the following sections. In order to achieve the programme objectives within the time frame much of the work has been contracted out to the organisations working in that area of research or organisations working at the interface between research and industry. There have been a number of outputs produced and impacts which are unlikely to have occurred without the support of the WSKEP. The type of activities which have taken place includes seminars, conferences, workshops, literature and reports.

These activities have been developed through one-to-one discussions between the Programme and end user representatives such as trade, professional or research and information associations. Through these discussions, the specific KE needs of users have been identified and the most appropriate knowledge exchange methods and tools were used to meet these needs. After 18 months the programme was reviewed and as a result, more focused discussions were held with businesses to identify their specific KE needs.

The programme has also supported a series of workshops and Receptions in Westminster to bring users and scientists together to aid discussions and collaborations at locations convenient for the policy, business and research communities at regional and national levels.

In addition to workshops and meetings, the programme has developed a number of web tools and hosts a well regarded website which has a calendar of events, news items, and documents relevant to the programme. The programme also has a monthly news letter which goes out to academics, policy makers, regulators and business. All of these activities carried out by the WSKEP are described below in more detail.

#### 4.1. Knowledge Exchange Workshops

During the first eighteen months of the WSKEP, a series of 10 workshops were held between November 2011 and June 2012. The workshops brought academics and a wide variety of research users together to discuss specific areas of water research. They were designed to support 3 key aims and objectives:

1. To increase awareness and uptake of research outputs in the Subject Area
2. To identify user needs and potential future research projects
3. To strengthen research/user group collaboration and networks

The Subject Areas considered were Integrated Water Management, Resilience to Extreme Events and Ensuring Water Resource Security. The subject areas were selected following discussions with an advisory group composed of senior business people, policy makers and researchers. Each Subject Area was divided into three or four Topics (See Table 1 for the titles of the workshops).

**Table.1. Workshops Topics**

<b>Workshop Reference Number</b>	<b>Workshop Topics</b>	<b>Date</b>	<b>Delegates Registered</b>
1.1	Assessing upstream methods of land/water management that improve water quality and quantity	30/11/11	35
1.2	Understanding and Managing the Impacts of Climate Change on the Ecology of Catchments	31/1/12	28
1.3	Linking natural networks and	5/3/12	23

	communities across rural and urban systems		
2.1	Improving flood prediction, communication and impact assessment	4/4/12	20
2.2	Improving drought prediction, communication and impact assessment	14/6/12	50
2.3	Supporting sustainable and resilient management of droughts	19/4/12	41
2.4	Supporting sustainable and resilient management of extreme rainfall	13/6/12	40
3.1	Assessing the value of water	1/5/12	35
3.2	Assessing Water-Related Business Risks	29/2/12	26
3.3	Informing Decision Making for Water Resources Management	19/1/12	46
			344

Each workshop followed a standard format, and was divided into 4 sessions:

1. *Setting the Scene*: an overview of the subject area, based on a paper presented by the keynote speaker, followed by table discussions noting key issues and insights. The object of this session was to ensure a shared understanding of the Subject Area.
2. *Making the most of current research activity*: individual researchers gave a short introduction to research work they were involved with, and participants had the opportunity to connect with programmes that interested them. Comments were captured, and participants logged their interest in specific programmes.
3. *Identify areas for future research activity/collaborations*: through table group discussions, individuals were invited to identify key propositions where further research/activity could be of value in taking forward the Subject Area. These were presented to the whole meeting and prioritized by participants.
4. *Alliances, networks and advice to the WSKEP*: table groups were invited to suggest ways to maximise the value of the Water Security Knowledge Exchange Programme.

Attendance at workshops was by invitation, and considerable care was taken to ensure that delegates would have a real interest in the subject matter, and that all the sectors would be well represented. The 344 delegates registered to attend the workshops were well distributed across different sectors with 208 coming from user groups and 142 coming from academia.

The reports from all of the workshops were reviewed at the end of the first eighteen months of the programme. Participants were encouraged to build upon the opportunities for interaction between researchers and users which were stimulated by the workshops. The programme maintained contact with the workshop participants and tracked some of the outcomes by carrying out a questionnaire and telephone interviews. Where possible, the workshop outputs were distilled into a much smaller number of issues, recommendations and practical actions which the

WSKEP has taken forward in the programme plans for the second eighteen month period. The outcomes of the review meeting were summarised into a report [1]. In addition to use of a standard feedback form immediately after each workshop, as part of the process a follow up survey of workshop delegates six months after the workshops. This found that 50 out of 71 respondents had identified potential collaborations as a result of the workshops, and that 73 bilateral discussions had been held. The results of the survey were presented in a report [2].

A variety of barriers to collaborations were identified, including the lack of time. Some of these barriers were structural and arise primarily from the way in which scientific research is currently organised and funded, and the mechanisms of reward for individual academics. The others were relational which arise more from failures of communication, and a lack of understanding between potential collaborators of respective cultures, interests and internal drivers.

#### **4.2. Westminster Reception**

In addition to the workshops, WSKEP hosted a Reception 'Improving Resilience of Businesses to Water Related Risks' in Westminster in late 2013 with short introductory speeches designed to inform the attendees and given by key people from government, science management and industry (thereby attracting high attendance rates).

In planning this event a great deal of attention was paid to the target audience, content location and timing. The event raised the profile of NERC science being used by businesses, by bringing together high level representatives from industry, government and academia to discuss recent initiatives to encourage innovation in water management.

The Chief Executive of NERC invited the attendees to discuss ways in which the research council could carry out Knowledge Exchange activities with business, resulting in useful follow on discussions. The reception was reported on in the WSKEP eZine and a film of the event was produced [3,4]. In addition to the presentation, particular areas of Water Science were represented and major web tools from the WSKEP were launched and demonstrated.

As with the workshops attendance was by invitation, to make sure interested people were targeted. The different science initiatives created a good opportunity for the science to be showcased, which aided discussion. Feedback on the event has been very positive and a number of different follow up discussions have taken place.

#### **4.3. User Based Activities**

WSKEP included a dedicated line of activities which have focused upon the specific needs of major users of NERC research (e.g. the Department for Environment, Food & Rural Affairs (Defra), Environment Agency (EA), The Water Services Regulation Authority (OFWAT), Water Utilities, British Water members,

European Commission, National Farmers Union, Devolved authorities, Local Government, Financial sector, Energy sector, Food and Grocery sector, etc). The activities which have resulted from discussions which the programme funded are described below including outputs and impacts of the work. The WSKEP has also written a number articles and papers to disseminate KE activities to a wider audience [5,6,7,8].

Interactions by the WSKEP with some of the key institutions involved in water research development and innovation are briefly listed and described below:

**European Commission:** In order to raise the profile of the European Commission's review of water policies (Blueprint for Safeguarding European Waters) in the UK, the WSKEP co-sponsored a conference in mid January 2012 with the Chartered Institution of Water and Environmental Management (CIWEM).

New policies were reported with response to:

- Integration of climate changes into the setting of the criteria defining the ecological status of water bodies – which up until now have assumed that the climate is static;
- New provisions on water scarcity and drought with the WFD
- Improving policy integration between the Water Framework Directive (WFD) and other EU policies such as the Common Agricultural Policy (CAP), Energy, Regional and Transport policies – which have been developed in isolation from each other and hence have sometimes resulted in contradictory outcomes.
- Where water footprinting methods provide a useful tool to encourage social change in water use.

The conference provided a forum for UK government, key industries, NGO's and the research community to explore the implications of this upon UK policy and legislation.

**British Water:** British Water is a trade association for the water industry supply chain. Several actions to encourage British Water members to engage more actively with the research community were co-funded by the WSKEP. These include:

- Innovation Days – where researchers and British Water members present latest research and innovation to water utilities. These provided an environment where SME's, researchers and large water utilities can meet with and discuss industry needs and research capabilities.
- Supporting two British Water Focus Groups (Sustainable Urban Drainage (SUDS) and Fats, Oils and Greases (FOG)) access research skills and discuss industry requirements. The efforts of both these groups to improve performance of sewer systems support high priority research interests in diffuse urban pollution, and in urban flooding. Actions will include closer linkage of these groups to the NERC Research Programme in Flooding, and in supporting a case for future research on diffuse urban pollution.

**Catchment Change Network (CCN):** CCN is a NERC-funded KE network that brings together a broad range of scientists and practitioners to consider the assessment of future changes across catchment systems. The WSKEP supported the CCN in developing the Catchment Change Management Hub website (<http://ccmhub.net>). The CCN Catchment Change Management Hub has been developed to provide a repository and guide to knowledge for planning catchment restoration and mitigation measures to achieve good ecological status in rivers and other water bodies for the benefit of local catchment managers, advisors and interested stakeholders including local community groups and general public. The site is being used by other projects concerned with the implementation of the Defra Catchment-Based Approach to disseminate information. The previous Defra Minister Richard Benyon identified the hub as a good example of how to work collaboratively to share good practice.

**Environmental Sustainability Knowledge Transfer Network (ESKTN):** The ESKTN is funded by the Technology Strategy Board and brings together diverse organisations and provides activities and initiatives that promote KE. The ESKTN ran a workshop with the objective of exploring what water and ecosystem services/footprinting tools and data are currently available and being used by different groups working in the agricultural domain. Through sharing information on current activities among a group of representative stakeholders, the workshop identified any obvious gaps and concerns about accessibility to relevant information which would be addressed by subsequent programmes of research or KE.

Given on-going technological developments associated with monitoring and measurement, which will inform deployment of smart technologies for cultivation and management of land and livestock, there is a clear need to continue exploring what are the most appropriate solutions for different situations. With more detailed information about local hydrology, water usage and quality, land managers will be better placed to contribute to overall catchment management and to benefit from potential ecosystem services dividends. The workshop was successful in developing engagement and presenting some good ideas for developing demonstration projects and also for identifying some of the gaps in data and accessibility issues, which have the potential to be picked up in future collaborations [9].

**AMEC:** AMEC is a leading engineering, project management and consultancy that were commissioned to undertake work to identify synergies between agriculture and water utilities. The report identified seven synergies which will be prioritised to offer the greatest opportunities to improve resources and water supplies. There currently remains many gaps in knowledge which may currently be inhibiting the value and/or exploitation of the synergies. A further meeting with Anglian Water and the Environment Agency amongst others is planned for early 2014 to discuss and take forward the initial findings [10].

**Imperial College London:** Work was undertaken by the Environment Agency and Imperial College to consider how we can better communicate Water Framework

Directive (WFD) outcomes and environmental improvements by using an ecosystem approach (ESA). Methodological linkages between the ESA and the WFD were reviewed and a framework proposed that links the ESA to WFD implementation. The ecosystem approach provides a framework in decision making for looking at whole ecosystems and the services they provide, to ensure that society can maintain a healthy and resilient natural environment now and for future generations. The benefits of using this approach to provide a preliminary assessment of how it could support future implementation of the WFD were identified and discussed. The paper demonstrates how a shift in focus from strict legislative compliance towards a more holistic implementation could help deliver the wider aims and intentions of the WFD.

The work on the potential of using the ecosystem approach for WFD implementation was submitted as a paper to the international journal *Science of the Total Environment*. This has led to wider dissemination of the work than had been previously planned, and demonstrates the high impact of the work. [11]

**UK Groundwater Forum:** UK Groundwater Forum is a platform for information exchange on ground water topics in the UK. WSKEP supported their annual Conference which had as its theme 'Communicating Groundwater – Bringing understanding to the water table'. This example demonstrates the importance of working through existing networks and groups as they have the relevant expertise and knowledge of a subject area. The UK Ground Water Forum set the agenda for the conference as they had a better understanding of where the gaps in groundwater knowledge are. The event included interactive discussions and workshop sessions to give everyone the opportunity to participate more fully throughout the day and share views and experiences. One of the key messages coming from the Conference was the importance of the water community speaking to the public and decision-makers with one unified voice. The other key message was that there is a need to get groundwater on the National Curriculum and better represented in schools.

**University of Exeter:** WSKEP supported the University of Exeter to run a Think Tank on the water-food-energy nexus in July 2012. The overall aim was to link together the Water/Food/Energy research and industry sectors. The workshops was a first step in establishing communication paths for researchers and practitioners involved in one or more of the 'resource spheres' (Water, food and energy), to develop a shared view of the challenges to water-food-energy security. The purpose of the workshop was to scope an integrated modelling framework for assessing the behaviour modes of the water-energy-food system capable of informing more effective policy at various scales. The workshop brought together experts from a number of fields and resulted in a critical mass of interesting parties. A major bid was put into one of the Research Councils involving engineering, natural and social scientists that had never worked together before. The workshop was successful in the way it brought together experts and created the opportunity to submit a multidisciplinary proposal.

The University of Exeter also carried out a programme to roll out current work on Catchment Management that had been done with South West Water and the Rivers Trust looking at Landscape restoration science to support resilient management of water and carbon. The Knowledge Exchange pilot integrated the research from 5 projects, funded by South West Water, Wessex Water and a range of other funders. By working across landscapes, from upland moorland to lowland wet grassland and intensively managed grasslands, the findings are relevant for a wide range of catchment managers in the UK and have been disseminated to a broad audience, via leaflets, science articles, journal papers and a workshop. It was identified that landscape restoration delivering multiple and previously unquantified environmental benefits, three of which (water quantity, water quality and carbon storage) can (and will in the near future) be monetised. Such findings could change the way in which the water industry manages its water and soil resources.

**Lancaster University and CEH Lancaster:** This activity involved researchers based at Lancaster University and CEH Lancaster who had been experimenting with a new form of participatory catchment management in a small catchment in Loweswater, Cumbria, ([www.lancaster.ac.uk/fass/projects/loweswater](http://www.lancaster.ac.uk/fass/projects/loweswater)). The key aim of this activity was to consider whether any lessons had been learnt about participatory catchment management in Loweswater. They produced a recommendations document, which formed the basis of the discussions held at the workshop organized for Defra/EA catchment managers in Lancaster in May 2012. This document is made up of two parts: the first part provides general recommendations for participatory working, while the second part contains advice for agencies and regulators. This activity demonstrates another good way in which knowledge can be exchanged.

**UEA Water Security and International Commission on Irrigation & Drainage (ICID):** WSKEP provided support to UEA Water Security and ICID seminar 'Irrigation policy in a time of drought and high food prices'. The audience numbered over 90 and included representatives from universities, international NGOs and specialist institutions. The programme drew from experts from a number of organisations including the World Bank, Dutch and UK universities. The fundamental idea that emerged from this seminar was that an integrated approach to irrigation management is essential in order to effectively meet food security in a global context characterised by rapid demographic growth, rising food prices and climate change. Clearly, the cultural, historical, socio-economic and political features of each region and community need to be taken into account. All participants agreed that future interventions in irrigation policy will have to be:

- (a) multi-sectorial - essentially coupling the irrigation sector with water resources management as well as policies and regulations that relate to agriculture, energy, and health,
- (b) multi-actor - integrating all relevant stakeholders (consumers/farmers, private companies, government, civil society) into decision-making related to irrigation,
- (c) multi-scale - considering solutions at different governance levels (regional, national and local).

The seminar demonstrated again the importance of working through existing networks to host an event. They were able to invite the right speakers to the event in order to stimulate discussion around the subject of irrigation policy.

**Water Industry Forum:** Water Industry Forum is a not-for-profit business that brings together a number of stakeholders in the UK water sector to tackle the impact of climate change, population growth and other challenge. They held a seminar 'Dealing with the threat of future water shortages – do we need a UK water grid or is it something else?' The seminar explored the different options available to address future water scarcity in the UK, the current constraints to progress and the ways in which these could be overcome. The seminar speakers included senior representatives from consultancies, regulators, water companies and Civil Society Organisations. The outcome of the seminar is that the Environment Agency will develop a proposal for a strategic forum for integrated water resource planning. This has been another good example of how by being able to support existing groups who are aware of current specific water security issues can ask the right questions to be able to find out what is required in order to take forward an idea.

#### **4.4. Engagement with Business**

From the middle part of the 3 year programme an increased focus on industry was required. The programme has engaged with businesses to determine their KE needs in relation to water security. These businesses include Severn Trent Water, South West Water, Yorkshire Water, Lafarge, Network Rail, BT, BP and Shell, Marks and Spencers, Danone, Coca-Cola, Scottish Coal, ASDA and Heineken. The first three businesses are major water companies. The importance of this sector, differences in methods of interaction and the range of issues over which WSKEP is engaging, make multiple engagement with this sector worthwhile. These discussions are ongoing and will feed into the work that NERC is doing to form strategic partnerships with businesses. This process has shown that it has taken considerable time for industry groups to understand what the WSKEP has been trying to achieve, and how it can complement industry wide needs from knowledge and innovation. This underlines the fact that building stronger research-user collaboration is a long term process. While the development process have been quite slow with some industry groups, once decisions are made to proceed, industry groups expect actions to start very quickly.

#### **4.5. Outreach**

The programme has its own website [www.wskep.net](http://www.wskep.net) which receives a 1,000 unique visits a month. The website contains documents related to water security, news items and an events page which has information on a number of water related events. The website is regularly updated and twitter to keep people informed. Using twitter alongside the website has helped the WSKEP to make more people aware of the programme and increase the number of visits to the website. The programme now has over 900 followers and this continues to grow. There is also a monthly WSKEP e-newsletter sent to nearly 4,000 contacts which

includes academics, policy, regulators and business. The most popular news items are about funding opportunities. The news letter receives a 15% click through rate (industry standard is ~7%). The website has become a well respected website and the use of social media and the newsletter has made more people aware of the programme.

The WSKEP has also developed two new web tools to facilitate knowledge exchange and networking between UK research providers and users. The UK Water Research Directory ([www.ukwaterresearch.net](http://www.ukwaterresearch.net)) is a comprehensive searchable listing of individuals active in water research and provides summaries of expertise and full contact details. It was launched in April 2012 with 300 entries and now has over a 1,000 entries and includes details of water networks and research facilities throughout the UK. The facility is designed to promote collaboration and to accelerate users (business and policy) access to NERC and other research funded water science. The directory will be maintained after the life of the programme. There are a number of organizations which are interested in the directory and have suggested ways in which the directory could be enhanced and improved in order to make it a more useful tool.

WaterR2B ([www.waterr2b.net](http://www.waterr2b.net)) has been designed to help businesses, policymakers, regulators and others see water-related challenges that they face have been addressed. The case studies are arranged across 8 different sectors and they promote long-term partnerships between the research community, and organisations that are facing water-related challenges. WaterR2B was launched in November 2013 and contains over 40 case studies across 8 different sectors and feedback has been positive. The website is self populating in order for people to submit their case studies, but in order to populate the site with case studies a consultant was employed to write a number of the case studies. The programme is currently seeking feedback to further improve the website to make it more useful to the users.

The programme is also currently developing a Water Data Portal to coordinate the many different data sources available. The Water Data Portal is an innovative media-rich online database delivering a comprehensive catalogue of water-related data that are of interest to a wide range of stakeholders. It will point them in the direction of the major national water related datasets that may help them resolve their challenges. The portal does not provide direct access to data but instead provides direct links to the data-holding site, sites relevant to that data, e.g. projects that produced or have used the data, and contact details of one or more custodians of the data. Site-visitors are encouraged to submit details of suitable datasets of which they are custodians, or to identify datasets that they are aware of that may be of interest to the site's intended audiences. The final details are currently being added to the Portal so its impact will not be known till beyond the end of the Programme.

Delivery of many of the WSKEP activities have depended upon third parties. Although this has been an effective approach and has generated a number of impacts it can be difficult to manage and track the deliverables. However, this has

been done effectively and in most cases work has been completed in a timely manner.

## **5. Conclusions**

During the period that WSKEP has been running, the Programme has succeeded in building up strong relationships with a range of businesses, government bodies and regulators. WSKEP has become a reliable source of information and knowledge and many new collaborations and partnerships have been formed on the back of its activities. As described above, with many examples, WSKEP has used a “multi-layered” approach using both the internal team and wider expertise in other organisation to make effective use of its resources over the short timescale of three years which was available.

The need for longer term KE initiatives like the WSKEP, lasting 10 years or more, was raised at several programme workshops. The time taken to establish programmes and the challenge of sustaining effective KE when a programme comes to an end is a problem experienced by this and many other initiatives. Longer term funding opportunities for these initiatives (or key parts of such initiatives) would clearly help to overcome this. In the case of the WSKEP, although the overall programme comes to an end in March 2014, a variety of ways are being considered to maintain the web tools, which have proven to be of great value in facilitating structured dialogue on Water Security issues between researchers and research users.

## **References**

- [1] Runnalls, N. and Jenkins, A. WSKEP – Short Summary Statement on Key Issues and Priorities from Phase One of the Programme. WSKEP Report. (2012)
- [2] Blackmore, R. Collaborations arising from WSKEP Workshops. WSKEP Report. (2012)
- [3] Heuser, K. WSKEP – excellent science meeting the needs of business. WSKEP eZine, Issue 16, (2013)
- [4] Dean, L. WSKEP event – a short film. WSKEP eZine, Issue 16, (2013)
- [5] Tindall, I., Heuser, K. Jenkins, A., Leeks, G., and Runnalls, N. The NERC Water Security Knowledge Exchange Programme – its achievements and remaining challenges. Paper for the 11<sup>th</sup> BHS National Symposium Dundee, Scotland. (2012)
- [6] Runnalls, N. WSKEP Soaking up knowledge. A novel approach to supporting sustainable and resilient management of droughts, FWR Newsletter, Issue 2, (2012)
- [7] Runnalls, N. Innovation for the UK Water Community: Opportunities and Barriers. FWR Newsletter, Issue 3, (2013)

[8] Jenkins, A. Systems Thinking: The river catchment approach, Sustainable Solutions: Raising the Water Mark, Westminster Sustainable Business forum, Essay One. pp.10-12 (2012)

[9] Miller, A. Business engagement in valuing and implementing water-related ecosystem services: making the case for the agrifood sector. ESKTN Workshop report.(2013)

[10] Ryan,S., Fawcett,C. and Kemlo,A. Water Quantity: Synergies between Agriculture and Water Utilities. AMEC Report. (2013)

[11] Vlachopoulou,M., Coughlin, D., Forrow, D., Kirk, S., Logan, P. And Voulvoulis,N. The potential of using the Ecosystem Approach in the implementation of the EU Water Framework Directive. Science of The Total Environment. Vol 470-471, pp. 684 -694 (2014)