

Towards Strategies with Impact in Water Education

Proceedings

of the

UNESCO Regional Workshop on Water and Education

in Europe and North America

26 – 27 February 2009

UNESCO-IHE, Delft, The Netherlands

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1. Introduction

This document reports the results of a two day UNESCO Regional Workshop on Water and Education on Europe and North America, held on 26-27 February 2009, at UNESCO-IHE, Delft, The Netherlands.

This workshop is one of five regional workshops held globally, initiated under the framework of the 7th Phase (2008-2013) of the International Hydrological Programme in the context of the United Nations Decade of Education for Sustainable Development (DESD, 2005-2014).

The regional workshops have the following objectives:

- To identify examples of best practices on water education in the region at all educational levels;
- To analyse examples of best practices to identify barriers and opportunities;
- To propose recommendations to enable effective water education in the region at all educational levels for: (1) the international community, in particular for UNESCO; (2) National Governments, in particular the ministries in charge of education and freshwater; (3) local authorities; (4) educational practitioners, including academics, researchers, trainers, teachers and mass media professionals.

During the workshop the domain of Water and Education was structured along five topics of water education, which match the workplan themes for Thematic Programme 8 (Education for Sustainable Water Management) of the DESD Action Plan:

1. Tertiary education and professional development of water scientist, engineers, managers and decision makers
2. Education and training of water technicians
3. Water education in schools
4. Community and stakeholder education
5. Water education for and through mass-media professionals

The Workshop was intellectually supported with the participation of fifty international experts from the Europe and North America region, with the support of sixteen academic and five non-academic staff members from UNESCO-IHE and two officials from UNESCO IHP (see Annex 1 for the list of participants). All participants were invited on beforehand to submit a paper, as well as a small abstract covering their interest, professional activities as well as their recommendations to their field of work.

In section 2 the background of the initiative to organize the regional workshops is described.

In section 3 the results of the Workshop, addressing the key issues for each water education topic that followed from day 1, are highlighted followed by recommendations and actions for the topic. The different topics are illustrated by case studies starting on page 17.

The abstracts and workshop program are presented in Annexes 2 and 3.

The keynote presentations held during the Workshop can be currently (2009) downloaded in MS Power Point format from: <http://www.unesco-ihe.org/UNESCO-Water-Education-Workshop-in-Europe-and-North-America/PRESENTATIONS> .

2. Background

Water education is key to achieve the water MDGs. The UNESCO regional workshops on water education intend to identify gaps and opportunities in order to catalyze appropriate responses to local needs and to achieve the objectives foreseen in the strategic plan for IHP-VII, the DESD Action Plan and the Water Education Work Plan.

While there is a range of materials and projects focusing on water-related education, these are often not well connected to offer customised solutions to individual countries. Some of the limitations identified with the existing water education include use of outdated, biased or irrelevant information; poor medium of instruction; lack of continuity between different levels of water education; lack of integration with the wider curriculum and with local knowledge; lack of practical relevance to local and community needs; lack of resources; and poor linkages with locally available professional bodies.

The workshops will contribute to the execution of theme 5 ("Water Education for sustainable Development") of the strategic Plan for the 7th Phase of IHP. In particular, the workshops will contribute to the following outputs of focal areas 5.1 to 5.4:

- Recommendations for broader curricula, exemplar educational materials and case studies
- Case studies, best practices and publications on water education within TVET.
- Guidelines for integrating water education related to sustainable development into the K-12 curriculum, with emphasis on "learning by doing" or "experiential learning" approaches.
- Production of guidelines, supported by practical examples, for community-based water education and media reporting of water issues.

The DESD Action Plan was prepared to provide strategic focus to UNESCO initiatives that integrates Education for Sustainable Development with related dimensions of UNESCO's activities in order to help create an enabling environment for capacity-building according to the needs of the Member States and other partners to achieve the objectives of the DESD. The Action Plan envisages several thematic programmes, defined as long-term intersectoral programmes, one of them on education for sustainable water management. For the 2008/09 biennium, the Action Plan envisages as expected outcomes, the "Review, development and dissemination of case studies innovative and effective practice related to the theme" and as expected results "Regional and/or International Experts' Meeting(s) held; Meta-analysis completed; Book of case studies published; Guidelines and Briefing Papers published".

The water education work plan, which was developed by an intersectoral group and experts from all regions, highlights the following expected outputs:

- Guidelines for integrating sustainable water management in water education and training.
- Case studies, best practices and publications on water education and training.

Further information on UNESCO's work on water education can be found in the brochure "Water Education for Sustainable Development".

3. Expert's Recommendations on Water and Education

The Water and Education Workshop on Europe and North America, held on 26-27 February 2009, at UNESCO-IHE, Delft, The Netherlands, was counted with the participation of 50 international experts from the region, with the support of 16 academic and 5 non-academic staff members from UNESCO-IHE and two officials from UNESCO IHP.

After in-depth debate in the five topic groups on the current status and challenges in water education and exchanges between the groups in plenary discussions, several main recommendations per topic were formulated by the experts. These recommendations are presented below.

Preamble

The participants of the Water and Education Workshop on Europe and North America express awareness regarding the following nuances that accompany the recommendations:

- Water education is part of and intertwined with sustainable development (SD) in general.
- All topics and their practices are inter-connected; there is no sharp conceptual border between tertiary education, education of water technicians, water education in schools and community education.
- The different areas of education all highlight a slightly different aspect of water education in the overall context of life-long learning.
- All water education areas have in common that activities are focussed on diminishing illiteracy in sustainable development in general, and in water specifically.
- We clearly subscribe that each area or working domain acknowledges the importance of gender-sensitive analysis, also encompassing issues such as cultural diversity, local knowledge and human rights. Within different areas, as well as in different Member States, this might lead to different conclusions and actions.
- The water sector as such differs very much per Member State. As a result, the relevant stakeholders can vary. A clear stakeholder analysis is an important prerequisite for success of water educational activities at the local level.

Box 1 What is Education for Sustainable Development (EfS)?

What are the Goals of EfS

- Bring understanding about real-world issues through integration of environmental, economic, and social factors
- Encourage and strengthen development of pro-environmental values, attitudes, and behaviors
- Emphasize importance of place-specific issues, ways of knowing, and decision-making processesPrepare citizens to engage in participatory democracy

What are instructional strategies of EfS:

- Interdisciplinary, multidisciplinary, and thematic approaches to curriculum
- Constructivist learning strategies including active learning, case studies, and cooperative learning
- Scientific model development and cognitive thinking skills
- Reflection on learners' environmental behaviors, attitudes, and skills
- Inclusion of Intercultural worldviews, practices, and local knowledge systems

Tertiary education and professional development of water scientists, engineers, managers and decision makers

Analysis of the domain and key issues

Key issues and challenges for the future, and intra-regional differences include:

- Inclusion of social sciences
- Focus on multi-disciplinary teaching approaches but also multi-disciplinary audiences – provide tools to communicate across disciplines.
- Look at how kids are learning and use more media, ICTs and blended learning.
- Policy makers need to be aware of what science can and cannot do in an uncertain world
- Universities often focus on research, not on teaching.

Successful approaches and aspects of success include:

- Blended learning, case studies and role play
- Promote didactics in a workshop setting – let teachers have trial sessions (e.g. student centred learning course)
- Structured collaboration between universities, e.g. to address staffing problems
- Collaboration between universities, practitioners, politicians
- The use of existing materials that are transferable to many different countries
- UNESCO as a forum for sharing best practices

Limitations, barriers and constraints include:

- Available resources
- Regional differences and how to cater for different audiences
- Language barriers
- Mono-disciplinary focus of university education and reward structure

Tertiary education, in connection with other educational areas and the water sector:

- Need to get out of the 'water box'
- Life long learning integrates all 5 areas of education discussed in the workshop
- See water as an integrated issue e.g. river basin approach, emphasize governance, social context, economics
- Education cannot change legal institutions, but can change the minds of those involved
- Our successes need to be better communicated

Recommendations

- Recognizing the scale of the current global changes in connection to water resources, together with increasing uncertainties and complexities, we believe that education on water issues, natural resources management and sustainable development is more important today than ever before in knowledge based societies.
- To enhance interdisciplinary problem solving capacities, we support restructuring of universities at graduate level around natural resources issues. This requires change in funding arrangements. Students should be well-educated in specialized disciplines and should be able to interact with multiple disciplines involved in natural resources.
- The development of capacities of tertiary education community on innovative learning and teaching methods (e.g. blended learning), assessments, evalua-

tion, research, administration, funding and interdisciplinarity. The change process should focus on the institute as a whole and take life long learning processes into account.

- In order to enhance the enabling environment for interdisciplinary problem solving capacity, international organizations, national and regional governments should facilitate demand driven networking and provide incentives. This requires close coordination amongst themselves and with the tertiary education community.

Box 2 OpenCourseware for Adaptive Water Management

Adaptive Water Management (AWM) provides a framework in which individuals and water management organizations can perpetuate learning systems that enhance the adaptive capacity of a society to deal with increasing risks and uncertainties in the water sector.

Ideally, a teaching programme in adaptive water management addresses the three aspects of learning - knowledge, skills and attitude. Effective teaching of adaptive water management therefore uses a diversity of working forms, including new educational approaches like role-playing and participatory modeling. For this purpose, *opencourseware* for adaptive water management has been created within the framework of the EU-funded Ne-Water research project (i.e. materials are free downloadable at www.watereducation.nl), and a complementary international training of instructors programme has been implemented (see <http://www.newater.info/everyone/3098>).

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Education and training of water technicians

Analysis of the domain and key issues

Key issues and challenges for the future, and intra-regional differences include:

- Regional approaches must be factored into training
- Technical training should incorporate appropriate cultural, institutional and governmental dimensions
- International/institutional networking should be more fully explored
- Any training needs assessment should consider the institutional needs in parallel with the technical needs
- Individual and institutional training
- How to best incorporate training into a business working-schedule
- Institutions must be supportive of employees needs to continue education

Successful approaches and aspects of success include:

- Establish sustainable training organisations, such as the Dutch “wateropleidingen”, which stimulate professionals training their peers
- Education should not be restricted by or to previous policies, but should build on lessons learned
- There is a need to produce more analysts and fewer advocates
- Open-source materials should be made more widely available
- Courses should be “tailorable”
- Exchanges between trainers and participants, and among the participants themselves should be promoted
- Education should be demand-driven instead of supply-driven
- Training must be both relevant and at the state-of-the-art level
- E-learning, distance learning and blended learning are increasingly important approaches

Limitations, barriers and constraints include:

- Integrated approaches to water resources planning and management are largely missing
- A blend of specialists and generalists is needed, ideally in a teaming arrangement
- How to put the principles of IWRM into practice remains unclear
- Understanding people from different fields can be difficult and there is a need for “facilitators” to compile the different views
- Many professionals need to learn teaching techniques
- How to best share the knowledge and best practices remains unclear
- Cooperation between foreign universities and language barriers (at Bachelor level) persist
- Requirements for professional institutions to direct the education requirements

Within technical education and vocational training, in connection with other educational areas and the water sector:

- Practical aspects of water resources planning and management should be increasingly infused into the tertiary education and professional development programs
- Water training should begin at the earliest possible age
- Public participation is a critical element of water resources management and should be considered as a critical component of practitioner training
- The mass media should be viewed as a key partner in the decision making process and not as a barrier

Recommendations

- The starting point for training should be the expressed needs of learners (both at individual and institutional levels)
- Stimulate professional organisations and governmental bodies (particularly ministries) for “life long learning”
- Stimulate the involvement of water professionals and practitioners in training their peers
- Intergovernmental organizations, such as UNESCO, should focus on the training of those who design and deliver training in developing countries, and ensure that this process is achieved in cooperation with trainers from the developing countries
- Develop incentives for life long learning (such as registers and guidelines) Develop training programmes with the help of education professionals (to bridge the gap between theory and practice)

Box 3 Water professionals training their peers

About 15 years ago the Dutch water sector decided to establish an independent training institute for water management to improve the quality of their employees with specific knowledge and know how on water issues. The water sector stimulates their employees in the life long learning by financing the admission fees. The institutions spend yearly approximately 2% of their personnel budget on education and development of the staff. Mostly the education programmes are external organised and diploma oriented.

The independent institute SWO (short for Stichting Wateropleidingen) offers very practical courses for a wide range of water related issues. The programmes are developed according the needs of the sector. And, as SWO is financial independent, all costs have to be financed by the course fees. Both in the Netherlands and abroad, SWO offers water education for individuals and institutions. Our courses are always up-to-date and directly related to daily practise because the trainers are professionals from the water sector. The SWO-programmes are organised on all vocational levels, as well academic, as lower, intermediate and higher vocational level.. The courses and education programmes are based on three principles:

- training for professionals by professionals
- inspiring and practical courses, tailored to you
- not-for-profit, not-for-loss

Contact:

SWO/Wateropleidingen
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Water education in schools / K12

Analysis of the domain and key issues

Key issues and challenges for the future, and intra-regional differences include:

- Emphasis on existing knowledge, practices and networks
- Systems approach adapted to local settings
- Public and/or private roles in water education
- Emphasis on emotions as a learning factor
- Equity, participation and behavioral changes
- Regional differences in water curricula (optional vs. compulsory) and in formal / non formal education settings
- Water education to raise awareness and citizenship and to raise professional interest
- Water education should be taught as a means of sustainable development, focusing on environmental, social (including cultural) and economical interactions and equity.
- Knowledge is crucial for water education
- Demographics, urbanization, economic, climate changes should be addressed
- Water education should be seen as a continuous process from kindergarten to adult learning
- Water as a cross-curricula issue
- Key place in the curriculum (e.g. in science education, environmental education, and other fields)
- Large number of materials available in the region

Successful approaches and aspects of success include:

- Identification of purpose is essential (water education for...?)
- Connection of formal, non formal and informal education
- In-loco (field) approaches (with a link to awareness, values, attitudes and behaviors)
- Integration of classroom/field education
- Intra-regional communication, cooperation and exchanges of best practices
- Teacher and trainers education, capacities and resources (on key global and local issues; role of cognitive capacity)
- Stakeholders cooperation (including researchers and policy-makers)
- Use of ICTs to share knowledge and strengthen out-of-school learning experiences

Limitations, barriers and constraints include:

- Competition in the curriculum (vs. opportunities in cross-curricula approaches)
- Characteristics of educational system determine the education approach
- Complexity of multi-stakeholder settings (including learning vs. understanding)
- Interdisciplinary and coherency (single-disciplinary approach vs. thematic approach)
- Human capital (capacities and number of educators)
- Funds availability and project sustainability
- Inadequacy of learning materials (particularly for non formal settings)

Within school education, in connection with other educational areas and the water sector:

- Economic factors
- Media and learning processes
- Integration of scientific research in water education

- Connections with tertiary education, TVET, and community education
- Learning of foreign languages (data exchange, etc)
- Raising awareness to learning theories

Recommendations

- Design water education to (1) raise capacities and enhance citizenship (including values, attitudes and skills) and (2) to promote lifelong commitment to sustainable development. This can be done by (i) documenting case studies and research of successful sustainable development approaches in learning; (ii) disseminating case studies and research of successful sustainable development in learning to stakeholders; and (iii) facilitating consultations with Member States.
- Water is crucial for sustainable development and should have high priority throughout the educational system, both in formal and non-formal settings
- Facilitate the development of a platform for wider teaching about water, with direct relevance to day-to-day lives, in a continuous process from kindergarten to adult education. This can be done by: (i) engaging with education advocates to enhance capacities for the promotion of water education; (ii) developing and promoting a strategy for disciplinary and cross-disciplinary thematic approaches; and (iii) establishing communities of practice to support adoption of the above strategy
- Water education should reflect a systems approach that allows a comprehensive understanding of water-related issues.
- Improve Water Education quality (teacher and trainers capacities; pedagogical aspects, including focus on emotions and cognitive skills; delivery methods and content, including informal, ICTs and field learning; systems approach in local context). This can be done by: (i) providing for professional development opportunities, content and pedagogy; (ii) helping to disseminate existing programmes for teacher and trainers capacity development; and (iii) helping to strengthen water education in school networks.

Box 4 The GLOBE Water Project: connecting students, teachers and scientists

'Water' is one of the projects schools can do within the GLOBE program. Other projects are about 'Weather & Climate', 'Phenology', 'Aerosols' and 'Soil'.

The GLOBE Water project offers GLOBE students the opportunity to conduct science investigations on local and regional watersheds using real-time and historical scientific data. This data is being shared on a digital database, which is accessible to GLOBE schools and scientists worldwide. By investigating the various features of water together with the feedback which students receive from scientists on their research, students get concerned in water and environmental issues and experience the different aspects of doing research.

GLOBE (Global Learning and Observations to Benefit the Environment) is a worldwide hands-on, primary and secondary school-based science and education program. GLOBE promotes and supports students, teachers and scientists to collaborate on inquiry-based investigations of the environment and the Earth system working in close partnership with different national and international scientific institutions. Today, more than 20,000 schools in 110 countries from all over the world participate in the GLOBE program.



In this sense GLOBE is a good example of a successful Sustainable Development approach in learning. GLOBE is characterized by its international scope and enhances a cross disciplinary approach in education.

The Region Desk for Europe/Eurasia is organised by GLOBE Netherlands. An overview of countries in Europe/Eurasia can be found here: http://www.globe.gov/fsl/INTL/regions.pl?rgn=Europe_Eurasia

Websites:

www.globe.gov

www.globe-europe.org

www.globenederland.nl

international GLOBE website

website of the European/Eurasian region

website of GLOBE Netherlands

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Community and stakeholder education

Analysis of the domain and key issues

Key issues and challenges for the future, and intra-regional differences include:

- How to effectively use the possibilities the Internet offers?
- How to shape an inspiring message on 'water' to be conveyed in an exciting manner?
- How to segregate the 'community and stakeholders' for dedicated education initiatives? An important sub-group may be commercial parties, like banks.
- How to assess and/or monitor the impact and level of success / failure of education initiatives?
- How to overcome that at the moment, most education efforts are 'project based' and time bound?
- How to satisfy the envisaged future need for water human resources?
- How to create carrying capacity of political decision makers?

Successful approaches and aspects of success include:

- Being able to adapt to local context – cultural sensitivity. Especially major differences between developing and developed countries
- Being able to tune in to the daily world of the to-be-educated by using the right message and messenger.
- Being able to communicate in local language.
- Being able to make effective use of ICT technology
- Being able to link to internationally designated days, like the World Water Day.
- Being able to team up together with other stakeholders – e.g. being known and know your partners
- Being able to combine with real life usefulness. Like let children make measurements that compose a database for the research community.
- Being credible in conveying the message.

Limitations, barriers and constraints include:

- Difficulty/inability to access financial resources of education/training providers
- Financial inability of participants – Willingness to pay
- Inadequate trainer's/educator's capacity
- The nature of the message is interdisciplinary, but so-far the co-operation is still multi-disciplinary
- Overexposure of environmental messages
- Low urgency for community members to 'know' or to be aware about water issues
- Too few inspiring stories known about water. This hinders the attractiveness for community members to be involved.
- Low understanding how to effectively play established mass media.

Within stakeholder and community education, in connection with other educational areas and the water sector:

- Relation with school programs as access point to communities and stakeholders.
- Scientifically evidenced support to increase credibility.
- Education delivery, knowledge transfer, and participatory involvement is voluntary or mandatory?
- The community and stakeholders group is diverse. And for community and stakeholder education needs to be tailored.

Recommendations

- Effective communication is important. For this purpose:
 - Design educational programmes that fit the needs of the stakeholders, with credible contents, delivered by esteemed facilitators and using an adequate approach.
 - Build the capacity of the messengers and/or facilitators for communicating effectively.
 - The key recipients of the 'water message', among others, are policy makers and journalists. Specific educational initiatives need to be tailored to suit intended stakeholder groups, particularly policy makers and journalists.
- Bottom-up approach is the key. For this purpose:
 - Recognize stakeholders' local knowledge and capacities; instigate local resource mobilization and cost-sharing by stakeholders.
 - There is a chain of participatory involvements, from international organisations to grassroots movements. It should be taken into account that this chain is as strong as its weakest link. It should be highlighted that international organisations involve national bodies, which in their turn involve local representative bodies, which then involve final stakeholders.
- Evaluation and monitoring of educational activities and assessment and impact evaluation of water education programs are important and hence such mechanisms need to be strengthened and institutionalised.

Water education for and through mass-media professionals

Analysis of the domain and key issues

Key issues and challenges for the future, and intra-regional differences include:

- Measuring success of communication and media work
- Financial resource allocation
- Information overload
- Getting language and messages right for your audience
- Use of new media is a future development to be addressed

Successful approaches and aspects of success include:

- The Netherlands lives with water campaign
 - Advocating on a policy and decision making level
 - Trustworthy messenger
 - Measuring success
 - Repeating the messages
- AKVO & AKVOPEDIA (Wikipedia, E-bay, YouTube)
- [Twestival](#)

Box 5 Digital sharing of knowledge and resources

Akvopedia is a new web initiative in digital sharing knowledge and resources regarding water and sanitation. While [anyone can edit](#) it, a community of moderators keeps an eye on valid information.

The goal of Akvopedia is to improve water and sanitation projects through knowledge exchange on smart and affordable technical solutions and effective approaches. At this moment, the Sanitation portal is well developed, the Water portal needs work, and the Approaches portal is just starting up.

Contact: [AKVOPEDIA](#)

Limitations, barriers and constraints include:

- Message scale (global vs. local)
- Own interest and profile > everyone wants to be in the spotlight
- Working across sectors problematic
- Limited finances and human resources
- Pushing messages on journalists backfires

Within water education for a through mass media professionals, in connection with other educational areas and the water sector:

- Water sector should communicate
- Climate change & HIV/AIDS issues pushes water issues lower on the media agenda
- Better coordination between content providers on school materials
- Better collaboration between water-related and Education Ministries

Recommendations

- Water sector should give the same priority (funding and human resource allocation) to communication as it does to research, capacity building, and other major areas. Key water players have a responsibility to decide and implement the priority provided to communication.
- Develop accurate communication plans, including monitoring progress, key-messages for specific target groups, long-haul, networking using all existing and new media channels. Communication professionals have resources to develop and implement such plans.
- Develop compulsory communication training programmes for water, environment, sustainable development professionals through curricula and short courses. UN Water should start more courses for journalists, together with water education institutes, UNESCO and universities.
- Promote an enabling environment for water professionals and media professionals to work together.

Annex 1: Participants list

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Annex 2: Abstracts

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

Name :

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Organisation:

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Developing an Educational Pipeline: Pilot description

In the academic year (Sept. 2008 – June 2009), 9 educational institutions in de region Friesland (northern part of the Netherlands), stretching from primary school until PhD, will work together on the design of a 'educational pipeline' for the theme 'water'.

Foundation of the pipeline are the most relevant and important competencies which will be addressed within the theme of water in each level of the education system. In this pilot, we want to experience new ways of teaching and learning.. Our desired outcome is to educate and deliver water technicians and managers we need in the future. By doing so, we develop a educational instrument for innovative water education. Besides, the pipeline will also be used as a communication instrument for the government to advocate its water policy to the next generations. The pipeline will concur in making the water branch more attractive to future young professional, and provide them motivating opportunities for an inspiring career.

Developing the pipeline means, in the first place, aligning and bridging the educational levels. In this pilot, teachers will be challenged to match competences profiles, educational content and teaching methodology match with those of their colleagues. In this exercise, 'water' acts as a common theme and set the framework for the fine-tuning of the curriculum of each level. In a parallel development, the pipeline must provide to teachers a common pool of enterprises I the region, which are interested in a cooperation with the educational system as well as being relevant societal partners in water. So the pipeline will also create the opportunity to build a network of different water partners in the same region where spin-off, incubation en emulation around the theme 'water' can occur.

The pipeline concurs in developing a guideline for water education for the future, meaning that the concept and principles of a sustainable development are imbedded in the pipeline. This innovative concept of education is problem-oriented, linked to real practical issues owned by stakeholders outside of the school. Students are 'learning by doing' and work interdisciplinary on innovative theme as water.

First impressions and recommendations:

- 1- Developing such pipeline around a specific theme like 'water' is not only a challenge for the educational system, but also for all social partners. All actors must reach an agreement on cooperation in action, exchange of knowledge and experience, and share the relative risk perception of an evolutive process.
- 2- It is quite not obvious for many teachers, especially in the primary and high schools, to cooperation with other educational institutions and/or with stakeholders outside the educational system. This means that developing a CTG involves also a personal participation of the staff that needs to get new competences.
- 3- To be successful, the design of the CTG must be eventually integrated in the educational system, to prevent it from only depending on the participants of the pilot/project and make it sustainable as a fully imbedded system. This means an high commitment from the school management along the whole educational structure.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

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Alterra/Wageningen Univ., Netherlands
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Learning to teach adaptive water management using an online curriculum and train-the-trainer courses

Our Project

Given unprecedented global changes where 'business-as-usual' is no longer an option in water management, teaching water management can also no longer be 'business-as-usual'. In recent years the concept of adaptive water management (AWM) has been developed, giving managers guidance on how to respond adaptively to increasing risks of droughts and flooding. The most important implications of climate change for the water manager are learning to deal with uncertainty, measuring vulnerability, managing participative processes involving stakeholders, and linking water management to societal and social learning processes. AWM ultimately provides a framework in which individuals and organizations can perpetuate learning systems that enhance the capacity of society to deal with increasing risks and uncertainties in the water sector.

While today's water managers are already facing the challenge of addressing these issues, university curricula need to be adapted in order to equip the next generation of water managers. Ideally, a teaching programme for AWM addresses the three aspects of learning: knowledge, skills and attitude. Effective teaching of AWM to tap these three aspects incorporates the use of a diversity of working forms, including new educational approaches like role-playing and participatory modeling. For this purpose, *opencourseware*¹ for adaptive water management has been created within the framework of the EU-funded NeWater research project (see www.watereducation.nl), and a complementary international training of instructors programme has been implemented (see <http://www.newater.info/everyone/3098>). Tracking the subsequent developments in the curricula used by course participants in their home institutions is being undertaken.

Our Recommendations

- Individual, organizational and societal learning to adapt to changing and uncertain global conditions. Adaptive and Integrated Water Management approaches constitute the predominant response to this need. **Water managers require not only new knowledge and skills, but also a shift in attitude in order to better respond to uncertainty and complexity.**
- **Learning is needed at all levels**, and in our project we are focusing on 'tertiary level education.' Hence, university level curricula need to reflect advancements in research and management concepts and practices.

¹ Opencourseware is a relatively new term for educational resources that are freely available on the Internet

- The NeWater Curriculum is *opencourseware* and therefore available for all to use. However other progressive water-related curricula are also available (e.g. IHE courses: <http://www.unesco.org/water/about.shtml> and CapNet for IWRM: <http://www.cap-net.org/>). It would be helpful to potential users if there were to be **more collaboration** between these programmes and if we were to create a portal of water related curricula.
- In our experience, a face-to-face train-the-trainers course is invaluable in helping instructors to understand the concept of and methods associated with adaptive water management, and to create a multiplier effect in the dissemination of AWM teaching throughout university curricula within developing and developed countries. It is therefore recommended that **curricula that are made available online be supplemented with direct training experience for the instructors** wishing to introduce AWM in their curricula.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

Name :

Mrs. Nelleke van Dorenmalen

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WETSUS, Centre for Sustainable Water Technology, The Netherlands

Scientific master specialization Water technology

Technological Top Institute Wetsus, that has been established in the city of Leeuwarden, coordinates a large research program to develop water technologies for sustainable water (re)use. Renowned universities and industrial participants have joined forces in this research program. From the interface of separation technology and biotechnology, sustainable technologies for treatment and production of water are developed. Crystallization, membrane technology, adsorption and electrochemistry are linked to bioconversions in the research themes. At this moment about 80 PhD-students, originating from different countries worldwide, participate in the program.

It is clear that there is a growing need for young professionals to continue the development of new technologies and the journey to a sustainable life. Besides the need for water professionals Wetsus observed in her research program a need for a new specialism to develop sustainable technologies. The development of such a specialism required innovation in water education and a new generation of academic professionals. Cooperation between Wetsus, the Wageningen university, the University of Twente and the University of Groningen and integration of specific knowledge resulted in a master specialization Water technology.

The specialization, that is offered by the Wetsus Academy in Leeuwarden, prepares students for a professional position in the broad area of Water Technology. Graduates will be employed as water specialists in various business positions, as entrepreneurs or as PhD students in the Wetsus research program. The specialization is a two-year program, focuses on the development and design of water related processes and makes a broad distinction between water technology demand in three types of country environment: low-income countries, emerging markets and high-income countries. The main added value of the course lies, like the Wetsus research program, in the multidisciplinary use of biotechnology and separation technology. This track will uniquely qualify students as the expert able to participate in resolving the global water issues and to achieve the Millennium Development Goals. A first international group of students started in September 2008. The program is also suitable for employees of companies related to water technology.

Currently the study program runs in the first year. Keeping up the specialization the annual inflow of students has to increase to at least 35 in the next years. For the present a growth of interested students seems realistic. The specialization anticipates a need, considering the global water problems and the demand for more water professional. However, the high costs of tertiary education in the Netherlands prevent an exponential flow of students from outside Europe.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

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University Water Management Education in the US

University education in the United States is not providing an adequate education to meet the challenges of water management. The dominant educational model values specialization, with the result that water is taught as the domain of a single discipline (law, hydrology, civil engineering, economics). Formal education in other departments is limited. The Masters of Water Resources Administration at the University of New Mexico addresses some of these issues, by requiring students to take classes in different disciplines, but it fails to adequately incorporate the social sciences (law, economics, geography, planning, political science). Recommendations:

- 1) Successful water management requires the contributions of different disciplines and the ability to integrate the perspectives of these disciplines. Water education should ensure that students are conversant with the contributions of all relevant disciplines.
- 2) There are a few model programs in natural resources that are genuinely interdisciplinary, but most education in the U.S. perpetuates monomaniacal foci on single disciplines. The professoriate must be pushed by outside constituencies to provide different models for the 21st century. Water practitioners can catalyze change within universities by creating interdisciplinary journals and organizations, by hiring graduates of interdisciplinary programs, and by contributing funding to these programs.
- 3) It is preferable for water education to be taught in new departments, such as within a program in environmental and natural resources education, creating curricula that fit the needs of water management, rather than trying to fit this inherently interdisciplinary subject into existing disciplinary categories. In other words, a school of natural resources, with a faculty drawn from different disciplines, but offering tenure within the school, is preferable to placing programs in an existing discipline, with add-ons from other departments.
- 4) Ecology remains the step-child of water resources management and this is reflected in higher education. The planetary changes that climate change are bringing fall on the very basis of societal existence: our natural systems. Nonetheless, legal systems for the allocation and use of water fail to protect natural systems and our educational institutions similarly slight them. Ecology, biodiversity and ecosystem services should be a part of every water professional's education.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

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LESSONS LEARNED FROM TWO TERTIARY EDUCATION PILOT COURSES ON TRANSBOUNDARY WATER MANAGEMENT IN SOUTH EASTERN EUROPE (SEE)

In this case study the main conclusions drawn from two regional pilot courses organised by UNESCO Chair /INWEB on transboundary water management and conflict resolution are reported.

The first course was a regional adaptation of two of the modules from UNESCO's educational programme entitled Potential Conflict to Cooperation Potential (PCCP), namely those on "Basics of Water Resources" and "Conflict Prevention and Cooperation in International Waters". The main objective of this programme is to create a new generation of engineers, lawyers, economists, decision makers, experts and trainers with a greater level of awareness, enhanced communication and the necessary management tools to put the programme's ideas into practice.

The main objective of the second UNESCO Pilot Course was to demonstrate the significance of groundwater in general and of transboundary aquifer resources in particular, in terms of related technical, environmental, institutional, economic, social and political issues, such as allocation of water between different sectors and neighbouring countries, preservation of groundwater in quantity and quality, protection of recharge areas, groundwater governance and land-use policies.

In preparing these pilot courses at tertiary education level, we had to respond to three main questions: 1) How could the contents of the courses be adapted in order to match the requirements of the multidisciplinary target audience? 2) How could a balance be achieved between delivering data, information and methodological tools on the one hand, and, developing skills and capacities for resolving new problems on the other? 3) How could the complexity and uncertainties of the real problems be communicated in a comprehensible way to non specialists (like lawyers, economists)?

Our responses to the above questions form the basis for the following recommendations being made to the water education sector:

1. In order to address the multidisciplinary nature of both the target audience and the topics themselves the recommended team of lecturers should also be multidisciplinary and consist of hydrologists, hydrogeologists, lawyers and socio-economists.
2. Educational courses should be divided into two parts: a) levelling and b) integration.
3. In order to balance the delivery of information and the development of skills educational activities should analyse selected regional case studies in order to demonstrate specific problems on the difficulties that arise when water is used by multiple stakeholders with conflicting interests.
4. A "role playing" methodology should be adopted and applied in order to demonstrate how negotiation strategies can reach a compromise solution.
5. New ICT technologies like Google Map and Google Earth should be used, together with Internet-based GIS data systems, positive on-line knowledge testing and in-situ visits.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

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Tertiary education and professional development of water scientist, engineers, managers and decision makers: a study of provision in Higher Education Institutions in England

This abstract reports research commissioned and conducted to:

- Establish a baseline of water education in the HE sector in England
- Learn from institutions' experience
- Identify key issues which present opportunities and challenges

A major output of this work was a searchable database. Findings from this include the following:

1. Higher Education Institutions in England engage with water education at a range of levels from certificate and foundation degrees through to doctorates. There are very many masters programmes.
2. Courses may be focused in traditional disciplines, in cross-disciplinary areas, and/or on the solutions to particular problems.
3. Water can be a major focus of a course, or a minor focus. It can be a very important focus without taking up the majority of the curriculum and without appearing in the title of the course.
4. The very great variety present is indicative of institutions and individual academics responding to a range of influences in the marketplace for students. The best-designed course in the world is of no value if lecturers are unable or unwilling to teach it, or if students decline to enrol.
5. On the whole, the range of provision is very identifiably that one might expect in a more economically-developed country. In this respect the database does not and cannot provide a generalizable model. Nevertheless, there are many courses of high quality present.

Recommendation

That UNESCO (continue to) make available resources for tertiary-level teaching in relation to water in an accessible and adaptable fashion that facilitates individual teachers and course developers in devising offerings to students that are most appropriate to their own professional and economic contexts. The extent to which resources are, in fact, utilized in the design of courses should be subject to a (fairly simple) process of monitoring and assessment.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

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Case study experience:

We have recently established two new LLM programmes in the field of water law and water governance at the University of Dundee, building upon core strengths within our Centre in water, and within our School (the Postgraduate School of Management and Policy) in postgraduate education in natural resources law, management and policy. From a beginning delivering core water law modules within programmes provided in other departments, our director Patricia Wouters developed a vision of water education with the concept of *Water Law Water Leaders*, to provide education and training opportunities in water law and policy for a new generation of water leaders.

The LLM Water Governance and Conflict Resolution is co-delivered with UNESCO IHE in Delft, where students study water resources management as well as conflict resolution and PCCP. They then move to Dundee to study water law on our summer programme, and to undertake their dissertation (or equivalent internship or work-based project).

The LLM Water Law is delivered wholly by the University of Dundee. The core water law modules are again delivered through our summer programme, but there is a part-time route where other modules (induction, and options, and dissertation or equivalent) are available through a distance learning format. The part-time route has maximum flexibility in terms of start dates and structure but still involves face to face study in Dundee on the summer programme, facilitating interaction and cross-fertilisation of ideas between groups of students from different backgrounds.

One of the most difficult problems is to convince those working in water in other disciplines of the importance of effective law reform, and the need to involve lawyers both in practice of water management and in the delivery of tertiary education in water. Usually the law is either overlooked, or treated as static and sometimes negative construct, when in fact it is dynamic and should contribute positively to effective frameworks for water resource management as well as delivery of water services. An effective legal analysis will place law reform in context and focus on implementation.

There are certain key features:

- Working with other education providers within UNESCO, particularly UNESCO IHE and the PCCP programme, and with the wider UN community such as the United Nations University
- Developing an executive style teaching model, where the core water law modules, addressing each aspect of water law (international, comparative national and water services) are delivered in block format in the summer, enabling uptake on a short course basis which may be for credit or as CPD, and with maximum flexibility.
- Delivering the programmes to students from different backgrounds – these LLMs are available to lawyers but also to non-lawyers wishing to acquire new skills in law and policy. The LLM Water Law especially has a heavy skills-based component especially geared to transferring work across the disciplines and enabling non-lawyers to work with legal tools and resources. The LLM Water Governance and

Conflict Resolution is ideal for students who have a background in the social sciences and wish both to develop expertise in working with legal frameworks, and to acquire knowledge and understanding of water resources.

- Ideally, the target markets will be river basins where groups of staff could be supported to take up these programme opportunities, and if there is sufficient demand, the programmes could be delivered in those basins.

Recommendations

- Maximum flexibility in programme design and delivery options
- Develop partnerships by which some or all of Masters programmes can be delivered on-site in other locations, subject to demand
- Actively facilitate the integration of a legal analysis into an interdisciplinary approach to tertiary water education whether or not it is a main focus of the programme in question.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

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Postgraduate academic specialization in the field of Water Resources and Environmental management - *EDUCATE!*

The EDUCATE! project (Building the Future of Transnational Cooperation in Water Resources in South East Europe) commenced in May 2006 in a framework of the EU INTERREG CADSES programme.

The idea of the project was initiated within and supported through UNESCO's Reconstruction of Scientific Cooperation in SEE Programme. Initial idea came from the event organized by UNESCO-Europe, Venice, 24th -27th February 2001. Two workshops were held afterwards - one in UNESCO HQ, Paris, from 30rd June to 1st July 2002, and one in the University of Belgrade, 19th - 20th November 2004 resulted in gathering of partner universities ready for collaboration in the transnational programme.

The overall objective of the project is to assist the regional transnational cooperation on Water Resources Management and Environmental Protection. This is achieved by providing training for current environmental policy makers through **the postgraduate educational programme** and training courses for government officials and industry.

The project partners involved in the project are the following:

- National Technical University of Athens, Greece – School of Civil Engineering and School of Chemical Engineering
- University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia
- Technical University of Civil Engineering Bucharest, Romania
- University of Belgrade, Faculty of Civil Engineering, Serbia
- IRTCUD, Serbia

The main result of the project is the postgraduate course in Water Resources and Environmental Management which in the first year had 36 students from partner countries. In the legal system of two countries which offer degrees from the course (Romania and Serbia) it belongs to the Academic specialization, which is awarded after BSc and Master studies. It is a flexible, distance learning programme based on both – e-learning and traditional way of lecturing. The students gather at their host university several times during the course: introductory week at the beginning of the course, examination for each thematic area, at a half of the course for definition of thesis and at the end of the course for presentation of thesis. Lectures and tutorials are developed in English. Duration of the course is two calendar years.

The course programme is organized as a pedagogic continuum and consists of four thematic areas:

- Thematic Area 1 presents introduction of the course and is focused on scientific background in water resources and ecology
- Thematic Area 2 targeted on integrative concepts of urban water management, including water supply and storm and waste waters
- Thematic Area 3 includes issues of catchment and environmental management by utilizing hydro-informatics tools, including distributed hydrologic models, advanced optimization and geostatistics
- Thematic Area 4 focuses on policy, legislation, decision-making and environmental assessment with an emphasis on the Water Framework Directive (WFD), as well as on other advanced topics

A research thesis comes as a follow up of the thematic areas.

In addition to the postgraduate course, a number of seminars on additional specialized topics are available to professionals from Government and Industry organized and delivered together with the Association for Water Technology and Sanitary Engineering, from Belgrade.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

Name :

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The role and impact of Associations for knowledge development in science and practice

IWA is the global network of water professionals, spanning the continuum between research and practice and covering all facets of the water cycle. Through IWA members collaborate to lead the development of effective and sustainable approaches to water resources management, drinking water, waste water and stormwater management in areas throughout the world, creating value and driving the advancement of both the science and best practice of water management. The ultimate strength and potential of IWA lies in the professional and geographic diversity and the level of skills contained in its membership – a “mosaic” of member communities.

This abstract details the results of IWA’s Network and Impact Survey. The survey was taken to determine how members take advantage of IWA’s offerings and whether they are satisfied with their membership. This is done within a bigger rationale for understanding IWA’s services to members and how they can be improved to add values to members and ideally attract new members. The survey sample included 1000 randomly selected members and the response frequency was 11.3% with 113 responses received. The survey was followed by interviews with some of the respondents. The results were scored according to members’ engagement with and experience of IWA. Overall, the results were positive. The survey shows that members are most happy with IWA as an international platform for professional information exchange and providing valuable opportunities for networking in various specialist fields. The tools IWA deploys to facilitate information exchange are valued by the membership in a varied manner. Some tools are appreciated by a larger segment of the IWA membership, for example, the publications, conferences and specialist groups. The underlying message of the results of the survey was that the more a member is involved in IWA activities, the more satisfied he or she is with the value and usefulness of membership. This report also details the methodology used in the analysis of the survey results, such as creating benchmarks within the membership and finding correlations between questions. It also goes a step further, making some suggestions of methodology of how to analyse added value to members further and some mechanisms of how to make IWA an even more attractive platform to benefit waterprofessionals

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

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The International Water Research Alliance Saxony (IWAS)

The International Water Research Alliance Saxony (IWAS) aims to contribute to an Integrated Water Resources Management in hydrologically sensitive regions by developing specific system solutions as a response to some of the most pressing water-related problems of our time. IWAS is a project of the Helmholtz Centre for Environmental Research (UFZ), the Dresden Technical University and the Stadtentwässerung Dresden (member of German Water Partnership - GWP). The project is funded by the German Federal Ministry of Education and Research (BMBF).

Such specific solutions to particular water related problems will be developed in five regions worldwide under the concept of Integrated Water Resources Management (IWRM). One model region will be Eastern Europe, and in particular the Ukraine. The objective within this region lies on the improvement of surface water quality in view of the EU-water framework directive.

Additionally, IWAS aims at developing system solutions, adaptation strategies, tools and methods that can be sustainably implemented in the regions under investigation. Therefore, the development of adequate knowledge transfer and capacity development concepts is an essential part of IWAS. It is intended to establish and to implement an integrated capacity development concept including concrete measures that will be adapted to the specific targets and needs of each model region.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

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Science and education on Managed Artificial Recharge to contribute to water supplies in water stresses and arid regions

The potential for managed aquifer recharge (MAR) to contribute to water supplies particularly in water stressed and arid areas is enormous. However, information for a sound implementation and uptake is rather scarce. Various international workshops and symposia have been organised to study best practices and to raise awareness on the potentials of MAR. These workshops have been well attended and have alerted scientists to the opportunities and constraints for a range of methods for MAR. The level of awareness of MAR as a range of methods to augment and protect scarce water supplies has grown through these scientific fora and have allowed balanced discussion and an understanding of constraints in conjunction with the advantages to allow rational implementation. The number and diversity of MAR projects have increased for countries where MAR was already established. Furthermore failures have been averted and success of projects beyond pilot phase has been universally high.

However in those countries without demonstration projects, particularly in developing countries, there has been virtually no uptake of MAR. A single event for information exchange among scientists is insufficient to integrate MAR into national and local water resources management strategies and allow authorities and communities sufficient confidence to implement MAR in areas where needs are dire.

In some cases it will be necessary to provide specific guidance in relation to options in areas of most need, and it is expected that often due to paucity in knowledge of local hydrogeology, the locales where MAR could secure safe drinking water supplies require interpretation.

Uptake of MAR could be improved by using pioneering MAR projects as a springboard for focussed scientific understanding and education that is relevant to regional needs.

Initiatives should be taken to:

- Scientifically demonstrate that safe drinking water supplies can be protected or produced for many communities with greatest needs using a variety of managed aquifer recharge techniques, and that in many cases MAR is the most cost efficient, environmentally friendly and socially acceptable way to provide sustainable secure supplies.
- To achieve this by developing local expertise in regions with greatest need, supported by an international network and building capacity in hydrological and hydrogeological research, integrated water management, community engagement, and water governance.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

Name :

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UNESCO Chair on Sustainable Water Management: Blended Learning concept for education in China

In 2007 the UNESCO Chair on Sustainable Water Management introduced a Blended Learning System that is used at three different Chinese Universities (Tongji University, Shanghai; Nanchang University, Nanchang; Jinan University, Jinan) and is implemented in the local accredited curriculum. The Learning Management System based on MOODLE is administered at RWTH Aachen University, the content has been designed by both Univ.- Prof. Dr.-Ing. Geiger (Storm Water Management) and Univ. Prof. Dr.-Ing. Nacken (Water Management and Hydrology).

During the process of design of the Blended Learning System RWTH Aachen University took the lead in media didactics and the concept and implementation of media enriched learning materials. The chairholder Prof. Geiger (formerly University Duisburg-Essen) supplied the learning management system with innovative content that was redesigned for the eLearning part of the system.

The Blended Learning System is a combination of traditional instructor lead courses with media enriched self paced learning material (see <http://unesco-china.lfi.rwth-aachen.de> for more details and the description of blended learning principles in the following pages).

Prof. Geiger is taking care of the courses in China (6 month out of the year) while the MOODLE system guarantees 24 hours / 7 days a week access to all learning modules. Implementation of the Blended Learning system has been a great success so far; the Chinese students are using the courses very intensively and the overall grades of students in those courses offered did rise. It can be shown that the Blended Learning approach is not specifically needed for the best students but does foster significantly students that are somewhat slower in knowledge acquisition. In addition the Blended Learning approach did rise the collaboration of students and helped them to learn by offering multiple perspectives to acquire water related competencies.

Recommendations for improvement

- To succeed in best possible knowledge transfer water related education should be extended from the present situation to a Blended Learning culture (traditional teacher lead instruction + media enriched self paced learning)
- We should organize and apply benchmarking systems to guarantee quality ensured learning modules . (Quality assurance has to be guaranteed related to media didactic, pedagogical design patterns as well as to existing eLearning standards)
- We should organize an (non-commercial) eLearning stock exchange to make use of already existing quality ensured eLearning Moduls

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

Name :

Mrs. Maria Pascual

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Capacity building program on decision making in water utilities based on a simulation game

One of the most challenging factors in water services management are the frequently conflicting objectives (coverage of the services, quality of the water, affordability of the service, access for the poor, cost recovery, health and safety issues, political popularity, etc.). At a management level of water utilities there are often tensions when making decisions regarding the different objectives to achieve in the short and the long term. Moreover the incentives for making decisions in developing countries are generally very different from the ones in e.g. The Netherlands. The complexity of **decision making** has been identified as a common problem at the management level in water utilities in developing countries. Strengthening the capacity of the managers in decision making processes is of extreme importance, in order to improve the performance of water utilities in developing countries. Motivated by this reality, the NHL University and Van Hall Larenstein University of Professional Education, together with UNESCO IHE Institute for Water Education and Vitens Evides International, decided to join efforts, experience and information in order develop a water utility simulation game that could be used for educational purposes. This project aims at the creation and implementation of a capacity building program based on the use of a multimedia game that simulates the decision making process in water utilities in different contexts (developed and developing countries). Both the development of the simulation game and implementation phase of the educational program will expose participants to learn about the complexities and trade-offs in the management of a water utility with the purpose of creating a better understanding of the inter-linkages and types of decisions that have to be made at a management level in different contexts (developed and developing countries). This will allow participants to experience and test themselves in decision making processes before encountering them in real life.

Recommendation:

A multimedia game is considered to be an extremely attractive and innovative format of teaching students, which we expect to be much more effective than being taught passively from the blackboard.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

Name :

prof. Michael Scoullos

Organisation:

Chairman, Mediterranean Information Office (MIO-ECSDE),
Chairman, Global Water Partnership Mediterranean (GWP-Med),
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Experience/case/project:

The MEdIES water relating activities in the Mediterranean 2002-2009:

MEdIES (the Mediterranean Education Initiative on Environment & Sustainability, www.medies.net) is an educational initiative that aims to facilitate the educational community (educators and students) to contribute in a systematic and concrete way to the implementation of Agenda 21, the MDGs and the UN Decade for ESD (2005-2014), through the application of innovative educational programmes with national and regional activities in countries around the Mediterranean basin. A primary target-theme for MEdIES is water, which also considered as a vehicle for the introduction to the field of sustainable development.

Types of MEdIES activities on water:

(1) Printed material, like "Water in the Mediterranean" publication for teachers of secondary education already presented in highly important political for a (WSSD, the League of Arab States, 4th WWF, UNCSD) for published in 7 languages (English, French, Italian, Greek, Turkish, Arabic, Serbo-Croatian) and widely distributed through formal and non formal education networks (i.e. Ministries, NGOs, the internet). In the formal curricula this kit can be applied either as a separate subject or infused in other disciplines. Other supportive printed material of MEdIES include the "Handbook on ESD methods" (in English, French, Arabic language), the water calendar poster, etc.

(2) Organisation, of a series of teacher trainings (national or regional ones) for formal and non-formal ESD educators on how to use the educational material in many Mediterranean countries (Athens, 2003; Rome, 2004; Istanbul, 2004; Cairo, 2004; Beirut, 2005; Rabat, 2007). These are undertaken together with the NGOs-local partners of MEdIES in each country, respectively. These are the entities that are in charge of further dissemination & promotion of the material at national level.

(3) The MEdIES webpage itself that acts as a library of educational material lesson plans, reference documents on ESD (education for sustainable development), etc. but also as a platform for networking with interested ESD individuals and institutions around the Mediterranean and beyond. Currently accounts ~2.200 registered e-users.

Recommendations:

1. Lessons learnt – Recommendations on the kit "Water in the Mediterranean"

The Mediterranean puzzle: the more the merrier! The participatory process followed during the preparation of the water-kit (NGOs from six Med countries were involved in the process) resulted in an educational material that is relevant to the Mediterranean reality, therefore meaningful to most ESD educators of the region.

Hardcopies or E-copies? Need to find a balance... Although all publications are available online for free download, many educators, especially from the South and East prefer to work with the hardcopies (probably due to limits in PCs, lack of internet access, or lack of basic ICT knowledge). Hardcopies entail higher costs for production and dissemination.

Print, yes, but where? For large-number publications in national languages it is less expensive to publish within the country. This allows for local fundraising (i.e. in Turkey, with local support 20.000 kits were printed, after some adjustments were made to it). Sometimes local production may result in lowering the printing standards set by the MEdIES secretariat.

2. Lessons learnt – Recommendations on the teacher trainings

Good, but not enough... All national seminars were organised with the close collaboration of MEdIES secretariat and the national partner. This resulted in high engagement from both. In most cases the trainings took place only once per country, to a restricted number of participants (low replicability potential). In some cases, the national focal point repeated the training within the country and followed closely the dissemination process and application and evaluation of the water-kit (e.g. Italy). In any cases more trainings are needed.

Trainings' follow up: In many cases there is not enough evaluation feedback from the educators that implemented the water-kit (neither directly to the secretariat, nor through the national NGO).

THE CHALLENGE: The development of an even more dynamic and structured strategy and plan for the implementation & evaluation of the water kit & future publications. The needed means to be secured.

3. Lessons learnt – Recommendations on the E-network

The loose electronic network structure has pros & cons:

(+): Its easy to become a MEdIES e-member and get involved in its activities, either as stakeholder (school, university NGO...) or as individual

(+): The e-network is open to anyone, also non-Mediterranean educators

(+): The e-network is open to educators coming from the formal level (schools) but also the non-formal one (NGOs, Museums, etc).

(-) : The non-binding structure makes a number of members less eager to contribute and some of them eventually become inactive, after some time.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

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WEDC, Loughborough University, UK

Opportunities and barriers for integrating sustainable water management in water education and training - lessons from WEDC's experience

This paper will draw lessons from WEDC's experience over 35 years of providing education and training related to water and sanitation in developing countries. This covers MSc programmes in the UK and by distance learning and short courses delivered world-wide. Participants are early/mid-career engineers and other professionals from a range of countries, predominantly Africa, Asia, Europe and North America.

Sustainable water management has always been central to these programmes, with an emphasis on ensuring that WS&S services and interventions continue to operate satisfactorily and generate benefits over their planned life, and that they support, rather than threaten, overall environmental sustainability. WEDC also has a long established interdisciplinary approach, with social, health, technical, economic, financial, institutional and environmental, dimensions – these map on to the "triple-bottom-line" approach to sustainability.

The interdisciplinary approach is logical, but we have learnt that it also provides a helpful way to engage course participants from different backgrounds. Each of them has previous knowledge and experience which is relevant to part of the picture, so they can contribute on this and learn new perspectives from others. We have learnt that people are more open to new understanding and perspectives in this context, than in working with a single discipline. Teaching engineers about gender or other social issues is an example of this problem.

Our education and training programmes focus on practical problems in developing countries, often arising from tutors' research and consultancy work. This has various advantages in gaining participants' interest and equipping them to do their jobs better and to become effective managers in the future careers. It also facilitates discussion, which reinforces the learning. This approach works well with participants who have some experience, but lack of previous experience is a barrier to learning on programmes like this.

This focus on practical problems related to participants' work also provides a way to introduce new approaches. Asked about the problems they face, engineers often cite social, financial and political issues, which provides an entry point for exploring these issues in more depth. As another example, engineers respond to gender more actively in terms of designing facilities to meet the needs of different groups of people, and of considering the roles of male and female engineers within their organisations, than they respond to more abstract gender concepts.

The paper will provide case studies of particular modules and courses (e.g. Management for Sustainability, IWRM) to develop these ideas in more detail.

Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers

Topic 3: Water education in schools/K12

Topic 4: Community and stakeholder education

Name :	Organisation:
Mariele Evers	Leuphana University of Lüneburg, Germany
Timm Ruben Geissler	Wasserland Hamburg/Germany
Lars Nyberg	University of Karlstad/Sweden
Scott Arthur	Heriot-Watt University, Edinburgh/Scotland

Capacity building on integrated water management - approach and activities in the European Project Strategic Alliance of Water Management Actions (SAWA)

The project

SAWA is a 8.2 million Euro high profile pan-European project which is funded with by the INTERREG IVB program. It is involves 23 partners in five countries: Norway, Sweden, the Netherlands, Germany and the United Kingdom. The overarching goal is to investigate "adaptive" flood risk management within the context of the EU Floods Directive and the Water Framework Directive. This work will focus on the engineering, social and capacity issues associated with flood risk management plans.

The aim of educational activities within SAWA is to pave the way for a sustainable approach to the multi-level use of floodplains- from the local residents to planning, and administration. This approach will thus facilitate damage prevention in line with the ecological requirements of the Water Framework Directive and enable the optimal implementation and lasting operational capability of the Flood Directive.

Key objectives and activities in capacity building

Where Capacity Building (CB) is concerned, SAWA has the following key objectives

1. A basic concept for CB will be derived based on local and individual experience, recognised best practice, leading academic research in the field and pedagogic philosophy.
2. Educational exchange framework, based on the CB-Theory - a network of international educational exchange and cooperation with respect to sustainable flood management. To reflect the needs of the economy, a high profile international postgraduate course will be established which will allow students to study for an MSc in Sustainable Water Management. Key elements of the course content will also be available to practitioners.
3. Sustainability Education Centres (SEC) for information, education and stakeholder integration - these will employ CB-theory to provide hands-on educational activities, tools and information for SFM/FRM. The SECS will deploy a suite of tested educational tools (including workshops and physical models) for use at primary (age 5-12) and secondary school (age 13-18) level. Where appropriate, these will link directly to national curricula. These tools will be specifically designed to encourage students to discuss the key issues with the parents and understand the nature of flood risk beyond their own town/city.

Case studies

As a basis for all Capacity Building activities in SAWA and in the future, a fundamental concept will be shaped, describing involved parties, aspired capabilities, necessary changes, possible conflicts and didactic methods for capacity building on the way to sustainable floodplain management (SFM). Via interdisciplinary cooperation, the concept will be derived from range of sources such as contemporary strategies, cutting-edge research results, pedagogic philosophy, leading into Best Practice Methods for education in promotion of and information on SFM.

To overcome barriers in integrated water resources management a change in water education towards trans-sectoral thinking is crucial. One important step towards are adapted didactic methods such as inter- and transdisciplinary approaches (team-teaching, projects, field work etc.) and problem based learning.

a) Course University of Karlstad/Sweden

Using a university course for capacity building at the local and regional scales – Climate change consequences and flood risk management for Lake Vänern, Sweden

To support capacity building in municipalities and counties around Lake Vänern, Sweden, a university course was started in autumn 2008 at Karlstad University. One objective of the course is to increase the knowledge about climate change consequences on ecosystems, and the effects for different societal sectors or interests that use or are dependent upon the water system. Another important objective is to build networks among students, local and national experts, decision-makers and academics. A series of day-long educational meetings in cities located around the lake create arenas for capacity building, including elements of social learning, trust-building and stakeholder participation. The group of students is dominated by persons with a present occupation within planning, environment protection, safety management, teaching, NGOs, etc, at local or regional level. The part-time pace (25% during a year) and distance course mode open up the course for participation of persons with an employment.

The topic for the course is a large water system in south-western Sweden – Lake Vänern and the Göta älv River. Lake Vänern with its area of 5,500 km² is the largest lake in Sweden and also in the European Union. The Göta älv River runs from the lake outlet, 90 km down to the sea at Gothenburg. Vänern and Göta älv are used for hydropower production, shipping, tourism, fishing, drinking water supply, as waste water recipient, etc. Each of these sectors is addressed during at least half a day during the course, including adaptation and risk management aspects. The entire risk system is complex with flood risks in the lake and in Gothenburg, which are connected to landslide risks and industrial risks in the river valley. The drinking water supply for 700,000 persons in the Gothenburg region is also at stake. Substantial increases in precipitation during the 21st century, according to IPCC, will give a corresponding increase in flood risks.

b) Environmental project study at Leuphana University of Lüneburg/Germany

Another activity is the development and implementation of an Environmental project study which is implemented in the Bachelor programme "Environmental sciences" at Leuphana University of Lüneburg in Germany. This project study implies eight modules in a period of 4 semesters. The subject is on sustainable flood risk management. The concept is based on a transdisciplinary teaching approach and inter-and transnational perspective and implementation.

In the first and second semester basics of integrated water resources management (IWRM), flood risk management, sustainable regional development and GIS analysis and modelling, and satellite interpretation and regional excursions are the main subjects. In the third and fourth semester students will do international excursion to SAWA partner universities with the focus on sustainable flood risk management. Furthermore they will develop flood risk scenarios, build up a collaborative modelling platform and will do collaborative modelling with the partner student group in Netherlands, Sweden, Norway or United Kingdom via a web-platform. By doing so they can develop adaptive measures, discuss these concerning sustainability and effectiveness and other aspects and will trade off possible measures for certain test-sites online or in direct discourses.

c) Sustainable River Catchment Flood Management at Heriot-Watt University/Scotland

MSc Sustainable River Catchment Flood Management

In Edinburgh, SAWA will focus on the further development of two existing MSc courses at Heriot-Watt University (Sustainable River Catchment Flood Management & Water Resources & Catchment Management). In the UK, MSc courses run over just 12 months; teaching September to April - the remainder of the year is used to complete a research orientated dissertation. As a result, this makes operating a formal international exchange programme at this level quite difficult. As well as developing online course material, the Heriot-Watt team will therefore focus of transnational research dissertations and the use of key staff (academics and practitioners) from within SAWA to deliver guest lectures and present case studies. In this way, the course will produce graduates with practical experience of the implementing some of the cutting edge adaptive measures being championed by SAWA.

Recommendations

To overcome barriers in integrated water resources management a change in water education towards trans-sectoral thinking is crucial. One important step towards that are adapted didactic methods such as inter- and transdisciplinary approaches (team-teaching, projects, field work etc.) and problem based learning.

Topic 2: Education and training of water technicians

Name :

Mrs. Barbara Anton

Organisation:

International Training Centre, ICLEI – Local Governments for Sustainability, Germany

Experience

I've been working for more than 10 years in the design, development, delivery and evaluation of training courses – both face-to-face and via Internet – for local government officials.

The subjects have all been related to various areas of local sustainability incl. Local Agenda 21, public participation, environmental management, sustainable procurement and the promotion of local employment opportunities.

Recommendations

(All recommendations refer specifically to training for professionals. They are generic, but also key in the water sector.)

- If training for professionals is meant to build the capacity of an institution (not just of an individual)
 - the training has to be part of a broader human resources strategy of that institution;
 - more than one person needs to participate in the training; and
 - a trilateral agreement is necessary between this institution, the training provider and the training participants.

- In most cases, all trainees are at the same time experts and their knowledge is equally important as that of the trainer. The layout of the training needs to take this into account.

- Training needs to be based on a good understanding of the professional tasks and working environment of the participants, their interest in the training and the applicability of the subjects of the course.

Topic 2: Education and training of water technicians

Name :

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Institute for Water Resources; US Corps of Engineers; Alexandria, Virginia; USA

Experience/Case/Project:

I manage a program for the Corps of Engineers entitled the [Advanced Degree Program in Integrated Water Resources Management](#) that was developed to expose interested professionals to the more integrative aspects of water resources planning and management through graduate studies. The program was developed by the Corps of Engineers in partnership with the Universities Council on Water Resources (UCOWR). After canvassing the entire UCOWR community, the following five universities were chosen to initially participate in the program: the Johns Hopkins University, the University of Arizona, the University of Southern Illinois, the University of Florida, and Harvard University. These institutions were chosen based on their willingness to accommodate practitioner needs, to streamline the degree-earning process, and to achieve a balanced inter-departmental program.

The following core courses were identified to provide an integrative field of study and were agreed to be taught by the participating universities:

- Institutional Considerations in Water Resources Planning and Management
- History and Philosophy in Water Resources Planning and Management
- Quantitative Methodologies
- Hydrology/Hydraulics
- Social Decision-Making
- Ecology for Water Resources Planning and Management
- Engineering for Water Resources Planning and Management
- Economics for Water Resources Planning and Management

A capstone seminar designed to focus on the inter-disciplinary aspects of water resources management was also developed by the Johns Hopkins University to further complement the program.

Thus far, the program has experienced limited success since its inception largely due to an overall reduction in training budgets that the federal water resources agencies have experienced. Also, it has proven to be extremely difficult to draw experienced practitioners away from their duties to pursue additional training. Therefore, the challenge has become how best to create a more flexible program that is attractive to a professional community that is both budget and time constrained.

In the summer of 2005, a survey was conducted in partnership with UCOWR and the American Water Resources Association (AWRA) in an attempt to gauge national interest in water resources education and to determine how best to institutionally target it. The results of the questionnaire were distilled into a [UCOWR paper](#) and presented at an AWRA-sponsored "brownbag" discussion. These two exercises demonstrated how diverse the water resources field of study is in the US. Some of the key observations are as follows:

- There is no consensus on how best to define the concept of integrated water resources management in the US, much less determine how to apply it.
- The continuum that exists between the social sciences and engineer studies makes it institution-dependent as to where to emphasize water resources education.

- Integrated water resources management is best realized through a team comprised of specialized experts who have gained at least a modicum of appreciation for the other water resources specialty areas.
- Water resources needs to be emphasized as an important field of study through all levels of education, i.e., elementary school through post-doctorate work.
- Distance-learning as applied to the water resources field, has been met with mixed results. Some felt that it should only be implemented as a last-resort training tool, as there is no viable substitute for the *in-situ* experience. Others felt that it provided the best means to educate a professional staff that frequently traveled or couldn't afford long intervals away from the office.

This experience has demonstrated that the Corps' existing program will need to be modified in various ways in order for it to achieve success. The US universities, for example, should be re-canvassed for inclusion into the program, as increasing numbers are seeing the value-added of an inter-departmental curriculum. Certification programs should also be developed in lieu of entire degree programs, which many professionals feel are impractical for their professional growth. Distance learning should be cautiously applied since it naturally promotes cross-boundary interaction and is an attractive alternative to prospective working students.

Workshop Recommendations:

The following recommendations for this workshop stem from my experience in managing the Advanced Degree Program in Integrated Water Resources Management.

1. An attempt should be made to reach consensus on what constitutes a water resources education program. In the US, for instance, it can be characterized as a highly varied field of study depending on the given training institution's emphasis. Within the US the primary focus is shared between the fields of civil engineering, applied economics, hydrology, environmental studies, social sciences or water law. There is a recent trend towards studies of an increased inter-disciplinary nature but that is also highly variable. The range of diverse disciplines should be considered in an attempt to more fully define water resources education.
2. An inventory should then be performed to identify all related institutions that administer water resources training programs, including undergraduate, graduate and college-level certification programs.
3. Explore options for promoting international exchanges ranging from teacher/student exchanges through to the sharing of degree-level programs. This is where distance-learning has the potential to become a fairly valuable training tool.



Topic 2: Education and training of water technicians

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Education and training of employees working in the water sector The SWO-concept as a basis for a World Water Academy?

Some starting statements

- World wide the amount of knowledge, know how and expertise on water topics is abundant, especially on higher and academic level
- Due to the millennium development goals lots of projects- world wide- are realised in order to provide sustainable access to safe drinking water and basic sanitation
- Workers, operators, .. are not skilled in the field and the specific aspects of water

SWO: broad experience in the water sector

SWO (short for Stichting Wateropleidingen) is a training institute for watermanagement. Established in 1993 by the Dutch water sector in order to improve the quality of their employees with specific knowledge on water issues, SWO built up a broad experience. We offer very practical courses for all water related issues. Each year about two thousand employees working in the water sector participate in one or more of our eighty education programs and courses.



SWO is specialised in education and training of water technicians as well as water policy makers as well as water governors. The courses have a wide variety of –all water related- subjects and cover a variety of educational levels. Focus is water and working in the water sector. Both in the Netherlands and abroad, SWO offers training for all kinds of employees working on different levels in the water sector. We offer courses on water systems, production and distribution of drinking water, sewerage, waste water treatment and communication. Our courses are always up-to-date, directly related to daily practice. The courses and education programmes are based on the SWO-concept.

The SWO-concept

- training for professionals by professionals
- inspiring and practical courses, tailored to you
- not-for-profit, not-for-loss

The SWO concept will be explained, based on the 15 years experience and improvement. The results of the application of the SWO concept in the Mekong Delta in Vietnam will be presented. Focus will be led on a long lasting and sustainable organisation and delivery of practical courses. A blueprint for establishing a training institute abroad based on the same unique three principles as in the Netherlands will be developed. Recommendations will be made on further application of the SWO-concept as a basis for a World Water Academy.

Recommendations

From the experiences SWO, training centre for water management, the following recommendations can be made:

- Make a connection to a water professionals association in order to come in touch with experienced professionals who are willing to share their experience;
- Use the "for professionals, by professionals- concept". The professionals have specific knowledge, always practical and up-to date. They share their tacit knowledge and the training centre "fixes" this knowledge in course books;
- Train professionals didactically to become a teacher. A didactical training is useful because most professionals like to "preach"; they are less focused on the target group and the they knowledge need;
- Develop tailored courses and training programmes to fit the target group and the learning goals. The target group will be interested if they can use the knowledge from the lessons tomorrow in their own work;
- Establish an institution focussed on professional training; Training courses for professionals are quite different from secondary and tertiary education programmes;
- Organise long lasting courses; The water problems are huge and wide spread. The solutions are diverse and the policy makers and technicians need advanced practical knowledge.
- Assure a continuous improvement; as the water sector develops, also the solutions for problems are developing. All courses need to be up-to-date.

Topic 2: Education and training of water technicians

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Hydroaid's water activities: the case study of the Hydroaid's core course

Managing water resources is a complex undertaking which faces a multiplicity of self-standing variables that - though -are not independent to one another and are often even in conflict. It therefore calls for both technical skills and appropriate policy-making tools.

In several developing countries, the water services are either missing or far from efficient. The cause of such underdevelopment is to be sought both in the natural environment and - more often - in the absence of a suitable legislative and administrative frame.

The cooperation offered by Hydroaid intends to fill this gap by staking on the technical capabilities of the local authorities in the improvement of their own systems. This essentially translates into a transfer of knowledge, whose primary objective is optimizing and reorganizing the local institutions for the efficiency and competitiveness of the service providers.

The instruments of cooperation adopted by Hydroaid are educational, namely: training and capacity building programs aimed at valorizing the know-how and management skills of those individuals who are appointed to the governance of the water system.

As working method, Hydroaid addresses the local government and authorities so that they are aware of their responsibility in the work program. In particular, Hydroaid seeks their involvement on the steps and overall goals of the project, implicates first-handily in the development of the activities deployed by local professionals and universities and resorts to experts from other developing countries who are already part of the Hydroaid's network. Successful experiences have been achieved in projects which integrated capacity building to the more conventional classroom teaching. The results are transferred from the field to the class and vice versa and the trainees become trainers, giving thus a thrust to the vital process of training the trainers. As a complement to the on-the-floor activities, Hydroaid is developing E-learning techniques, since we believe they will be a valid tool to give continuity to an educational project with a specific group of alumni and favor the setting up of a technical set of connections.

A distinctiveness of Hydroaid is the network of the former participants and partners. This environment plays a significant role in the establishment of a shared culture on water issues facilitating the identification of pooled solutions to deal with a global issue. The network actively contributes and participates to Hydroaid's activities.

CASE STUDY: Educational program «Post-graduate Program on Management of the Water Resources and Services». Scholarship-based training is organized every year for engineers and managers from the developing countries. This program has been held at the campus of the International Training Center of the International Labor Organization (ITC-ILO) in Turin every year since 2002. The overall curriculum consists of three courses of theoretical study and field training, namely:

- Management and governance of the integrated water service cycle;
- Management of water resources for soil conservation and agricultural development;
- Supply systems for drinking water, irrigation and sanitation.

CASE STUDY: Italy-Brazil International Technical Cooperation on Water and Environment Management. This cooperation program is held within the framework of the inter-institution protocol between Hydroaid and the *Ministério das Cidades* of the Federal Government of Brazil. The bilateral program of joint technical initiatives is intended to: pro-

vide training on environmental issues, territory and water management as well as technical support for the integration of directives defining risk mitigation programs and management of the natural resources. The ultimate aim is to improve the efficiency of the public agencies and develop programs which conjugate environmental requirements to development strategies that can lead to economic growth while safeguarding both man and the environment.

RECOMMENDATIONS:

1. Cooperating with the beneficiary countries for the sharing of the objectives, fostering the participatory involvement of the local authorities
2. Boosting South-to-South cooperation as an efficient tool of cultural mediation and undertaking of responsibilities in the regional development processes
3. Within the development of the educational programs, integrating the experiences acquired from abroad to the domestic reality in order to stimulate a process of critical discussion and start an appraisal of the management system culture.
4. Developing elements of continuity in the professional cooperation with the network of former alumni and of the beneficiary countries in order to provide a consistent technical reference point and foster the creation of a shared technical background to tackle global issues.

Topic 2: Education and training of water technicians

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Experience/case/project:

September 2008, a group of 30 enthusiastic students started a new bachelor Water management at the Rotterdam University of Applied Science (Hogeschool Rotterdam, HRO) in the Netherlands. This new degree program focuses on water management in delta cities and urbanized lowlands. Given the demographical and climate challenges delta cities are facing today, the importance of sound water management is widely recognised. Design and implementation of such water management is a difficult task, for which water managers are needed with both technical and social competences. HRO aims to educate professionals, who design, realise and maintain complex infrastructural and urban planning projects from a water perspective, using these competences. The curriculum is built upon three pillars: delta technology, delta design and delta management and has been developed in close corporation with professionals. Next fulfilling the qualitative demand for water managers, the new HRO program aims to help fulfil the quantitative demand. Students, especially female students, are attracted to study programs that combine technology with social sciences.

Recommendations:

- Our first and strongest recommendation is to involve professionals in the development of a degree program at a very early stage. From the start, professionals have helped us with the curriculum and with promoting water management education through a research institute and a professional advisory board.
- The second recommendation is to confront the students with the professional practice frequently and at an early stage. Activities such as excursions and fieldwork help students envision their future career possibilities.
- Finally our last recommendation is to seek close corporation with other (international) universities that offer water management programs. Exchange of students, teaching staff and education material may increase both quality and variety of the offered education. Students are attracted by the international aspects of the Bachelor Water Management, including international excursions, internships and study exchanges.

Topic 3: Water education in schools/K12

Name :

Orit Ben-Zvi –Assaraf (1),
Nir Orion (2)
Daniel Ronen (3, 4)

Organisation:

(1)The Science Teaching Department, Ben-Gurion University of the Negev ;
(2) The Science Teaching Department, Weizmann Institute of Science, Israel;
(3) Ben-Gurion University of the Negev, J. Blaustein Institutes for Desert Research, ; Zuck-erberg Institute for Water Research, Department of Environmental Hydrology & Microbiology
(4) Water Quality Division, Israel Water Authority

UNESCO – IHP as a framework for the Transfer of the Blue Planet Earth Systems Approach (BEPESA)

The Israeli chapter of the IHP and the Israel National Commission for UNESCO present the Blue Planet Earth Systems Approach (BEPESA) for the study of water related systems. The main goal of BEPESA is to encourage students, at junior-high school level, to develop system-thinking as a basis for environmental literacy. BEPESA is an earth system-based curriculum package that focuses on the study of water-related issues in an environmental context. The program, implemented in Israel since 2,000, is based not only on environmental education towards awareness, but on the development of environmental insight and understanding.

The transfer of BEPESA is firstly based on a workshop that promotes the teachers' ability of thinking-based teaching that is oriented to the development of higher-order thinking skills and environmental insight. We here present a metodological approach for knowledge transfer that has been applied successfully at the Workshop Organized, in Mar del Plata, Argentina on November 2007:

1. During the workshop the teachers experience the interdisciplinary nature of an environmentally based program. Following the workshop, each teacher is able to identify an authentic environmental "cover story" concerning the role of water in his local environment.
2. The pedagogical approach is related to the constructivist educational paradigm. Therefore, the workshop deals about teaching strategies that promotes authentic and relevant learning. A special emphasize is given to the use of the outdoor learning environment as an integral part of the learning sequence.
3. The ability to perceive the hydrosphere as a coherent system depends on both scientific knowledge and cognitive abilities. The workshop supply to the teachers: (a) the required tools to diagnose student's system thinking abilities and, (b) the methods to develop such cognitive abilities.
4. Throughout the workshop the teachers go through the same learning process that their students will go through.

Recommendations:

One of the central purposes of science education is the development of environmental insights among the future citizens of the 21st century to generate long-term sustainable life on Earth. Therefore, our recommendations for the water education:

1. The BEPESA model emphasizes that acquiring system thinking skills in the context of earth sciences is a fundamental stepping stone for students in developing an environmental literacy. It is claimed that the understanding the reciprocal relationships within and between each of the Earth systems; i.e., the geosphere, the hydrosphere, the atmosphere, and the biosphere (including mankind), will enable students to become thoughtful decision makers, concerning environmental issues in the future.

2. We strongly suggest that implementation of the Earth systems approach could serve as a powerful platform in motivating students to study water based environmental phenomena. This approach can serve as a concrete basis and as a relevant context for the understanding of scientific concepts complicated scientific concepts and processes from all the scientific disciplines (eg. chemistry, physics, geology, and biology). This interdisciplinary models for environmental education offer students opportunities to learn critical thinking, problem solving, and effective decision-making skills.
3. Water education should involved searching for environmental problems related to students' lives and interests, developing interdisciplinary environmental stories, creating an authentic learning environment, and supporting teachers in the learning process.
4. The introduction of an interdisciplinary environmental program within the science curriculum should involved environmental and earth scientists, educators, teachers, and students.

Keywords: System thinking skills, earth science curriculum, hydrosphere, sustainable development, teacher professional development.



Topic 3: Water education in schools/K12

Name :

Mrs. Bjarke Birkeland, Biologist

Organisation:

AQUA Freshwater Aquarium, Silkeborg, Denmark

Project "Water Check"

Water check is a national surveillance project where school classes, groups and other interested examine and monitors the condition of local ponds and smaller lakes. The project is based on a simple but useful method to determine the overall water quality. The project runs from 2007 to 2011. The results are complemented by a range of other information about lakes and ponds and with the children's own experiences from visits and surveys of their local pond.

The projects primary aim is to promote educational and exciting environmental learning about water and ponds, which are concrete and meaningful for children, teachers and public partners outside the school.

The project builds on a digital solution with a database and a project website. This creates new unique opportunities to integrate nature experiences, nature studies and natural surveillance in teaching. Furthermore the project may help to create a wider cooperation between schools, landowners and municipalities around the local community.

Background of the project

In Denmark, we have approximately 120,000 lakes and ponds with an areal of more than 100 m². The majority of these are smaller lakes and ponds, but 2,762 of the lakes are more than 10,000 m². It sounds as a lot, but earlier there has been a lot more water in the Danish landscape. Over the last 200 years it is estimated that 80-90% of all ponds, wet meadows and lakes have been involved in agricultural or urban development through an intensive drainage. Meanwhile, the remaining lakes were threatened by discharges of sewage, chemicals and nutrients from cities and farms. Many animal and plant species in and around the water is either gone in the period or are now heavily threatened. Water quality and number of animals and plants in water holes are linked. The highly polluted and oxygen-poor lake is also poor in species.

The last 20 years has brought political commitment to focus on a better and cleaner water environment in Denmark. Still it's difficult to get a good overview of the environmental status of our ponds and lakes. Only a small percentage of the existing lakes and ponds are covered by the National Monitoring Programme. Of our 120,000 lakes and ponds less than 50 lakes are intensively monitored and approximately 1,000 lakes and ponds less extensive.

It can obviously not give a true picture of the status and the development of quality in the Danish waters. The Danish municipalities are by monitoring and natural plans committed to ensure that our lakes and ponds have a "good environmental status" by the year 2015. There must be made natural environmental plans for the area in 2009 and efforts must be completed by the year 2012. There must be no deterioration in the quality of water. All this is written into the national legislation of the European Water Framework Directive.

Results from "Water Check" can hopefully help to give a balanced picture of the condition of the Danish waters. The classes are encouraged in their investigations and surveillance to come up with good ideas on how water quality can be guaranteed and how we make it even better.

The results must in particular be used to raise the debate about water and water-quality and about the responsibility we have to our nature on a local, national and global scale.

We expect that more than 400 school classes join the project in 2009.

The project is supported by Hess Denmark ApS, Aage V. Jensens foundation and the Gaming and Lottery funds from the Ministry of Education.

Topic 3: Water education in schools/K12**Name :**

Mr. Jeroen Bron

Organisation:National Institute for curriculum development,
SLO, The Netherlands**Experience/case/project**

I have worked for thirteen years as a curriculum developer in the area of the cross curricular themes such as citizenship education, health education and education for sustainable development. Some communalities in these issues are:

- the relation with current issues in society;
- far reaching ambitions of changing behaviour;
- the themes are usually covered by more than one subject;
- it often includes a moral dimension;
- not all themes have a legal status;
- there is a large variety in the way the themes are addressed in schools.

As a curriculum developer, I am interested in the discussion on the socialising task of schools: what are core tasks, what are additional tasks, how can a coherent curriculum be developed, how can curriculum overload be prevented and what implementation strategies are successful.

This year I will be involved in a curriculum development- and implementation project on the theme 'water' throughout the education system in one Dutch province. The main objectives are: 1) raising awareness of the importance of water and 2) getting more students interested in water technology studies.

Recommendations

1. Be aware that schools are faced with many claims to add subjects, issues and themes to the curriculum and on the other hand are measured on their output in the core subjects reading, writing and arithmetic's.
2. Use a broad perspective of the curriculum including: rational, aims and objectives, content, learning activities, teacher role, materials and resources, grouping, location, time and assessment.
3. Consider the implementation process. Consult and involve as many stakeholders as possible including schools and teachers.

Topic 3: Water education in schools/K12

Name :

Organisation:

Mrs. Lut Gilis

Hidrodoe (Pidpa), Belgium

Hidrodoe, getting engaged with water. About nonformal water education – strategies with impact.

Hidrodoe is an interactive water centre in Herentals, Belgium, with a total exhibition area of 2000m². The mission aims at changing behaviour towards water and is for everyone from 4 to 94. The strategy concept is built on 4 buzzwords: information, interaction, emotion and fun.

The information is *clear and simple*. Exhibits, temporary exhibitions and/or temporary activities and actions are conceived from the idea of collaboration with partners as to *build capacity* e.g. a new exhibit on the theme of the UN Millennium Development Goals was produced together with Protos, a NGO with focus on water.

The messages that directly appeal on behaviour change, are being *repeated through multiple channels* and are often *implicit e.g.* in the exhibition area visitors can drink of tap water fountains when they are thirsty. The message is that tap water is drinkable and tasty. This message is repeated in the Watercafé of Hidrodoe.

Information is highly *customized* as we use multiple communication channels and tools are used: education programs, school rally's, films, demonstrations, games, workshops ... E.g. for primary school visitor groups, special school packages were set up. The customization is further done via the the infotainer.

'Interaction', is integrated in the design of the exhibits as well in all type of action and activity in Hidrodoe. Interaction enables the visitor to 'communicate' with the exhibit, with fellow visitors, with the infotainer, appeals to the *analytical type of learners* ... Essential condition in exhibit design is that the exhibit *interaction* be very *intuitive*. In order to enhance fun, Hidrodoe seeks for a *variety* of interaction.

We add emotion by using strong images, good story telling, beauty, etc. e.g. the first exhibit that the visitor comes across is an enormous 'Waterdrop'. While lying on 'wave-seats', the visitor is immersed into a sphere of beauty.

The infotainer is the outstanding critical success factor. The infotainer is not only the person who is capable to customize the visit, enhance interaction, and -an equally important role- add passion, warmth, inspiration, challenge, authenticity, joy, kindness, love ... to the visit.

Recommendations

Bring information that ...

- is simple and clear with little textual information in exhibits
- is shared by partners as to build capacity
- makes use of multiple communication channels
- is repeated, implicit
- is customized through specially designed concepts, products
- is customized via the infotainer

Introduce interaction that ...

- is intuitive (exhibits)
- is varied, in order to enhance fun, curiosity (as well in exhibits, as in activities)
- enables direct experience, satisfies common sense/analytical type of learners
- enables the infotainer to enhance information, inspiration, motivation

Add emotion that ...

- is authentic
- customizes the visit in so many ways

Cherish

- human capital

Topic 3: Water education in schools/K12

Name :

Mrs. Claudia Kourey-Bowers

Organisation:

Kent State University, Ohio, USA

Education for sustainability (Efs)

Education for sustainability (Efs) is an integral means of support for water resource sustainability. Previous efforts in Efs which addressed learners' needs in knowledge, awareness, and values were successful in enhancing only knowledge and awareness. Values typically ranged from an anthropocentric view (a narrow frame of mind in which natural capital is seen as for human usage) to an eco-centric view (an expansive perspective in which humans are charged with safeguarding natural capital). A third view on values (Bonnett, 2006) asserts that sustainability is a frame of mind, embedded in human consciousness, which places humans within a mutually beneficial relationship, creating an openness to the power and fit of nature. Bonnett's model of sustainability goes beyond the related concept of connectivity, described as a sense of community which humans express for the natural world.

Further confounding Efs are weaknesses in students' foundational knowledge of ecological systems. Studies of primary, secondary, and tertiary learners have found persistent misconceptions regarding 1) multidimensional cause-and-effect relationships, 2) spatial and temporal interrelationships, 3) interactions between abiotic and biotic components - specifically the role of water resources as a limiting factor, and 4) the role of energy in driving ecosystems.

Efs must address persistent misconceptions and deeply embedded cultural values. Science education curricula and policies primarily focus on knowledge acquisition rather than on understanding, synthesis, or values. Efs can potentially be met through an intercultural approach to science education. The United Nations' initiative, Decade for Education for Sustainable Development (DESD), provides an ideal template for intercultural science while the Four Pillars of Education for All represent the complexity of goals and means that encompass quality education. Intercultural science education emerges coherently from the integration of constructivist theory and attention to resource sustainability.

Recommendations for Efs Curricula:

- Promote understanding of multidimensional cause-and-effect, abiotic and biotic, temporal, and spatial relationships,
- Implement Four Pillars of Education to promote awareness, values, and multiple perspectives within a scientific context, and
- Develop strategies to identify ecological niches of humans in urbanized/industrialized and rural ecosystems, placing humans within nature rather than outside of nature.

Topic 3: Water education in schools/K12

Name :

Mr. Dennis Nelson,
President and CEO

Organisation:

Project WET Foundation, USA

Water Education for Children and Young Adults, Through School and Community Educators

Project WET is a water resources education program with over 25 years of experience in reaching children and youth through school and community educators. Each year, Project WET reaches millions of children and youth through its global network of regional partners (ex., UNESCO-IHP Latin America and Caribbean) and country host institutions (ex., Project WET Argentina, Canada, France, Italy, Mexico, UAE, Uganda, USA, and Vietnam). The Project WET Foundation has raised over \$50 million (\$US) from public and private donors and invested the funds in the creation of one of the largest sets of original water science activities (teaching methods) in the world. The regional and country host institutions partner with Project WET to adapt and localize the educational materials for use in their respective regions and countries. Project WET's network annually conducts over 3000 Train-The-Trainer workshops and reaches over 30,000 educators.

This presentation will tell Project WET's story from the program's concept phase in 1984 to becoming a global leader in children water resources education today. Case studies will be used to highlight challenges and opportunities for others to use in developing their own education programs. The speaker's goal is to motivate and empower "all" people in the water and education sector to become active and effective water educators.

The research conducted by the Project WET Foundation over the past twenty-five years has clearly documented the value and importance of educating children and young adults about water and its use, management and protection. The most successful water education programs combine the scientific and technical expertise of water professionals with formal and non-formal educators. When water and education sectors work together, we all benefit.

Recommendations:

- Let us shed our organizational egos and actively pursue joint ventures and partnerships to scale-up and reach more people.
- Post-secondary, colleges and universities should include water education teaching methods courses in science and non-science curriculum offerings with a goal of ensuring that every pre-service student has the materials, knowledge, skills, and experience necessary to be an effective educator of children and young people.
- Water and education sector leaders and practitioners need to link education to locally appropriate solutions and actions (**ActionEducation™**).
- The universal nature of water will allow education and program developers to e-publish materials that can be used around the world – a **water science education template for schools**.
- The digital version of the **Global Water Education Village** and **Children's Water School** (5th World Water Forum Interventions) is recommended to provide a site for

people to network with others active in water education and a place to access and obtain the best water education materials in the world.

- A series of **WaterCourses™** ranging from general water science and water management to more focused and in-depth courses on specific priority topics such as groundwater, wetlands, water and health, or sanitation will be designed and made available to non-technical education providers and learners of all ages. The materials and programs will be available for use by any government, agency, organization or business interested in educating people about water and thus support scaling-up.
- Finally, water and education sector leaders should establish a **certification program** to establish credibility and value to the educational programs for school and community educators and to the people who take their courses. The key question is: "Does learning occur and can the learner use the information in their daily life to better manage and improve water conditions?" If the answer is yes, we have done our job.

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Topic 3: Water education in schools/K12

Name :

Dr. Ján Šípoš, PhD. ,
Mrs. Livia Majernikova

Organisation:

Young Scientists of Slovakia – YsoS, Republic
of Slovakia

Young Scientists of Slovakia

Young Scientists of Slovakia is a non-governmental and non profit organization which works as National organizer of the Stockholm Junior Water Prize. Since 2006 we have signed a cooperation agreement with commercial water Distribution Company named Bratislava Water Company, joint-stock company. This Cooperation is oriented to development and realization of long term and periodically organized water educational program for kids. This program contains both - formal and non formal methods and it is realized in 85 basic schools in territory of commercial interest of this company (Bratislava region, Trnava region and Trenčín region). We organize workshops and trainings for teacher dealing with new approach for better understanding of aims and methodology of Water education. For pupils we organize variety of educational activities as in schools and outside of school (water clubs, environmental games, sciential and art competitions, and other interesting activities. Our institution publishes some publications for teachers and kids. In this field we cooperate with universities and other research institutions. Program is interesting and varied; kids and their teachers are very interested about program.

In last evaluation report of the program in 2008 we have been note that for increase of quality of our work we need more perceptual materials and any interesting and good working web site for better exchange of experiences, for dissemination of aims and results of our work.

Our recommendations:

- For water education process should be important to have interesting interactive web portal with (minimally) European impact,
- Deficiency of learning materials particularly in non formal learning must by resolve. We should find any mechanism for exchanges of the best learning materials (books, brochures, posters, guidelines, etc.) between animators and education managers around Europe or around the world,
- Personal experiences are irreplaceable. We need to have any system for international cooperation and exchange of teachers and educators.

Topic 4: Community and stakeholder education

Name :

Mrs. Agnes Biesiekierska

Organisation:

EWP - European Water Partnership, Brussels, Belgium

Aquawareness (www.ewp.eu/aquawareness)

The new voluntary program Aquawareness sets sights on changing behaviour and practices, shaping and integrating water into policy and strategy agendas as well as creating a water saving and efficiency culture among private, industrial, business and agricultural users. Through information, education and training a paradigm shift from supply to demand management shall be achieved.

Water Vision for Europe

In order to position common goals and objectives for the European water sector, a Water Vision for Europe has been worked out in a multi stakeholder process. The Vision shall serve as a joint basic starting point for both – policy making and future project setting of the European water sector - and therefore unites stakeholders to joint action on advanced water management. Actually, the vision already underpins the project settings of the European Water Awareness and Water Stewardship Program.

European Water Awareness Program

This program directs to introduce a water saving and water efficiency culture among political decision makers, key stakeholders and inhabitants within Europe. The basic tool to implement awareness on sustainable water use on all social and geographical levels is to make information on sustainable water use available for everybody. Improved information creates transparency on the water situation and ensures a realistic and objective decision making process on all levels. In that way, the program encourages the change of behaviour, practices or habits and supports an efficient policy making process.

Water Stewardship Program

The objectives of this program are to establish and provide a voluntary scheme for sustainable water use that:

- Becomes an extensively adopted instrument for sustainable water management crossing public, private and sectoral barriers
- Promotes water to become integral part of policy and business agendas
- Creates knowledge&transparency on production and consumption patterns
- Presents a common framework for assessing, implementing and communicating sustainable water management

Topic 4: Community and stakeholder education

Name :

Mrs. Ase Johannessen

Organisation:

International Water Association, IWA,
The Netherlands

Case: Water awareness and education for young people and future leaders

- An example of World Water Monitoring Day - an outreach programme that involved 70 countries and 72,000 people in 2008

IWA International Water Association and WEF Water Environment Federation coordinate the World Water Monitoring Day (WWMD) – which is an international outreach programme to engage and raise awareness about water quality with communities and students. The programme monitors four parameters (pH, turbidity, Dissolved oxygen and temperature) and provides the basics to carry out such monitoring including a kit. The kits are distributed free of charge to schools in low and middle income countries on demand.

The WWMD works through a diversity of partners all over the world. WWMD is a useful programme to organizations that feel they need to expand how they reach out and where WWMD can help them realize their own communication objectives. Being able to offer another way for teachers and students to engage in the watershed is often complementary to their own activities.

In many places, especially in low and middle income countries issues of sanitation and hygiene are of critical importance. Any discussions about water quality will therefore be about these topics. The WWMD identified that it could contribute to the International Year of Sanitation (IYOS) and spread the word about IYOS by distributing factsheets for hand washing in the kits including a bar of soap to practice on and use.

This campaign was highly successful and in 2008 the WWMD reached 72,000 people in 70 countries.

Still, WWMD cannot replace formal curricula development, but it is a useful complement to it, as well as a way for teachers in low and middle income countries where no formal curricula exist to be able to carry out water education.

The Programme is continuously under development and during 2009 the coordinators will develop an awards programme, facilitate twinning between schools and develop a visual system for logging of the data onto a mapping interface. Materials will also be developed to better fit different regions, together with partners and curricula experts, and material that explains water quality will be added that is on demand from the users of the programme.

Recommendations:

- There is a great willingness to take part in educational programmes and campaigns by local communities, but often it is the lack of capacity in the supply chain from international/national coordination level reaching the local level that is the bottleneck in the roll out of these programmes. Support in terms of communication, funding and coordination is needed by a variety of actors who sign up to objectives of water quality awareness.
- As much as campaigning is important, there is a need to develop formal curricula development in parallel with education initiatives for communities. This would change the way communities respond more profoundly, especially in countries where civil society awareness is low on the environmental area.

- It is recommended to develop and provide ready made material as resource materials as many partners appreciate this where they don't need to develop the concept from the beginning. At the same time it is crucial to get away from mainstreaming the awareness building according to one cultural norm in the material provided and reworking it with local and regional curricula experts to fit the context.

Topic 4: Community and stakeholder education

Name :

Mr. Sjoerd Kaarsemaker

Organisation:

Institute for Environmental Education (IVN),
The Netherlands

Case: IVN, a Dutch nationwide NGO focusing on environmental education and extension

The IVN is a Dutch nationwide NGO focusing on environmental education and extension. It comprises both volunteers (18.000) and professional employees (120). The professional employees work in provincial units whereas the volunteers work in 176 local branches. The provincial units support the IVN volunteers and initiate and support activities and organisations which provide environmental education and extension.

Your Experience/case/project:

IVN has developed several methods for extension which have been used for water topics. Main aim of every activity is to make people aware of the beauty of nature and offer participants a perspective for personal action. Children become enthusiastic, grown-ups become aware of their natural environment and mostly equally excited.

For children aged 8-14 IVN developed Watch. Originating from the wildlife trusts in England 'Watch' was translated in Dutch. The focus was put on water. Material was gathered, a standard lay out was chosen, a website was added, the material was filtered, re filtered and again filtered. Until a smart looking little book with a manual a toolbox and a website provide a basic material for field excursions and project weeks. Over the last 10 years more than 100.000 children participated. Watch functions as a network of extension enthusiasts, a development platform and a means for water boards to promote themselves.

For teenagers aged 14-18 IVN developed Schools for Sustainability. A method in which students are challenged to respond to an actual sustainability theme. The students form an advisory office at school, which is then confronted with a question or problem. The students have to do research, read, surf the web and interview people. On the basis of the gathered information they form their own opinion, advise, article which they present to an audience of professionals including political key figures. In the last few years several projects concerned water topics. One project 'dry feet' was organized together with several waterboards and provinces in the north of the Netherlands. It concerned the flooding risk in the area of schools caused by climate change. In another project students make planning decisions under assignment of the ministry of transport, public works and water management.. Last year a project was finished on developing a sustainable harbour in Rotterdam. This year a nationwide project has started concerning the elaboration of the water quality directive (KRW) of the EU.

For adults IVN has developed a course for voluntary water guides. People are trained in tour guiding with a focus on water. The interaction with the audience and keeping the information interesting by good preparation are main topics in the course. Already 242 guides have been trained.

IVN cooperates with partner organisations such as the environmental federations, the nature trust and the provincial trusts. Product development and most water projects are done in cooperation with and under assignment of water boards, provinces and the ministry of transport, public works and water management.

No recommendations at this stage.

Topic 4: Community and stakeholder education

Name :

Mrs. Anna Kuhmonen
Mrs. Ella Gustafsson

Organisation:

Luonto-Liitto / The Finnish Nature League
The Baltic Sea ambassadors visiting at schools
-project, Finland

Baltic Sea ambassadors visiting at Finnish schools – case study

The Nature League (NGO) established Baltic Sea ambassador visits at schools in 2006. Since then ambassadors have already met over 6000 high school students in different cities of Finland. Ambassadors are young people, usually university students, who really care and are worried about the state of the Baltic Sea. The Nature League educates the ambassadors few times a year, this year in three different cities. Teachers can order ambassador to visit his/her class at school for free and the visit is recommended to last 90 minutes and is around for 20 students. Materials are in Finnish, English, Russian and Swedish. We work with the "Friends of the Baltic" NGO and have started school visits in St. Petersburg as well.

Baltic Sea ambassadors talk and discuss with students about the uniqueness of the Baltic Sea. They also tell the reasons why the Baltic Sea is so polluted. Still the main point of the visit is to concentrate on the possibilities of a single person to affect to the state of the Baltic Sea. The method is not to give lecture, but is based on discussing with youth and letting them to think their relationship to the Baltic Sea and to its problems. Our way to summarize the lecture is to use little role play, in which students can choose a role in pairs and they need to think how they (the role) would hope the state of the Baltic Sea to be and what they would be willing to do for it. The roles are: the director of the factory, fisherman, ringed seal, blue-green algae, bladder wrack, young man. Usually this works really well!

The Finnish Nature League (Luonto-Liitto, in Finnish) is a nature- and environmental protection non-governmental-organisation (NGO) for children and young people in Finland. The goal of our organisation is to influence the society in a way that leads to the protection of nature's diversity and respect for its inherent value. To achieve these goals, the Finnish Nature League works actively in the field of environmental education offering knowledge, experiences and activities, and creates possibilities for young people to influence the national environmental policies.

Recommendations:

1. Creativity as an important part of the water education
2. Using drama, for example role-playing, as a way to summarize studied things
3. Discussions in the pairs and afterwards in the group
4. Young people teach young people

Topic 4: Community and stakeholder education

Name :

Mrs. Marie Prchalova,
Programme Specialist for Science

Organisation:

UNESCO-Moscow,
Russia

Case: Living Volga Programme: An initiative contributing to implement DESD goals

The current UNESCO biennium (2008-2009) continues to focus on water and associated ecosystems within its biennial science sectoral priority "Promoting research and capacity-building for the sound management of natural resources". Thus, UNESCO continues to play an active role in UN Water initiatives. Among key responsibilities of UN Water is also follow-up on the implementation of the International Decade for Action, "Water for Life", which began in 2005 and on the UNESCO's leadership role for the Decade of Education for Sustainable Development (DESD).

The Volga River is the largest river system in Europe. Sustainable development of river basins necessitates an integrated basin-wide approach. In a river basin, causes and effects result from the movement of air, water, people, animals and plants, against a background of climate change, environmental deterioration, social transformations and other major drivers. Integrated management of natural resources and ecosystems must be based on an interdisciplinary approach, building on established knowledge and setting common objectives. The interdisciplinary/integrated approach to resource management implies public participation and involvement of local authorities and representatives of civil society. These features contribute to public acceptance, develop ownership and enhance capacity building, all essential elements of sustainability.

Within an entire river basin there are nine biosphere reserves (BR) having been included into the World Network of Biosphere Reserves (WNBR). Parts of several BRs are designated as Ramsar sites/wetlands.

Changes in attitudes towards water and perception of water as a highly valuable resource can be reached through intensive education, training activities and environmental awareness enhancement. This point of view was adopted by the UNESCO Moscow Office and Coca-Cola HBC Eurasia. As a result in 2006 the partnership between the organizations was established and the programme for "Living Volga" was launched.

This partnership has been further developed and used as an efficient vehicle in the on-ground contributing to expected results of the new UNESCO biennium, DESD and the UNESCO Moscow Office strategy and work plan.

By the end of 2007 the pilot/demonstration project on sustainable development "Enhancement of environmental awareness targeting effective water and wetlands ecosystems management of the Volga delta" was implemented. Then the programme smoothly moved to the second phase "Towards enhanced knowledge of the Volga river basin ecosystems and their sustainable use: follow-up on the Living Volga programme".

The main outcomes of the programme are the development of methodological materials on Volga wetlands preservation, training workshops and training modules on stakeholder involvement into ecosystem conservation. The materials were approved at the training-workshop on "Involvement of governmental, private and public organizations in addressing the issues of conservation of the Lower Volga wetlands", held in September 2007 in Astrakhan and Astrakhansky State Biosphere Reserve, Russia. These informational and methodological materials can be used for environmental education purposes by professional or non-professional educators, as well as a self-instructional material – "from children to ministers".

The Volga Day was officially launched on 20 May 2008 in Nizhniy Novgorod. The UNESCO Moscow Office and Coca-Cola HBC Eurasia proposed to inscribe the annual Volga Day in the international ecological calendar with the purpose to raise the public awareness on the problems of conservation Volga River nature and sustainable use of its resources.

The Volga Day is to be a regional festival honoring the Volga River and its vital role in providing water, food, power, recreation and livelihood, commemorating the need of its conservation and sustainable use, as well as the importance of joint action of different stakeholders in addressing these challenges. This ecological event aims to attract public attention to problems of Volga preservation and symbolically is a follower of a Danube Day celebration.

The innovative education and awareness tools – education and awareness Volga Kits – were also developed, based on the principles of sustainable development and environmental education and awareness, and will be broadly disseminated.

Volga Kits are focused on different user/stakeholder groups in Russian and English. It gives local private, governmental, educational organizations, general local public, mass media, schoolchildren and youth a greater understanding of the Volga river, the threats posed to the river and the need to conserve and preserve water and water related ecosystems.

Main recommendations

- Mobilization of resources and an establishment of a strategic partnership is one of key steps to facilitate a progress and focus further on a sustainability of reached results.
- Stakeholders' involvement is recognized as an integral need and even requirement to focus on such objectives as having been set-up in this initiative. In fact, stakeholders' participation is a key instrument and an ultimate aim to implement the project.
- Local authorities and communities will further play an important role as they received a better awareness and valuation of biodiversity resources of the Volga River basin including water and wetlands ecosystems and an understanding of the principles of sustainable development.
- Raising the visibility and understanding of Education for Sustainable Development (ESD) at the local and regional level helps significantly to implement DESD goals. Moreover, it contributes to the ability of the subjects within the Volga River Basin to plan and manage the Volga river catchment area on a sustainable basis.
- Cooperation and coordination with National Committees of UNESCO scientific programmes – International Hydrological Programme (IHP), Man and Biosphere (MaB) Programme and with other UN organizations operating in the area concerned assist to link and complement joint activities, to avoid negative overlaps, to exchange knowledge and experience and to share benefits.
- As the Living Volga Programme and its mission is in a conformity with sustainable development needs as stated in Seville strategy and Biosphere Reserves Statutory Framework, it is recommended to be considered as a best practice of an on-the ground implementation of the current Madrid action Plan for MaB Programme and Biosphere Reserves and thus, to follow-up on it accordingly.

Topic 4: Community and stakeholder education

Name :

Mrs. Merebeth Switzer
Mr. Rick Wishart

Organisation:

Ducks Unlimited,
Canada

Ducks Unlimited Canada (DUC)

Since 1938, Ducks Unlimited Canada (DUC) has conserved, restored and managed wetlands and associated habitats based on sound science. With 450 staff, 7,300 volunteers, 75,000 members, and 18,300 partner landowners, DUC's grassroots multi-faceted approach has positively influenced over 13.5 million ha. This case study demonstrates several approaches to address wetland conservation and source water protection in Canada.

Healthy Wetlands, Healthy Communities – Human impacts have destroyed 70% of wetlands across southern Canada. This multi-year, multi-partner effort improved the capacity of 14 existing key interpretive facilities to better educate the public about the link between wetland protection and their water supply. Its success has led to a second phase to expand landowner stewardship in important wetland areas.

See www.downatthepond.ca

Driving Demand to Change Policy – Partnering with universities, DUC's researchers studied the Broughton's Creek watershed to investigate trends in land use and wetland loss associated with impacts on water quality, greenhouse gas emissions and nutrient loading on Lake Winnipeg. Modeling of findings support the need to broadly enact wetland protection policies. Information is being disseminated through the media, stakeholder meetings, and conferences to politicians and the public to encourage governments to change policies.

See <http://www.ducks.ca/conservation/research/projects/broughtons/index.html>

Healthy Prairie Landscapes – This multi-faceted initiative in partnership with Richardson International, a leader in Canadian agriculture, will demonstrate the link between wetland loss, watershed health and the quality of life for rural residents. Three Sustainable Land Use Centres with an array of beneficial land use practices will show how habitat conservation can complement commercial agriculture and resource extraction. Sites will incorporate DUC's successful, school-based Wetland Centres of Excellence program to provide student enrichment studies on wetlands and water quality. Outreach, through the media, post-secondary educational institutions, and farm extension programs will disseminate information to target audiences. The program will be evaluated against desired outcomes so that changes to future programs can be made.

Recommendations:

1. Make information and science-based solutions personally relevant by providing examples that people can relate to, demonstrated by credible local or peer advocates (e.g. farmers speaking to farmers, students to students, etc.) and which allow people to take action.
2. Work with partners to implement a multi-pronged approach to reach a range of key stakeholders (eg. politicians, landowners, educators, students, corporations, media) using a range of tools (eg. media, stakeholder meetings, education policy, interpretive centres, demonstration sites).
3. Weakness – "Education" and communications are often too technical. Researchers and others in the field need to recognize that we have a specialized vocabulary, a high level of education and training, and that we are hugely focused on

this topic so we see it as a primary priority. We need to communicate to people with passion in the language and ways that work best for them and not to simply impart our knowledge. We also need to present it in a way that integrates with their own interests, feelings and priorities so that they are engaged in finding solutions with us.

4. Weakness – Often goals for success are not established as part of implementing a program. Measureable goals that are evaluated are needed from the outset so that adaptation can assure programs are effective and efficient.

Topic 5: Water education for and through mass-media professionals

Name :

Mr. Dick de Jong
[http://www.irc.nl/page/27806/\(nid\)/645](http://www.irc.nl/page/27806/(nid)/645)

Organisation:

IRC International Water and Sanitation Centre,
www.irc.nl,
The Netherlands

Case/Experience

I am a Journalist from the School of Journalism in Utrecht (1969), with over 30 years of experience as a practicing communication specialist, including seven years in international and national journalism and three years in the field of information and communication with UNICEF in Bangladesh. With IRC more than 25 years involvement with communication and newsletter writing on water supply, sanitation and hygiene education in developing countries. Responsible for IRC's global public information, advocacy and communication programme and provides support to its activities in newsletter writing, communication planning and media training. In the period 2007-2009 I helped design and facilitate four media training workshops in Asia for various UN agencies.

Findings

- Mainstream journalists focus too much on water conflicts and disasters crisis news reporting.
- There is lack of capacity for more investigative feature writing, radio and TV programmes on water sanitation and hygiene.
- Most journalists in our workshops did not want to collaborate and share with colleagues, except for some story ideas
- Not enough financing available for national workshops with media professionals.
- The International Year of Sanitation provided a good opportunity for media attention for sanitation.
- The use of ambassadors/celebrities such as Prince Willem Alexander, Nepali actress Jharana Thapa (sanitation ambassador), Rose George and Angelina Jolie attracted attention on sanitation and water of the mainstream and trade press in 2008.

Recommendations

- UN-Water to organize more finance for national media and water workshops.
- Proactively involve selected media bosses and chief editors through high-profile dinner and keynote+ speaker sessions.
- Create a water media college/programme at the various Water Academies (Sweden, Abu Dhabi), the latter already requested by Egypt.
- Create a global Water and Media website with existing regional media networks, such as the Asia Water Wire <http://www.asiawaterwire.net/> , Africa Environment <http://www.ipsnews.net/africa/environment.asp>, both from IPS, and a newly suggested one on the Arab Water Council site.
- UN- Water Decade Programme on Capacity Development to create a joint platform, generate more funding and more synergy between the existing water and media programmes of the Fifth World Water Forum, United Nations Convention Combating Desertification (UNCCD), UN-HABITAT, Water Supply and Sanitation Collaborative Council (WSSCC), and World Water Council (WWC).

Topic 5: Water education for and through mass-media professionals

Name :

Mrs. Renée Vergouwe, Programme
manager Human Capital Water

Organisation:

Netherlands Water Partnership (NWP)
The Netherlands

Experience/case/project: Human Capital Water programme

The Dutch water sector that is renowned for its expertise worldwide, faces major challenges. We will have to deal with changing circumstances at a national as well as an international level. Where sea and land meet, the land use will have to change radically, so that we are prepared for climate change. The increase in population and urbanization also require adjustments to the way we use the land. But this necessity also creates opportunities. Opportunities which the Dutch water sector intends to seize and cash in on. We strive to prepare the Netherlands sustainably for the expected developments resulting from climate change, and to help the Netherlands excel in the field of delta technology and to strengthen its export position in this field. We also aim to create an excellent Dutch water technology sector that serves both economic and social purposes, in the Netherlands as well as abroad.

These are ambitious objectives, which can only be achieved if the water sector has sufficient, well-qualified professionals, who are able to combine knowledge, technique and technology with creativity, commercial instinct and entrepreneurship. And that deserves our particular attention. The labour market is already tight, and the shortage will only increase in the years to come. If we do not intervene, a major gap will arise between the demand for personnel due to replacement and growth and the supply of personnel (i.e. the intake of graduates from water related studies).. It concerns vacancies at all educational levels, from lower secondary professional education to scientific education. And this situation is aggravated by the fact that the water sector has to fight with strong competitors.

To turn this tendency around, and to increase the intake of well-qualified professionals, the water sector has joined forces and set up the Human Capital Water programme. This programme consists of activities in mainly two areas. Firstly, making the water sector more widely known, and improving its image. Secondly, to reduce the gap between education and labour market, by increasing the focus on water and the water sector at all educational levels, in order to inspire pupils and students to take up studies that eventually lead them to a career in the water sector. To achieve this, water sector organizations need to cooperate with education institutes. Moreover they need to work together, as only joint efforts can result in a major increase in young people choosing for a future in the field of water.

Topic 5: Water education for and through mass-media professionals

Name :

Mrs. Marianne van As

Organisation:

Netherlands Watermuseum, Arnhem,
The Netherlands

My experience

The Netherlands Water Museum is a modern, interactive museum dedicated to all aspects of freshwater. A "hands on" museum where you can take a trip through a sewer, watch a fascinating film about water and do water experiments and also find out about dyke management, drinking water, groundwater and how people in the Netherlands and the rest of the world use water.

The Netherlands Water Museum was initiated by Henk van Brink, Dyke Warden of the Rhine and IJssel Water Board. The Netherlands consists of 26 water boards. Most of these boards take care of their own communication towards inhabitants on projects in their catchment area. On big projects this has proven not to be successful. This is mainly the reason why the Netherlands Watermuseum was built.

The people in the Netherlands are generally not aware of the danger that living under sea level brings, or that living behind River dykes brings. People generally think there is no reason to fear, as we've been safe for such a long time! Since 2000 (after the near floodings of '93, '95), new national policies came into place to include the consequences of climate change.

For example, new policy came into place : "Room for water", as the dykes will not be big and strong enough to hold the water in the future. Of course, there was a lot of reluctance towards this policy, especially in areas where houses might disappear under water to give room for water. A big national campaign was started: Netherlands Lives with Water. The aim of this campaign is to create understanding towards the policy, through radio and tv commercials and all sorts of local campaigns and pilot projects. Combining these pilots and projects with a visit to for instance, the Netherlands Water museum, will have a bigger impact, because in the museum we can explain the situation from all sides, and show all the aspects and consequences in a "hands on" way.

Recommendations:

Communication and education should go hand in hand. Many organisations assume that if they communicate about certain aspects or changes in the water system, they did their job. But only when people come to a place like the Netherlands Water museum, where communication takes place through interaction in a game and by finding your own solutions, they really start to understand (learn) why fresh water is such a precious resource and why water management is such an important task. Through education you communicate!

People need to make their own mistakes: through interactive media, or hands on science centres this can be made possible. Through mistakes, people learn.

Annex 3: Workshop programme

26 February, Day 1, Expert Meeting "Water and Education"		
		Room
08:30 – 09:00	Registration at UNESCO-IHE	Hall Reception
<i>Plenary</i> 09:00 – 09:15	<p>Session 1: Opening (plenary)</p> <ul style="list-style-type: none"> • Word of welcome by Rector UNESCO-IHE (Mr. Richard Meganck, Rector UNESCO-IHE) • Explanation of the workshop Process (Mr. Carel Keuls - UNESCO-IHE) 	Plenary Chair: Mr. Jan Luijendijk
09:15 – 09:45	<p>Session 2: Opening Keynote on Water and Education</p> <p>Mr. András Szöllösi-Nagy, Director of the Division of Water and Secretary of the International Hydrological Programme of the United Nations Educational, UNESCO</p> <ul style="list-style-type: none"> • Keynote introducing the IHP Water Education Program and Scoping Needs, addresses global climate and political, economic changes, the need for education and some challenging statements on knowledge and learning 	
09:45 – 10:00	<p>Mrs. Natalie Ferguson (Jamaica), Member of the UNESCO-IHP/Project WET Water and Education Coordination Committee</p> <ul style="list-style-type: none"> • Recommendations from the Expertmeeting on Water and Education in Asuncion, for the region Latin America and Caribbean, December 2008 	Auditorium
10:00 to 10:30	Coffee/Tea Break	
<i>Plenary</i> 10.30 – 12.35	<p>Session 3: Opening Keynotes on Meeting Topics</p> <p>Reflections on key topic questions + relation to other topics (max. 25 minutes)</p> <p>10.30 – 10.55: Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers Mr. Richard Meganck, Rector UNESCO-IHE</p> <p>10.55 – 11.20: Topic 2: Education and training of water technicians Mr. Paul Bourget, Institute for Water Resources, U. S. Army Corps of Engineers, USA</p> <p>11.20 – 11.45: Topic 3: Water education in schools/K12 Mr. Matthijs Begeyn, SME Advies, The Netherlands</p> <p>11.45 – 12.10: Topic 4: Community and stakeholder education Mrs. Eva Csobod, Director Regional Environmental Centre for Central and Eastern Europe (RECCEE), Hungary</p> <p>12.10 – 12.35: Topic 5: Water education through mass-media Mrs. Saskia Ras, Dutch National Campaign "Netherlands lives with water", Ministry of Transport, Public Works and Water Management, The Netherlands</p>	Plenary Chair: Mr. Jan Luijendijk Auditorium
12:35 – 13:30	Lunch	Restaurant

<p>Parallel Group sessions</p> <p>13:30 – 17:00</p>	<p>Session 4: Water and Education Domains: Analysis and exchange of current practices, challenges, constraints, good examples on the basis of 4 key questions:</p> <ul style="list-style-type: none"> - What are the key issues within this professional field, given current and future developments? Are there regional differences? - What appear to be successful approaches or at least ingredients for success within your Topic? Are there regional differences? - What limitations/bottlenecks is this Topic confronted with? Are there regional differences? - How is the relation to the water sector as a whole and/or in relation to the other topics developed? Are there regional differences? <ul style="list-style-type: none"> ▪ Topic 1: Tertiary education and professional development of water scientist, engineers, managers and decision makers <i>Chair: Mrs. Marie Prchalova, UNESCO-Moscow</i> <i>Rapporteur: Judith Kaspersma – UNESCO-IHE</i> ▪ Topic 2: Education and training of water technicians <i>Chair: Jan Leentvaar – UNESCO-IHE/UNW-DPC</i> <i>Rapporteur: Marloes Mul – UNESCO-IHE</i> ▪ Topic 3: Water education in schools/K12 <i>Chair: Meine Pieter van Dijk /Mathew Kurian – UNESCO-IHE</i> <i>Rapporteur: Mathew Kurian/Miguel Doria – UNESCO-IHP</i> ▪ Topic 4: Community and stakeholder education <i>Chair: Krishna Prasad – UNESCO-IHE</i> <i>Rapporteur: Marco Schouten – UNESCO-IHE</i> ▪ Topic 5: Water education for mass-media professionals <i>Chair: Dick de Jong – IRC</i> <i>Rapporteur: Alida Pham – UNESCO-IHE</i> 	<p>A2</p> <p>D1</p> <p>SocioRoom</p> <p>D2</p> <p>Video Conference Room</p>
<p>Break from 15.30 – 16.00</p>		
<p>17.00 – 18.00</p>	<p>Session 5: Preparing Group Presentations on 4 key questions Preparing group presentation on the 4 key questions</p>	<p>Same Group Rooms</p>
<p>19.00</p>	<p>Meet at Reception UNESCO-IHE, Joint walk to Restaurant</p>	
<p>19:30 – 21.30</p>	<p>Dinner</p>	<p>Restaurant De Prinsenkelder</p>

27 February, Day 2, Expert Meeting "Water and Education"		
08:30 – 09:00	Coffee / Tea	Restaurant
Plenary 09:00 – 10:30	Session 6: Group Analysis Wrap up 09.00 – 09.05: Day Introduction Sharing Group Presentations; Recap of the First Day 09.05 – 09.20: Presentation & Discussion 4 key questions Topic 1 (<i>Presenter</i>) 09.20 – 09.35: Presentation & Discussion 4 key questions Topic 2 (<i>Presenter</i>) 09.35 – 09.50: Presentation & Discussion 4 key questions Topic 3 (<i>Presenter</i>) 09.50 – 10.05: Presentation & Discussion 4 key questions Topic 4 (<i>Presenter</i>) 10.05 – 10.20: Presentation & Discussion 4 key questions Topic 5 (<i>Presenter</i>)	Plenary Chair: Jan Luijendijk Auditorium (A 1b)
10:30 – 11:00	Coffee/Tea Break	Restaurant
Parallel Group session 11:00 – 12:30	Session 7: Group Discussion Keymessages/ Recommendations and Actions Group Discussion Topic 1 Group Discussion Topic 2 Group Discussion Topic 3 Group Discussion Topic 4 Group Discussion Topic 5	A2 D1 SocioRoom D2 VideoConference Room
12:30 – 13:00	Preparation presentations on Recommendations & Actions	
13:00 – 14:00	Lunch: Connect & Share	Restaurant
Plenary 14:00 – 14:50	Session 8: Sharing of Topic Recommendations & Actions 14.00 – 14.10: Recommendations & Actions Topic 1 (<i>Presenter</i>) 14.10 – 14.20: Recommendations & Actions Topic 2 (<i>Presenter</i>) 14.20 – 14.30: Recommendations & Actions Topic 3 (<i>Presenter</i>) 14.30 – 14.40: Recommendations & Actions Topic 4 (<i>Presenter</i>) 14.40 – 14.50: Recommendations & Actions Topic 5 (<i>Presenter</i>)	A2 Plenary Chair: Jan Luijendijk
14:50 – 15:00	Write/Make your adjustments to recommendations	
15:00 – 15:30	Coffee/Tea break	Restaurant
Plenary 15:30 – 16:30	Session 9: Panel Discussion on Recommendations & Actions Final Panel Discussion on Topic Results, collected adjustments, possible overall recommendations, as well interconnections between topics & Follow Up	Plenary Chair: Jan Luijendijk A2
16:30 – 16:45	Closing statements & closure	
17:00 – 18:00	Farewell Drinks	Hall D2

Overview of involved Chair(wo)men and Reporters for the Topic Group Sessions:

Plenary Chair:	Mr. Jan Luijendijk – UNESCO-IHE
Plenary Rapporteur:	Mr. Carel Keuls – UNESCO-IHE
Chair Topic 1:	Mrs. Marie Prchalova – UNESCO-Moscow
Rapporteur Topic 1:	Mrs. Judith Kaspersma – UNESCO-IHE
Chair Topic 2:	Mr. Jan Leentvaar – UNESCO-IHE/UN-U, Bonn
Rapporteur Topic 2:	Mrs. Marloes Mul – UNESCO-IHE
Chair Topic 3:	Mr. M.P. van Dijk – UNESCO-IHE (Day 1) Mr. Mathew Kurian – UNESCO-IHE (Day 2)
Rapporteur Topic 3:	Mr. Mathew Kurian – UNESCO-IHE (Day 1) Mr. Miguel Doria – UNESCO-IHP (Day 2)
Chair Topic 4:	Mr. Krishna Prasad – UNESCO-IHE
Rapporteur Topic 4:	Mr. Marco Schouten – UNESCO-IHE
Chair Topic 5:	Mr. Dick de Jong - IRC
Rapporteur Topic 5:	Mrs. Alida Pham – UNESCO-IHE
Backup Chair:	Mr. Nigel Wright – UNESCO-IHE
Backup Rapporteurs:	Mrs. Vanessa D'Oliveira – UNESCO-IHE Mrs. Mishka Stuip – UNESCO-IHE