

Sustainability education centres, master education and student exchange





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Abstract

One important part of WP3 in SAWA was the education activities. In this report three activities are reported: 1) the 7 sustainability education centres (SECs), 2) the higher education (master and upper bachelor level) and 3) the student exchange programme (SEP).

The 7 SECs that were developed at universities and public institutions in 4 of the SAWA countries became nodes for education, information dissemination. They linked school and university activities to local (SAWA) projects and authority activities within the implementation process, whilst supporting public perception and integration. Several target groups have been addressed, e.g. the public, school pupils, university students, and water experts within and outside SAWA.

The SECs have reached a very large number of Europeans, in the efforts to educate and build capacity for flood risk management. The centres have had impact on local, on regional and on national level in the SAWA countries. Several of the activities have also been trans-national. The SECs has created arenas for meetings, for reflections, for discussions and for learning. And the public, the flood experts, students and various stakeholders have been connected because of the SAWA SECs. The future plans for the 7 SECs are also a guarantee for a substantial impact also onwards in Europe from the SAWA project.

Higher education has been a focus area for the 7 SAWA universities. There are several incentives for education on water management and flood risks. One driving force is to spread the knowledge and experiences from the serious flood events that has occurred in Europe the last decades. Another strong force is the climate change, which causes need for new knowledge and education. A third incentive in the floods area is the EU Flood Directive that was adopted in 2007 and now is implemented in all member states.

A jointly developed and implemented master course (15 credits) has engaged ca. 30 students and complementary master and upper bachelor education more than 300 students. The students were both regular students and professionals from 12 different countries. The SAWA master course has been given 2011 and 2012. Four themes gave the structure of the course: governance and legal framework, flood risk analysis, integrative planning and adaptive measures. The learning components were lectures, excursions, individual assignment and a group work. Many of the SAWA partners have actively contributed to the activities which have given valuable examples. The post-evaluation for 2011 gave an over-all score of 4.1 on a five-degree scale.

A 1-2 year master programme was outlined among the SAWA universities. The bearing components were the combination of water and flood risk management. This education idea can be implemented in future transnational projects.

A concept for student exchange was developed and more than 50 students at bachelor, master and doctoral level took part in the SAWA exchange. The SAWA network is a tremendous basis for future student and staff exchange activities. The SAWA master course that is now a permanent course at Karlstad University will be a platform for student exchange and for continuous cooperation between the SAWA universities.

1.Sustainability Education Centres (SECs)

1.1 Purpose

As one of the major outputs in SAWA is the establishment of 7 Centres for sustainability education (SEC). According to the application to the Interreg North Sea program from the SAWA partners:

"centres for education towards sfm¹ (SEC) will be installed at universities or public institutions, providing hands on educational activities, tools and information on sfm education for the public, schools (+ universities), linking school and university activities to local (SAWA) projects and authority activities within the implementation process, whilst supporting public perception and integration".

Further according to the application, expressed as one of the seven project phases:

"Establish a network of SEC's where information and education material is concentrated either as a virtual (www) or, in some cases, a real office. The established structure should also provide a platform to disseminate SAWA outputs (e.g. course materials, contact persons, student exchange programs, etc.) and will outlive SAWA."

Based on these activities, centres for education (SEC) have been installed at universities and public institutions, providing hands on educational activities, tools and information on education for the public, schools (+ universities), linking school and university activities to local (SAWA) projects and authority activities within the implementation process, whilst supporting public perception and integration.

SAWA have established a network of SEC's where information and education material is concentrated either as a virtual (www) or, in some cases, a real office. The established structure provides a platform for dissemination of SAWA outputs (e.g. course materials, contact persons, student exchange programs, etc.) and will outlive SAWA.

1.2 The SEC concept

Based on a concept paper² the following concept description guided the development and implementation on the SAWA SECs:

The idea of the centres for sustainability education

The idea of local centres that engage in education for sustainable use of floodplains and respective approaches to water is predicated on these requirements. The overall aim is the integration into the local culture, to develop a "water culture" that recognizes waters and floods as qualities of the area and provides approaches to adapt to and live with it.

The structure of ideas for the SEC-concept is shown in Fig. 1. The scope is that of the authentic surrounding and the flood and water related activities and project. The content is generally experience-based, giving a positive meaning and value to the water-affected surrounding. This shall happen in a collaborative way, integrating different target groups in interaction with the

¹ sustainable flood risk management

² Geissler, T.R. Requirements for Capacity Supportive Design of Sustainability Education Centres. SAWA, 30 July 2009

water and flood issues and with each other, thus aiming to establish a local network, which will broaden to comprise a whole local society and thereby evolve into a local water-tinted culture."



Fig. 1. Structure of ideas for the SEC-concept.

The main position of the centre is that of a knot in a net: bringing and holding the different groups, projects, tasks, activities and information together (Fig. 2). Activities in this sense can be those done in any case by one or the other group or institution and that are suitable for participation but they can also be generated in a coordinate process. Examples for the first case are:

- residents or schools participating in maintenance work
- pupils taking responsibility for delivering information to residents

Examples for the second case are:

- Students arrange projects for school classes as semester assignment and in coordination with water board
- Local company sponsoring writing contest on the topic of "how my home town will look during a flood..."

The role of the SEC in these and similar cases would be initiation and coordination. But a SEC can just as well or in addition offer own activities like workshops, excursions, talks or establish a recurring memorial day and coordinate the activities – all and always with the vision of a cultural integration.

Examples:

- Residents participate in project work with local authorities
- Pupil develop and stage a play on flooding
- Students develop and conduct a project for school classes as assignment in coordination with the water board



Fig. 2. SEC-concept and role of SECs: Connecting people, groups, institutions, tasks projects and other SECs.

A didactic manual for SAWA SECs³ was developed in connection to the SEC in Delfland. Theories from the education and learning areas were used to formulate descriptions and recommendations for the SEC design. The Water Management Educational Exhibit was used as an example.

1.3 The 7 SAWA SECs

In the SAWA project 7 sustainability educations centres have been established. Those are:

- 1) Centre for Climate and Safety, Karlstad University, Sweden
- 2) Delfland Mobile Flood Exhibition, Netherlands
- 3) Dike protection training centre, Hamburg, Germany
- 4) Flood animation studio, TUHH, Hamburg, Germany
- 5) In Deep Water, Heriot-Watt University, Scotland
- 6) Lake Vänern Mobile exhibition, Sweden
- 7) Virtual centre for integrated water management (vIWa), Leuphana University, Germany

The SECs are described in more detail below.

³ Schmidt-Oorbeek, Charlotte. Didactic manual for SAWA SECs. University of Rotterdam. Oct 2009.

1.3.1 Centre for climate and safety, Karlstad University, Sweden

General description of SEC

The Centre for Climate and Safety (CCS) was established in spring 2008 as a university centre at Karlstad University. The SEC has been a substantial part of the centre activities during 2008-2011. The SAWA consortium has been a strong basis for European cooperation for this SEC. The SEC has initiated activities and used SAWA results and networks for research, education and collaboration.

Target groups have been professionals at primarily local and regional level, but also national authorities and private sectors such as insurance, hydropower and technical consultants. Another important target group has been students in Sweden and internationally. Some of the activities have also been directed towards the public.

Major SEC activities during the SAWA-period

• National conferences on water risk management

In 2009, 2010 and 2011 conferences on water-related risks has gathered more than 500 experts and stakeholders in Sweden. In 2009 and 2011 there were two-day conferences, whereas in 2010 it was a one-day conference. There have also been exhibition areas for companies and other interested parties to expose products and services.

• National network for stakeholders in Flood risk management

The SEC has established a network which in January 2012 has gathered 25 organisations and 60 contacts persons from municipalities, regional and national authorities and private companies. Seminars and workshops are held ca twice a year. The latest workshop in Gothenburg 2011 had the title "Climate Proof Cities".



Excursion along River Mölndalsån during workshop on Climate Proof Cities in Gothenburg in May 2011.

Master course

A master course on Integrated Flood Risk Management was developed in cooperation with six universities within SAWA. The course comprised 15 credits and was given the first time in spring 2011. The course will also be offered during spring 2012. This course is another phase in SAWA and is reported separately.

• Bachelor courses on Climate change, risks and risk management

Several courses on bachelor level were developed by the SEC. The themes in these courses were climate change, extreme weather, societal vulnerability, risk management, etc. Most courses are based on e-learning. One of the courses is about Water and flood risk management and is a parallel course to the master course described above. Another course has been directed towards Lake Vänern which was one of the test sites in WP1.

• Student exchange

There has been a student exchange between students from Karlstad University and students from Leuphana University. The master course, which included two excursions, each of five days, recruited students of 12 different nationalities and many different universities. These excursions gave a substantial exchange of knowledge and experience among the students and teachers. Six PhD students from four different disciplines took part in a 9-day study tour in Germany (see below).

• Flood walk in Karlstad city (physical and virtual)

As a measure to build capacity a flood walk in the city of Karlstad was developed. The tour has 14 stops but normally only 5-6 stops are used during walks of ca 2 hrs. During the walk hazards and vulnerabilities are shown and discussed, but also risk-reducing measures from the municipality and other interests. Several groups have been guided, also international groups. As a development a virtual flood walk has been produce during 2011, to open up for use on the Internet.

• Floodville/Researchers night

The SEC was responsible for arranging Researchers night (EU FP7 activity) in Karlstad in 2011. The theme was water and climate and several activities were arranged that day: researchers visits to school classes, photo workshop, climate theatre, climate pub, etc. The target groups were youths and the public. One popular activity was to compete in the game Floodville which is a physical model of the Karlstad delta. Vulnerable objects in the city should be protected during some minutes of game.

• Publications

The SEC has developed a report series, and three research reports have been published during 2010-2011. The topics have been on 1) an evaluation of the damages after the flood in Lake Vänern 2000-01 2) GIS-applications in flood risk management and 3) social consequences of a low water level in Lake Vänern. A book about the 10-year anniversary of the large flood in Arvika in year 2000 was published in Nov 2010.



Gymnasium pupils preparing for the Floodville game during Researchers night, Sept 2011

• Communication

The SEC has established a website in Swedish and English with information about the SAWA-project and Climate risk management <u>www.kau.se/ccs</u>. Also different types of information material have been produced.

• Study tour to Germany

In Oct 2011 a 9-day long study tour along Elbe and the Rhein was made by 35 persons from Sweden, Finland, USA, Spain and Iran. The participants were professionals and PhD students. The cities of Hamburg, Dresden and Köln were visited as well as nature protection areas, villages and a marine national park.

Contribution to education, risk communication and capacity building

The CCS SEC has contributed substantially to the master education, bachelor education student exchange, etc. Also regarding capacity building, this centre has been active. A network of Swedish stakeholders has been established arranging workshops, study tours, etc. A flood walk in the city of Karlstad has been visited by many persons up to date. A virtual web-based flood walk has been developed to increase the dissemination of this concept. National conferences on water and flood management have contributed to an increased knowledge among many professionals. The engagement in Researchers Night, including the Floodville game, addressed especially capacity building among young people.

Future SEC activities

Several of the SEC activities started under the SAWA project will continue. The master and bachelor courses on Flood risk management will be given every year. The network of Swedish stakeholders that was started in 2009 will be an important basis for the SEC's external relations also henceforth. The network is growing continuously. A new study tour is preliminary planned for 2013, this time to the UK. The Flood walk concept is much requested and the idea is to develop the guide material further, to offer flood walks to a larger number of gymnasium pupils on a yearly basis and to develop the web-based version further.

1.3.2 Delfland Mobile flood exhibition, Netherlands

General description of SEC

The Dutch are internationally known for their battle against the water. Holland is famous for its mills, for winning land from the water, the delta works that protect our country from the sea and for keeping the lower parts – polders – of our country dry. All over the world Dutch water professionals contribute to projects on water safety, sanitation and water quality.

The oldest governmental institutes of the Netherlands are the water boards. The Dutch water boards are responsible for managing both water quality and quantity and for cleaning wastewater. There used to be thousands of them. Nowadays through merges there 25 are left. And, they are doing a good job. They have been doing such a good job, that most Dutch people have little idea what they are for. Although they have been doing a good job some political parties want to liquidate the water boards to accomplish cut backs. The water boards raise their own taxes, they know what needs to be done to protect their part of the land against the water and to keep the water clean. Should water management become a task of the national government, then for money it will have to compete with healthcare, education, defence, etc. Most countries in the world facing water problems are envious of the Dutch system, none the less, most Dutch people know too little of their water boards to want to keep them. The lack of knowledge of the Dutch also threatens their international position on water knowledge. Shortages on the labour market are foreseen in the nearby future if the Dutch young do not pick up on water management as an interesting career opportunity.

So, the water boards are facing an educational challenge. The Delfland water board has picked up this challenge since the end of 2006. Delfland is a region in the south west of Holland with 1.24 million inhabitants, 40.000 institutes and businesses, and a large green house area. Due to the intense expansion of activities the increasing amount of houses, buildings and roads has forced Delfland to constantly adapt and improve the drainage system. Especially the green house area has presented Delfland with challenges. This is the area where they have had some floods in the recent past (1998 and 2004).

Delfland is confronted with the effects of climate change. The rains are far more intense than before and on the other hand the area is facing longer periods of drought. Delfland has enhanced the capacity of pumping stations, widened canals, and realized retention basins. Delfland is also finalizing a large program on the improving of our regional barriers. The DSS system Delfland is working on is the crown on these investments. Delfland is also facing the effects of sea level rising. To keep the area safe Delfland has reinforced both the Delfland coast and the Scheveningen Coast.

Major SEC activities during the SAWA-period

A lot of work is being done, and it is all paid for by the people who live in Delfland. So for the water board of Delfland it was important to build an SEC that explains the main task to the people in the province. Delfland wants them to understand what the province do to keep their feet dry. For this Delfland built a mobile exhibit on the drainage system. An exhibit for Delflanders: it

is about their region, it's about the new DSS, the mills and pumping stations and canals in their own vicinity.

The exhibit comprises of four sections: three walls and what is known as a polder shower (see figure to the right). The parts can be positioned in the form of a circle to illustrate a water droplet. The exhibit can also be set up in the form of a wave. Both options provide easy access. Maximum use is made of the surface area by giving all the walls a function.

Text on the outer wall provides information regarding the water board. The inner wall displays informative text, an interactive map



and an interactive water stairway to explain the discharge & storage basin system (polder-boezemsysteem).

The opposite inner wall has a touch screen to acquaint people with how the Technical Automation project works. The polder shower will also attract the attention of members of the public. Visitors can enter the name of their home town to see how far below sea level it is situated.

The water exhibit provides various active components. The water stairway shows how the discharge & storage-basin system is used. The visitor can turn the Archimedean screw to pump up water. This concrete example directly illustrates what happens in a discharge & storage-basin



system and members of the public experience what one of the water board's tasks specifically involves. The same applies to the interactive map. The map displays the area where the visitors live and various buttons provide an overview of several pumping stations at the level of the discharge & storage-basin and at sea level. Here too, there is a clear link to the visitor's existing knowledge and the aim is to provide a concrete illustration of the water board's tasks. The polder shower is an attraction for everyone who likes to have a concrete experience of what it means to live in a

country where people live at many different levels under sea level. Visitors can enter a column which is enclosed on three sides, type in a place name and then immediately see at which height or depth the area is where they live. Discovering the various levels (polder level, storage-basin

level, sea level) is meaningful and the information can be used directly in the interactive components. Just having a pleasant experience is possible too and visitors who are not particularly interested in acquiring new knowledge still find the exhibit's attractive presentation and active components inviting and fun to try.



Young man actively experiencing the mobile exhibition in Delfland.



Mobile flood exhibition.

This exhibit is a mobile one. It was first presented at the opening of the RDM Campus in Rotterdam where the water management course of the HRO has found a new home. Then it was at the Science Centre of the Technical University of Delft. It has been on display several times at the visitors' centre of the Maeslant barrier. Delfland also uses it at congresses and events where

decision makers and the Delfland public are. The exhibit can be borrowed by schools, museums and educational institutes in Delfland.

Contribution to education, risk communication and capacity building

The Delfland exhibit had proven to raise awareness of flood risk in the lower parts of the south of Holland, has helped the visitors to understand the tasks of the Dutch water boards in general and Delfland in particular and is being used to interest the young for water management

Future SEC activities

Delfland uses the mobile exhibition at congresses and events where decision makers and the Delfland public are. The exhibit can be borrowed by schools, museums and educational institutes in Delfland.

The ambition is to develop the Sec further. One important issue is to connect the SEC to the Delfland operational water management system. This would make the the SEC also attractive for water professionals. Further on a new case study will be added to keep up the attraction to visit the exhibition.

1.3.3 Dike protection training centre, Hamburg, Germany

General description of SEC

There was a time when all of this was common knowledge. The lowlands at the Elbe and the Elbe islands and in particular the dykes, their construction and maintenance was well present as part of the local culture. Every landowner in the lowlands was bound to participate in protecting this stretch of land against the river and its floods. Building and maintenance of dykes was just as well part of everyday life as was the wearisome defence in times of high tides. Everyone helped with the dykes. Thus, the exposure to the waters of the river Elbe and the North Sea, the possibilities of high tides and the devastating power of storm surges was firmly rooted in the individual experience and the conception of ones living environment. The legends that have formed dealing with floods and dykes bear witness to this presence and general importance, showing the societal implications and integration with everyday life. It was part of the local self-understanding.

This is far-off from the situation today. Knowledge and comprehension have disappeared in many areas, as people are no longer involved in the dyke building activities in general and – even worse – a large proportion of the population is no longer aware that the land, they live on is protected by dykes and is usable and habitable only thanks to these dykes. This is particularly true for the densely populated western parts of the Elbe islands. This ignorance accounts for a variety of problems even outside of acute hazardous situations. Protection of dykes and respect for their needs have become urgent issues, as appropriate behaviour is hardly possible if understanding of purpose and function lacks. In emergency situations, this lack of "dyke culture" may simply become dangerous or life threatening for both the individual and the whole local society. Regulations and prohibitions are inimical to the cause, as experience by dyke associations shows. Improper use of dyke areas like driving up and parking on dyke slopes are clear signs of lack of knowledge – and information only reaches those that are looking for it. For this reason, establishing the DykeDefenceClass shall lead onto a path, where at the end dykes will be re-established as part of a local culture: Knowledge of dykes, awareness for their existence, importance and function as common part of local consciousness and comprehension of place.

The concept of the DykeDefenceClass will help ensure that local people build relations to dykes and storm surges as being part of their lives, helping them to know "their" dykes, have realistic pictures of their exposed living environment – providing room for these issues in consciousness as well as in daily life without promoting fear and retreat.

The following strategic and qualitative criteria should pave the way:

- The activities will be implemented in schools, making use of the disseminating function of children to possibly reach the parents as well.
- The children and teenagers shall encounter the topic in theory as well as experientially having to deal with real situations on real sites. In particular, they shall experience the basics of dyke building, the interaction of water, sand and soil, feel the forces and encounter the relentlessness of water "with their hands in the mud".

- To bring about familiarity, the topics shall be encountered and experienced intensively, at best interdisciplinary in various situations over time, in different forms and contexts. There should be re-encounters in school, in everyday life, sports, the environment.
- To promote positive relations, encounters shall come about in the form of events, constitute adventures. And they should establish personal references. Ones "own dyke in the backyard" is a quality of great importance.

The Concept is designed in 3 steps

Step1: Preparation in class

Educational material will be designed. This includes

- a compilation of knowledge, information and sources for the teachers, regarding literature, institutions and reliable sources on the Internet
- an age-appropriate presentation of specific and technical issues for the pupils, the DykingBook, introducing a kind of "corporate design" to be re-discovered later on in the following steps and activities
- a compilation of subsequent worksheets, assignments and projects or experiments

Step 2: Find the real things...

Dyke excursion: see dykes and make them yourself.

Survey and exploration of various protective infrastructures throughout Hamburg, i.e. on one of the DykeWaterPath1: dykes, walls, gates, culverts, sluices, pumping stations. There will be a guiding booklet and study materials. End point of the excursion is the beach in Blankenese, where children can build their own dykes and dams at low tide to use it for observations and experiments.

Step 3: Dyke defence

Understand what threatens the dykes, what can be done to protect the dykes and how it works all by doing and attending explanation. This is the part at the training centre for dyke safety, carried out in the pilot project, in the way described below.

Major SEC activities during the SAWA-period

<u>A Pilot Project:</u> The first implementation of the concept was carried out as pilot project with an 8th grade class of the Stadtteilschule Wilhelmsburg (a comprehensive school in the district of Wilhelmsburg on the Elbe Island). It was a shortened version, that skipped excursions and broad interdisciplinary introductions into the topic, but consisted of two central units,

- the application of DykingCrates (dyke models) in school and
- a DykeDefenceRally, carried out on the premises and with the equipment of the training centre for dyke safety.

The following paragraphs give a short introduction to this pilot implementation and draw a résumé with recommendations for a regular implementation.



Dyke breach in the classroom. Pupils form sand models of dyke start the flooding and observe how their dykes behave when hydraulic stress rises. The dykes collapse due to seepage failure. A series of several experiments trains the eye for details, such as the advancing wetting towards a seepage at the opposite dyke slope.

Our pilot class, the class 8d of the comprehensive school Wilhelmsburg has chosen tides and storm surges as theme for their school profile, meaning the students will immerse themselves into every aspect of floods, dykes, flood protection and dyke defence, as far as their living environment is affected by it. Having become Flood Scouts after this period, they will engage in passing on their knowledge to their fellow citizens. Dissemination of experience and knowledge is stated goal right from the beginning of this project. The participating students had no special knowledge prior to this pilot project, neither in a theoretical manner nor as being themselves subject to the matter, due to living in this low lying part of Hamburg on the Elbe Island.

<u>DykingCrate</u>: The pilot group's first encounter with dyking, dyke protection and the defence of dykes took place in the classroom. A prototype of the DykingCrate was put to action, allowing groups of pupils to build dyke models from sand in a glass container, which was then strained by a simulated Flood-in-the-Box, slowly but steadily – until a dyke breach occurred, mostly due to seepage failure. Four groups hade made four dykes, one per group. When the construction works were finished, the DykingCrates were flooded one by one. Thus the pupils could observe the course of things happening four times, from the dry dyke to its breaching.

<u>DykeDefenceRally</u>: The class's second encounter with dyke defence took place on the premises of the training centre for dyke safety, a facility of the agency of roads, bridges and waters, which otherwise serves to educate and train the experts for dyke defence. The compound of this facility provides a variety of training situations for learning and practicing actions and operation sequences in dyke defence work. Similar to an emergency situation, the four groups were requested to carry out these works against time, while obeying the quality of their works or giving estimations as to the dyke's behaviour under flood load. Two pairs of groups worked the

stations in direct competition, doing the following: (1) Comparison of the behaviour of an unsupported sand dyke and a dyke supported by a foot protection. (2) Estimate the final position of the seepage line at a 1:1 sand dyke model, that will form inside the body of a dyke, that is impounded to its crest (3) Fill sandbags (4) Use sandbags to build a foot protection for the dyke (5) Build a sandbag embankment for a seepage point (Quellkade).



Material: glass tank, sand, shovels, scrapers, a paper pattern of the dykes cross section and a reservoir.

Each group received a notebook with worksheets and free space for note taking. The worksheets explained the stations, the tasks at each and the rules of the respective competition. Points were rewarded for the results regarding the time needed, quality of the results and the answers to the questions. Finally a award ceremony was held. All pupils received a certificate; the trophy for the winning team was a "Dyke Preserver Spade" – which in the case of this pilot class now inherits a place of honour on the classroom wall.



Filling sand bags, hauling sand bags, feeling the arms getting longer. Hard work for 8th graders. But shining faces in the end, after the awards ceremony, showing the certificate to the photographer.

Future SEC profile and activities

The regular school schedules comprise several project phases per year, each of a week's length. The Dyking package would be best suitable, if it would fit into this time frame. In addition, these project phases are partly harmonized among different schools to avoid too much overlapping. A more interdisciplinary approach will provide several options for reencounter with the topic. Another appealing approach would cover the topic in to different age levels, thus giving the chance to come back to the topic with a developed background and on a widened, elaborate level of comprehension, while having lived with it over the years. Especially intriguing, a critical discussion later on would provide the chance to reflect upon own behaviour and societal implications in risk-taking.

Guidance for project work, excursions, experiments etc. would as well be helpful if not mandatory, as teaching material as well as learning material. A DykingBook as workbook for pupils could contain much of the necessary material and facilitate a better recognition and familiarity by using consistent graphical elements throughout all parts.

The DykingCrate component should be extended to show different modes of function, e.g. clay dykes and other forms in addition to the mere sand dyke. In addition, there should be possibilities to visualise the principle of the seepage line and make it comprehensible. Furthermore, experiments can be accomplished outdoors, in the real environment. Tidal beaches are very suitable to dam up water, let dams collapse...

What's the whole matter like in the real world? At least one excursion should connect the "familiar" environment with the whole topic, showing the nearness to the topic. With respect to the "My Dyke" strategy, excursions should be adapted to a class's respective residential surrounding. Connections to other projects like the DykePark, the WaterBuildingPlayground or the WaterPaths can bring further input.

1.3.4 Flood animation studio, TUHH, Hamburg, Germany

General background and description of SEC

Due to the uncertain future development driven by climate change (IPPC, 2007) or rapid urbanisation, and increasing number of stakeholders can be potentially affected by floods, going beyond the existing borders of flood prone areas. For example, the intensity of heavy rainfalls is likely to increase in Northern Europe (IPCC, 2007), which when combined with urban redensification can cause severe pluvial floods. Also, due to the sea level rise, the existing flood defence structures are likely not to guarantee sufficient protection level of the areas behind them (e.g. dikes). The development of new strategies for coping with the uncertainties and existing and future flood risks sets challenges to the stakeholders, causing rethinking of their current attitudes and practices, requiring their active involvement in Flood Risk Management (FRM). Substantial challenge is set to private stakeholders, as they have to accept this new situation and their role in it, adequately contributing to FRM. Social science research has shown that stakeholders behave conservative and are reluctant to change their habits despite better options. This Entrapment Effect marks a key barrier in the transfer process in FRM. At the same time, the Flood Directive postulates active participation of all relevant stakeholders, indirectly supporting development of methods for building their capacity, but little guidance is given on the right strategies to accomplish it. The trigger for changing the behaviour and motivation for further participation in the learning process is acknowledging the existence of own risk. Methods and tools are to be developed that initiate the learning process and support the motivation for capacity building process. This SEC addresses a new, "hands on" approach for raising flood risk awareness, embedded in an integrated capacity building strategy based on the experiential learning theory (ELT). The results of the application of this concept targeting private and public stakeholders in the Hamburg area are presented.

Capacity building as a long-term process should support the effective participation of stakeholders within their role in FRM. The role of private stakeholders becomes the protection of their own properties which implies 4 main steps:

- 1. Understanding the necessity for action
- 2. Acquiring relevant information for understanding own role
- 3. Acquiring relevant knowledge for practicing the assigned role
- 4. Accepting the role and taking action (protect own properties)

Consequently, the key tasks to be accomplished when building capacity of stakeholders can be summarized as following:

- 1. Raising flood hazard/risk awareness
- 2. Delivering relevant information to the stakeholders for accepting their own role in FRM
- 3. Delivering required knowledge/expertise required for taking proactive actions
- 4. Supporting and motivating stakeholders to take actions (pro-active behaviour)

Raising hazard/risk awareness (1) implies improvement of the perception of flood as a phenomenon in terms of its extent, intensity and the consequences it can cause. This is the crucial step for understanding the necessity for action and getting motivation for further participation in

the capacity building process. Relevant information supporting the acceptance of the own role (2) is related to understanding the complexity of FRM in terms of its hydrological, but also socioeconomic aspects, including responsibilities of different stakeholder groups. Here the scope of the own role has to be defined and made transparent and understandable to private stakeholders. The relevant expertise/knowledge (3) should emphasize the scope and strategies of flood risk management in general and focusing on the measures for protecting the own properties. Supporting pro-active behaviour (4) is related to motivating the stakeholders to take actions.

The concept for raising hazard/risk awareness has been embedded in the integrated strategy for capacity building of stakeholders - Interactive Learning Program (ILP). The ILP has been implemented following the learning steps of the ELT as described above and is depicted in Fig. 3. Raising flood awareness initiates the learning process in the ILP. Following the postulates of raising flood awareness the Flood Animation Centre (FAC) has been developed. It is composed of the two main elements being flood cylinders and flood animation box as shown in Table 1 right. Flood cylinders (2m, Ø20cm) that can be filled with water in real time, are connected to a GIS-flood map, enabling the user to fill the cylinders with water up to the level that corresponds to the flood probability of the location of interest (i.e. own property or neighbourhood). An emotional situation is created by walking through a "forest" of water columns, creating a feeling of a continuous water body, surrounding the observers, which they can regard or even walk through. The effect of cylinders is supported by envisaging of the extent of potential damage by means of the flood animation box, designed as a living room with exchangeable contents. In this way, the box represents a common, familiar space, supporting the identification with the situation among learners. The box is circled by the cylinders, creating the impression of their physical unity, coordinating the water level in cylinders and the flood box, depending on the selected value in the GIS based flood map. Media technology, such as audio effects, animations, videos or light effects are being used to support identification with the flood problem and strengthen the local context and relevance of flood problem (e.g. filmed historic flood events in the area).

Appealing to emotions and further interactivity with the learners has been achieved by active involvement of the stakeholders into the flooding process. Within the flood simulation procedure (so called "panic room" simulation) performed in the flood animation box, the test persons are confronted with the situation of flood and the most critical issue during a flood event that is the lack of time for decision-making. This simulation should demonstrate eventual weaknesses and unstructured reactions of their current behaviour in case of a flood event and make them aware that efficient reaction without previously undertaken measures can hardly be achieved.



Fig. 3 a: Conceptual design of tools for raising risk awareness b: ILP.

The flood simulation is composed of the following phases as given in Table 1 left:

1. Preparatory phase - devoted to setting the scene depending on the concrete situation (e.g. flood typology to be addressed).

2. Action phase-during the simulated flood event, the test persons are given particular tasks to accomplish that correspond to the real situation in case of a flood. Those tasks are given depending on the flood typology and the profile of test persons (young/old, male/female) and describe typical situations and operations that are to be done in a case of flood. They can be: rescuing items of high intangible or tangible value (e.g. private photographs or purse with money), collecting items of practical use for the given flood conditions (e.g. medicaments) or taking safety measures (e.g. switching off the electricity emergency switch).

3. Reflection & analysis phase - after the simulation, the impressions are analyzed and discussed. The own flood situation is being reflected. The experiment can be performed, both in presence or absence of observers. In the case with the observers the learning effect is extended to the whole group, which is supported by the discussion after the experiment.

Higher level of mobility and at the same time accessibility, has been achieved by development and implementation of a road show, where all elements of the FAC can be easily transported by a container (2,5 m x 6,0 m) and assembled on site. In this way, FAC can be exposed to a larger group of stakeholders taking advantage of fairs or other live events.

Table 1 left: Procedure of the flood simulation (panic room) right: Flood Animation studio and a snapshot of a flood simulation involving test persons.

| Phase: | Time | Activity | - Comp |
|--------------------------|--------------|---|------------------------|
| Prepa ratory phase | 1-2 min | Begin and short introduction to the procedure | Flood Animation Box |
| - | 1-5 min | Stepping into the box, getting familiar with the contents | Flood Cylinders |
| | 1 min | Test persons "living" in the box (e.g. reading newspapers) | |
| | | Story depending on the given situation and relevance for the targeted group | Multimedia& Flood Maps |
| Action phase | 30 sec | Audio signal announcing flood | |
| | 30 sec | Flood warning via megaphone | |
| | | Flooding of the box starts | |
| | max 5 min | Response: Collection of the items, and temp store on the "safe" place in the box | |
| | | If not interrupted by the test persons before, the siren clears off the warning | |
| | | Flooding of the box finished. | |
| | 30 sec | Getting out of the box | |
| Analy | 5- | | |
| sis | 10min | Interviews and wrap up | |

Contribution to education, risk communication and capacity building

The Food Animation Centre has been applied to initiate the learning motivation in the Hamburg area at the Klima Woche event (http://www.klimawoche.de/) that took place 20th-26th, September 2010 in Hamburg, addressing different flood typology (e.g. heavy rainfalls and storm surges). More than 200 people took part in experiments either as test persons (10) or observers, whereby 28 of observers have been interviewed with the main objective to assess the acceptance and efficiency of the Flood Animation Studio to trigger the motivation for further participation in the capacity building process. The behaviour of the test persons has been observed and analyzed. Additionally, in the reflection& analysis phase the test persons are being interviewed. The analyzed behaviour and conducted interviews with the test persons indicates their low flood preparedness and low ability to act in a structured way (Table 1 right). Although got defined tasks to accomplish, they reacted confusedly, getting more helpless with the increasing water level. Identification of "safe zones" where the collected items can be temporary stored caused the feeling of anxiety that increased with the increasing water level in the box. Having multiple tasks

to accomplish at the same time, considerably contributed to this perplexed feeling and inability to react properly. The interviews with the observers conducted after the flood simulation, indicated high interest in the tool and the flood topic. 90% of the respondents described the tool and the simulation as realistic mostly by comparing it with the experienced flood event (flooding at the river Oder or storm surge in Hamburg from 1962). 85% of the interviewees have seen no chance for structured reaction and assessed their potential reaction as chaotic or helpless without measures taken prior to the event. In 75% of the answers the interviewees expressed the readiness to participate in the further events and learn more about flood risk management and measures to protect their own properties, although 50% of the interviewed observers had never thought about that before. Currently, they are considered for capacity building process, following the whole cycle of the ILP.



Flood animation studio - road show

Future SEC activities

New strategies and tools are required to break the entrapment effect and motivate stakeholder to step into their role in FRM, considering the existing and potential flood risks. This paper introduced a new method for raising flood awareness, as an initial step in the capacity building process, crucial for the learning motivation and behavioural changes. It has been implemented as a Flood Animation Studio embedded in the Interactive Learning Program based on the experiential learning theory. The results of the application of the Flood Animation Studio in the Hamburg area showed high interest of addressed stakeholders in the flood issues and further participation in the learning process. Further activities are planned inland and abroad, taking advantage of the mobility of the tool (road show). Still raising risk awareness is just the first step in capacity building process and more efficient participation of the stakeholders is to be expected after completing the whole cycle of the capacity building process.

1.3.5 In Deep Water, Heriot-Watt University, Scotland

General description of SEC

In Deep Water is a SEC that aims to engage public audiences with the issues surrounding urban flooding. The SEC is delivered by the School of the Built Environment at Heriot-Watt University (HWU-SBE) and was funded between 2009 and 2011 through the Engineering and Physical Sciences Research Council's Partnerships for Public Engagement grants scheme and the SAWA Interreg IVB project.

The project comprised the development of interactive workshops delivered by practising engineers and engineering students. The workshops centred on a pair of model landscapes fitted with showers so they could be 'flooded'. The models included urban areas, and allowed workshop participants to make changes to the environments to mitigate the effects of flooding.

The public engagement objectives of In Deep Water are as follows:

1. Inspire future generations of engineering practitioners to become involved in built environment professions.

2. Stimulate the public's interest in the issues surrounding urban flooding, and publicise the type of innovative and sustainable mitigating measures beginning to emerge from academic research.

3. Encourage the public to consider how all levels of society, from the individual through to water utilities and national governments, can have an impact on the causes and effects of urban flooding.

4. Develop the expertise and role of the School of the Built Environment (Heriot-Watt University) in the field of public engagement.

Four target audiences were identified in the funding proposal:

- 1. General public at science centres/festivals (n~7000);
- 2. Secondary school children at organised external events (aged 11-16) (n~1000);
- 3. Post-option school children at HWU-SBE (n~500);
- 4. Professional bodies and organisations (n~300).

Major SEC activities during the SAWA-period

On the pilot day, pupils participated in the workshop in groups of 8. During the school day two P5 and two P7 groups participated. After school, students were invited to participate with their families.



One of the interactive models developed for the project.

The session had four elements:

- a brief introduction to flooding (presentation)
- a demonstration of how flooding can occur away from rainfall (on model)
- discussion of ways to address flooding (presentation)
- simulation of flooding prevention measures (on model)

Students and adults greatly enjoyed interacting with the model and many described it as fun and hands-on. They acknowledged that the presentation elements were less exciting, but appreciated they were necessary in order to understand what was going on. Most felt that the balance between talking and doing was about right, as was the session length of around 40 minutes.

Several approaches to the interactions with the model were trialled during the day and this still needed a little work so that changes can be self-explanatory to some extent. Certainly with the larger groups at the end of the day, while the presenter was working with one family others were observed struggling with particular sections or looking confused. One of the P7 groups felt frustrated when told what to change and would have preferred to have had the time to discuss the options and work out the solutions for themselves.

The presentations were positively received. Explanations were appropriately pitched and students appreciated the pictures on the slides and the interactive approach to the presentation, i.e. asking students lots of questions and ensuring everyone had a chance to answer. Some felt the images were rushed through slightly, and that they would have liked longer to see where the previous floods had occurred and why.

When asked about learning, almost all students focused on flood prevention mechanisms, particularly grass roofs. Some also commented on more general aspects of flooding, and two or three mentioned permeable paving, although none could remember the correct term. This led to some interesting discussions on the day, about whether changing this term would constitute 'dumbing down' the content.

The talk mentioned two causes of increased flooding: climate change and urbanisation. Interestingly, when probed during the focus groups, many students cited climate change as a cause and none mentioned urbanisation (although this was recalled by one of the adults). This indicates that only half of the message is getting through – perhaps because students had already studied climate change they made the link with flooding more readily. However urbanisation is actually the issue that civil engineers look at more closely, so it would be useful to consider the best way to communicate this message, perhaps by removing or limiting the references to climate change from the presentation.

For the family sessions, parents highlighted the value of learning with their children in that they can continue discussions beyond the session. In the second session, the adults had many questions at the end – including a focus on what measures they could take with their own homes or communities. It may be worth including this in the presentation for groups that include adults.

30 days' worth of activities was delivered at schools, science festivals and open days. The following venues were included: Currie high school (pilot), Tayport primary school (pilot), LEAPS @ HWU (open day), Hawick high school, Borders Science Festival in Hawick, Cheltenham Science Festival, Techfest Science Festival in Aberdeen, Manchester Science Festival, Grangemouth Science Festival, and Newcastle Science Festival.

Audience figures as gathered by session deliverers were:

| Audience | Male | Female | eTotal |
|----------------------|------|--------|--------|
| # Primary students | 644 | 644 | 1288 |
| # Secondary students | 303 | 257 | 560 |
| # Teachers | 46 | 67 | 113 |
| # Family children | 643 | 602 | 1245 |
| # Family adults | 645 | 599 | 1244 |
| # Adult public | 14 | 13 | 27 |
| Total | 51% | 49% | 4477 |

It is estimated that all of these participants interacted with the model during either booked or drop-in sessions, although the duration of the interaction will have varied.

A videofilm about In Deep Water is available at Youtube: <u>http://www.youtube.com/watch?v=DaaKoYNGpyU</u>

Contribution to education, risk communication and capacity building

The following evaluation data were collected:

• 549 pupil/child questionnaires across three science festivals (Hawick, 203; Techfest, 295; and Manchester, 51).

• 70 teacher/adult questionnaires across three science festivals as above (Hawick, 13 teachers; Techfest, 25 teachers; and Manchester, 32 parents/adults). In addition 17 teacher questionnaires were collected at Grangemouth Science Festival, but it was not made clear that these referred only to the flooding workshop. As a result, teachers fed back about a range of different activities so we have excluded these responses from the sample.

• Six focus groups at the pilot involving 43 pupils and 6 adults, and further informal paired/group interviews at Hawick Science Festival involving ~25 pupils.

• Follow-up focus groups at three schools conducted within a month of sessions involving 23 pupils and one classroom assistant (Techfest, 1 group of 7 pupils; Grangemouth Science Festival, 2 groups of 8 pupils, one group involved a classroom assistant).

Children were asked to rate their experience of the activity using a five-point smiley face scale. The chart (Fig. 4) illustrates the progression of the workshop: All three sets of data meet the project's success criteria of having over 75% expressing enjoyment of the activity.



Fig. 4. Result from evaluation of 'In deep water'.

The questionnaire asked about possible improvements to the activity. To some extent, the comments depended on the workshop location. In Hawick, some felt the activity would have worked better with smaller group sizes, a concern that was also shared by the delivery team and emerged from a few of the students' responses. At Techfest, the activity was situated next to a very loud activity, so there were many comments about background noise. The consistent comment across all the sessions was that some participants would have liked to see more rain to show severe weather conditions, or allowing children to control the water (although one respondent qualified this with the comment 'if you are brave enough').

The team identified a number of strengths and weaknesses. Ideas were grouped into themes and prioritised. The most important theme was that the project was fun, from the perspectives of both audiences and deliverers. This was seen as a key strength; however it was noted that it needed to be balanced with the engineering messages as it was noted that 'too much fun' could mean audiences' attention starts to drift.

The delivery team also noted the benefits for presenters from working on the project. The most important benefit was seen as public engagement experience, which a number of researchers were able to gain. The opportunity to interact with a wide range of age groups was a strength here, but a weakness was that delivery can become repetitive, so spreading the experience between a suitably large group of researchers can help avoid this.

The delivery method was a crucial strength of the project. Success factors were its interactivity, versatility and educational value. Because the model is facilitated by researchers, they are able to respond to audiences' prior levels of knowledge and interests. This meant the activity was fully inclusive. However, the researchers noted that if not enough time was allowed, the conclusion to the session could be compromised, which would weaken the session's impact.

There were two main weaknesses identified with the project. Firstly, a set of session constraints were identified. These included the amount of space required for the model, and the minimum time required. Time and space constraints were seen as limiting the extent to which audiences could meaningfully interact with the model, and limiting the size of the audience it was possible to reach in a given time. Secondly, a further set of model constraints were identified. These related to the physical size of the model, which is difficult to transport and is a set height – so not accessible to very young children.

Future SEC activities

Looking forward, the team discussed several themes related to opportunities and threats for the future. These were more highly prioritised than the strengths and weaknesses discussed above.

The most highly prioritised idea in the discussion related to different audiences for the project. The team identified opportunities to engage a wider range of audiences with issues around urban drainage through the next stages of the project. These included demonstrations at local flood meetings, engaging particular authorities as collaborators and a potential link with the Scottish Environmental Protection Agency that is discussed in greater detail in the next Section.

Opportunities for future development of the model were also discussed and the team were keen to pursue these. Creating a single-property model was suggested, as this might allow more detail that is relevant to individuals to be included. Covering other issues such as pollution and costbenefit analyses of different flooding mitigation approaches were also suggested as means to extend the work. Within this theme, a threat of oversimplification was put forward. This reflected concerns that the current model had been simplified further than originally planned.

Two other themes emerged from the discussions. One further opportunity was in relation to Heriot-Watt University. The team felt that the model could be used in student teaching, and that the project was valuable evidence of public engagement. However a large threat was also identified: the practicalities of carrying out the project development work. Central to the threat was the challenge of sourcing funding, but researchers' time, the need to maintain the model and issues around transport were also concerns.

There are several plans already underway for the next stages of the SEC. The team has been invited back to Techfest in Aberdeen in September 2011, so will be taking the model there. In addition, there has been interest in the project from the Scottish Government through the Scottish Environmental Protection Agency (SEPA). SEPA has a remit to involve communities with issues around flooding and may use the model as part of a national roadshow.

In the debrief meeting, there was a sense that the project had brought together a team of civil engineers in the HWU-SBE with an interest in public engagement, who had also had the opportunity to develop their skills in this area through the project. This team were keen to continue the engagement using the model, either in its current form or (hopefully) with the opportunity to develop the work in some of the ways discussed above.

1.3.6 Stan é full av vatten, County Administrative Board Västra Götaland, Sweden

General description of SEC and activities during the SAWA-period

The exhibition *Stan é full av vatten* (transl. The city is full of water) is produced by The Vänern Museum in Lidköping in cooperation with the Swedish SAWA partners. The exhibition highlights the problem of flooding Lake Vänern. The exhibition conveys the personal, the emotional issues about flooding. What if a flood affects our home and neighbourhood?

The exhibition reveals the different thoughts about flooding, and is adapted by texts and profile pictures, after the actual location of the exhibition. A total of 137 000 people has sofar visited the exhibition. The largest number of visitors was in a number of public libraries around Lake Vänern.

How does a flood affect society at large? The exhibition has a structured environment consisting of an outdoor environment, a bathroom and a garage. One part of the exhibition is a model which with simple tools illustrate why floods occur. Flooding is not something new, and the historical perspective is depicted in a slideshow.

To address the exhibition, but also to have the opportunity to directly discuss with visitors to the exhibition, the Swedish SAWA partners organized an opening workshop for specially invited school children. The opening seminar took place on 14 April 2010. The day began with some short presentations: SMHI reported on new results on the effects of climate changes on water levels in Lake Vänern. County Administrative Board of Västra Götaland told about possible effects on environmental values in Vänern as a result of the new water regulation strategy. Lidköping municipality presented the municipality's planning strategy for new housing areas. The controversial project *The port city*, which aims to build lakeside homes along the shore of the Lake Vänern in Lidköping, was discussed eagerly.

The approximately 70 pupils from the second year in highschool came from De la Gardie High School in Lidköping, Birger Sjöberg College in Vanersborg and Gullmar College in Lysekil. After the seminar, the students visited the exhibition. The day was a success and appreciated by all participants.

The exhibition went on, after the time at Lake Vänern Museum, as a traveling exhibition. The traveling exhibition consists of modules of the original exhibition. It has visited libraries in Karlstad, Mariestad, Vänersborg, Kristinehamn and Åmål. A small part of the exhibition was in Vara at the Symphony Hall. After the opening activities in 2010 there has been further request to use the exhibition from e.g. other museums around Lake Vänern.



Sections of the exhibition Stan e' full av vatten.



Opening workshop for gymnasium pupils.

Contribution to education, risk communication and capacity building

The SEC has contributed to knowledge dissemination to a large group of interested persons. Apart from the public as a target group, school children have been addressed. The wide reach of the exhibition has likely contributed to increased flood risk awareness around Lake Vänern. The mobile exhibition has also connected the cities around the lake, regarding the common interest for the lake and its flood risks.

Future SEC activities

The mobile exhibition is ready to be used for further activities around Lake Vänern, like education activities, conferences or on request from any of the 13 municipalities around the lake.

1.3.7 Virtual centre for integrated water management (ViWa), Leuphana University, Germany

General description of SEC

The purpose for the ViWa platform is creating a virtual sustainability education center as part of the project to SAWA, in order to provide flood risk management (FRM) related information. The main target groups for the virtual SEC are students and professionals. ViWa represents a web based platform where information, learning material, addresses, networks, activities etc. on capacity building in integrated flood risk management is collected and published, and where interactive communication is possible. ViWa allows nearly everybody to take part and get with a few "clicks" much interesting information for download or as link. Since a central purpose of the SAWA-SECs is exchange and interaction we decided to establish not a static website but a WiKi platform with the possibility for a living and "learning" platform, which can be developed further by interested persons in an interactive way therefore ViWa give all interested the possibility to share that space commonly. The main idea is not only to provide information but also to fill the gaps together. Every SAWA-Partner and any person are able by specific log-in data to excess and fill in their data (Fig. 5). The ViWa platform is therefore meant to be a joint project. Especially specific learning materials and tools as well as addresses of professional networks and events on capacity building are the main topics.

Major SEC activities during the SAWA-period

In SAWA the concept, the development, the data and information research, collecting material from other partners and other SAWA sources as well as preparation and posting on the platform was realized.

The Structure of ViWa

The platform consists of nine rubrics partly with subcategories which are to find on the left side of the page as follows:

- Projects
- Law&Order
- Education&Capacity Building
 - \rightarrow Education
 - → Capacity Building
- Higher Education
 - \rightarrow Master's Programs
 - \rightarrow PhD's programs
 - \rightarrow Further links
- Software&Tools
- Events
 - \rightarrow Past Events with Output

- Tips
- Some Literature
 - \rightarrow Download
 - \rightarrow Links
 - \rightarrow References
- Links for further investigation

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| Main Page | Special page | | |
| Community portal | Log in / create account | | |
| Current events | | | |
| Recent changes | | | |
| Software and Tools | Log in | | |
| Tips | You must have cookies enabled to log in to VIWa. | | |
| Events | Username: Wikiadmin | | |
| FRM & Education and Capacity Building | Remember my login on this computer | | |
| FRM & Higher Education | Log in E-mail new password | | |
| Some Literature | | | |
| FRM-Links for further investigation | | | |
| FRM & Projects | | | |
| FRM & Law and Order | | | |
| Random page | | | |

Fig. 5. Screenshot of the homepage and log-in area of ViWa.

Nevertheless are the addressees mainly postgraduate students. For them we create especially the rubrics **"Education and Capacity Building"** as well as **"Higher Education"** (see Fig. 6 and 7). Here, one can find links and downloads for nearly all topics from A-Z of flood risk.

| \sim | | Privacy policy | About ViWa | Disclaimers |
|--|--|----------------|------------|-------------|
| Hello Visitor! Sign in / Sign up | Search | | Go | Search |
| Navigation | | | | |
| Main Page | History View source Discussion Page | | | |
| Community portal | Capacity Building | | | |
| Current events | | | | |
| Recent changes | Imedia.Hochwasser Aktionsplan-werse [dej Hochwasserschutz St. Pauli [de] | | | |
| Software and Tools | Country Report Germany (Mulde River) [eng] | | | |
| Tips | Hochwasserminderungsmatsnammen in Kleinen bewaldeten Einzugsgebieten in Kheinland-Praizjoej Capacity Building for Integrated Flood Management 🛃 | | | |
| Events | The Coastal Wiki Glossary | | | |
| FRM & Education and Capacity Building | Integrated Flood Managementer Diane-CM E-tearning platform <i>Q</i> 100 Links zum Hochwasser <i>Q</i> | | | |
| FRM & Higher Education | Hochwasservorsorge durch eLearning [de] Elood Management Education Platform r | | | |
| Some Literature | Flood Riske | | | |
| FRM-Links for further investigation | Flood Risk Management | | | |
| EDM & Projects | Land unter.[de] | | | |
| FRM & Frojects | Dresden Flood Resaerch Centre | | | |
| FRM & Law and Order | GEOVLEX | | | |
| Random page | Gewässerpädagogik | | | |
| Help | Die Mediendatenbank H2O-Wissen @ | | | |
| Foolbox | FloodsHochwasser - Grundlagen, Risiken und Abwehr @ Floods @ Pamao flooding example @ | | | |
| What links here | IWA-WaterWiki/Flooding | | | |
| Related changes | Undergraduate Teaching Materials for Flood Risk Management Waterwiki | | | |
| Special pages | 7-Punkte Programm zum Hochwasserschutz im Einzugsgebiet der Elbe [de] Decision Support System for flood risk analysis for the River Thames [end] | | | |

Fig. 6. Screenshot of the Capacity building rubrics.



Fig. 7. Screenshot of the Master Course links.

Furthermore the rubric **"Events"** (Fig. 8) outlines some of the main annual water events for 2011 and 2012. Additional the subcategory "Events with Output" was disposed to collect data of passed events, like documentation of the speakers or poster presentations etc.

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| Hello Visitori Sign in / Sign up | Search Go Search | | |
| vavigation | | | |
| Main Page | History View source Discussion Page | | |
| Community portal | FRM & Events | | |
| Current events | | | |
| Recent changes | In this category you will find some of the important annual events on water and flood issues. The subcategory "Past Events with Output" offers some documentations for download out of some of these. | | |
| Software and Tools | | | |
| Tips | 34th IAHR World Congress (Australia, June-July 26-01, 2011) | | |
| Events | International Symposium: Urban Flood Risk Management (UFRIM) (Austria, Sep. 21-23, 2011) World WAter Congress (Brazil, Sep. 25-29, 2011) Sth International Conference on Flood Management (Japan, Sept 27-29, 2011) Acqua Atta 2011 - Exhibition and International Conference on Climate Impact, Flood Protection and Hydraulic Engineering (Germany, Oct. 11-13, 2011) | | |
| FRM & Education and Capacity Building | | | |
| FRM & Higher Education | International Water Week 2011 (Netherlands Oct-Nov. 29-04, 2011) 6th World Water Forum (France, March 12-17, 2012) P | | |
| Some Literature | 10th International Conference on Hydroinformatics - HIC2012 (Germany, July 14-18, 2012) The 2nd European Conference on Electricity Management (Netherlands, Net, 20-22, 2012) #2 | | |
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Fig. 8. Screenshot of the Event rubrics.

The category **"Projects"** shows already realized as well as active ones. The list is not intended to be complete as all other rubrics of ViWa to, but give a short insight of projects according to flood risk management as the screenshot (Fig. 9) presents.

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| Community portal | FRM & Projects | |
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| Recent changes | About Danube Floodrisk@ TransRisk@ | |
| Software and Tools | [[Media:]Start klar für die Lebendige Alster]] [de] [] | |
| Tips | = EECKer = EFAS8EXCIFF [eng] | |
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| FRM-Links for further investigation | Galerian Horix (2) | |
| FRM & Projects | Veris-Elbe @ SAPISK #3 | |
| FRM & Law and Order | • Kliwa 🚱 | |
| Random page | Category: FRM & Projects | |

Fig. 9. Screenshot of the Project links.

Regulations are essential for flood risk management and build amongst others with directives the category of **"Law&Order".** Here, the users get a short overview of the Water Framework Directive of Europe as well as on the Flood Directive by certain links.

The last category "Some Literature" is one of the most developed ones. It provides more than thirty links classified into:

- Flood Risk Management
- Capacity Building&Communication
- Mapping&Modelling
- Uncertainty&Climate Change
- Flood Damage

In completion one will find also literature to be downloaded easily and direct from the ViWa platform and a list with further 100 references for all water and flood risk relevant topics (see Fig. 10 and 11).

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| Tips | 3 Mapping & modeling | | |
| Events | 4 Uncertainty & climate change 5 Flood damage | | |
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| Special pages | River restoration and flood protection: controversy or synergism? Flood Hazard Assessment and Management Interface with the Public | | |

Fig. 10. Screenshot of the Links to relevant literature.

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| Law and Order | Bürger K, Dostal P, Seidel J, Imbery F, Barriendos M, Mayer H, Glaser R (2006): Hydrometeorological reconstru (southwest Germany) Hydrological Sciences Journal, 2006; 51 (5): 864-877 | uction of the 1824 flood event in the Neckar River basin |
| Projects | Bürger, K., Seidel, J., Imbery, F., Dostal, P. (2006): Xfloods, Analyse historischer Hochwasserereignisse f ür ein Hochwasserschutz. UWSF - Z Umweltchem Ökotox. 18 (1): 27-29 | integratives Konzept zum vorbeugenden |
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| Software and Tools | presentation at the EGU - General Assembly 15, -20, April 2007, Vienna (in print). Bornschein, A. (2009): A simple method to estimate inundation due to dam breakin: Bauer, E.: Semprich, S.; Zenz, G. (eds.): Proceedings of the 2nd International | |
| Tips | Conference on Long Term Behaviour of Dams, Graz, Österreich, S. 751 – 756. | |
| Some Literature | Brazdil, R., Glaser, R., Pfister, C., Dobrovolny, P., Antoine, J-M., Barriendos, M., Camuffo, D., Deutsch, M., Enzi, S events of selected European rivers in the sixteenth century. Climatic Change 43: S. 239-285, Kluwer Academic | S., Guidoboni, E., Kotyza, O., Rodrigo, F. S. (1999): Flood Publishers |
| Links for further investigation | D'Eliso, C., Oumeraci, H.; Kortenhaus, A. (2006): Breaching of coastal dikes induced by wave overtopping. Proc Englanging (ICCE), ASCE, Volume 3, San Diago, USA, pp. 2844, 2856. | ceedings 30th International Conference Coastal |
| Random page | D'Eliso, C., Oumeraci, H.; Kortenhaus, A. (2006): Breaching of coastal dikes: detailed breaching model. Bericht | te Leichtweiß-Institut für Wasserbau, Technische |
| Help | Universität Braunschweig, Nr. 1937, Braunschweig, Germany. D'Ellso, C., Oumerad, H.; Kortenhaus, A. (2006): Breaching of coastal dikes: preliminary model. Berichte Leich Braunschweig, Nr. 927, FLOODsite Report T06-06-01, Braunschweig, Germany, 82 p. 3 Annexes. | tweiß-Institut für Wasserbau, Technische Universität |
| Toolbox | D'Eliso, C., Oumeraci, H.; Kortenhaus, A. (2006): Breaching of coastal dikes: reliability analysis and validation of Wasserbau, Technische Universität Braunschweig, Nr. 938, Braunschweig, Germany | of the model system. Berichte Leichtweiß-Institut für |
| What links here | Deutsch, M. (2000): Zum Hochwasser der Elbe und Saale Ende Februar/ Anfang März 1799, In: Deutsch, M., Pö | örtge, KH., Teltscher, H. (Hrsg.): Beiträge zum |
| Related changes | Hochwasser/Hochwasserschutz in Vergangenheit und Gegenwart, Erfurter Geographische Studien (EGS), Bd | 1. 9, Erfurt, S. 7 – 44 |
| Upload file | Deutsch, M. (2004): " und konnte sich keiner an solche Fluthen erinnern." - Zur Untersuchung schwerer, histo 1900, In: OHLIG, C. (Hrsg.): Wasserhistorische Forschungen. Schwerpunkte Hochwasserschutz/ Elbe, Schrifte | orischer Hochwasser der Saale im Zeitraum von 1500 - en der Deutschen Wasserhistorischen Gesellschaft e. 1 |
| Special pages | (DWhG), Band 4, Siegburg, S. 117 – 141 | |

Fig. 11. Screenshot of the Links to relevant references.

Contribution to education, risk communication and capacity building

The virtual SEC is a platform for relevant flood risk information with relevance for education. This is the case for significant documents with recent research results, research projects, literature and important documents. Furthermore information for interested/potential students (either normal students or professionals) on educational courses and study programs in Europe are provided.

Future SEC activities

The ViWa Platform will be maintained in future. It was established at Leuphana University in Lüneburg but will migrate to Bergisch Wuppertal University (Germany) since the project leader (Prof. Mariele Evers) moved to this university. For the platform it will not have any change concerning the structure, the content or the access. It will live further on.

1.4 Major output and contribution to European flood risk management

The 7 SAWA SECs have reached a very large number of Europeans, in the efforts to educate and build capacity for flood risk management. School children, university students, the public, flood experts, politicians, etc, have been engaged by the SECs. The centres have had impact on local, on regional and on national level in the 5 SAWA countries. Several of the activities have also been trans-national. The SECs has created arenas for meetings, for reflections, for discussions and for learning. And the public, the flood experts, students and various stakeholders have been connected because of the SAWA SECs. The future plans for the 7 SECs are also a guarantee for a substantial impact also onwards in Europe from the SAWA project.

2. Transnational education for Flood Risk Management

2.1 Purpose

There are several incentives for education on water management and flood risks. One driving force is to spread the knowledge and experiences from the serious flood events that has occurred in Europe the last decades. Another strong force is the climate change, which causes need for new knowledge and education. A third incentive in the floods area is the EU Flood Directive that was adopted in 2007 and now is implemented in all member states. The directive with its broad perspective on flood risk management (FRM) requires new methods and practices regarding risk mapping and risk-reducing measures, which all in all create needs for education. It also requires the integration of climate change aspects and the transnational coordination of flood risk issues in Europe.

There are also specific needs for *transnational* and *European flood education*. Many countries in Europe share several characteristics regarding flood hazards and vulnerabilities. The climate, the geography and the societal structures are fairly similar, which opens for common knowledge development and education. Furthermore a number of transnational rivers call for transnational knowledge development and risk management.

Joint education, involving universities from different countries, has different positive effects:

- bringing knowledge between countries, by exchange of
 - o students
 - o teachers and researchers
 - o professionals
- shared experiences of flood events and different/divers conditions
- shared examples of approaches, strategies and measures taken in different countries

Seven universities are partners in SAWA, each with an own profile in the water management and flood areas:

| Universities | Profiles |
|--|--|
| Germany | |
| Hamburg University of Technology | flood management, water engin., hydrological modeling |
| HafenCity University, Hamburg | urban water, architecture and planning |
| Leuphana University, Lüneburg | sustainable development and flood risks, collaborative planning and modeling |
| Norway | |
| Norwegian University of Science and Technology, Trondheim (NTNU) | hydraulic and environmental engineering |

| United Kingdom | |
|-----------------------------------|---|
| University of Salford | environmental engineering, water and wastewater systems, flood retention basins |
| Heriot-Watt University, Edinburgh | water resources, catchment and flood management |
| Sweden | |
| Karlstad University | climate (esp. flood) risk management, vulnerability studies, learning from flood events |

Against this background the SAWA University partners decided to combine their competences in order to create transnational offers in higher education which focus on the integration of flood risk aspects.

The SAWA education activities are:

- 1) Master course, Integrated flood risk management, 15 credits, spring semester 2011 and 2012
- 2) Planning of master program in integrated Water and Flood Risk Management, 1-2 years
- 3) Student and teacher exchange (described in next section of this report)

2.2 Development of SAWA education profile

The education development process among the SAWA universities was facilitated by two workshops during 2010: Gothenburg in March and Edinburgh in August. At an earlier stage two inventories had been made: 1) education in flood-related fields at the 7 SAWA universities and 2) on relevant competences at the SAWA universities and potential contribution to a joint course.

The discussions in the group of universities ended with a two-step development idea:

- To develop a joint master course on Integrated flood risk management, 15 credits. After having compared education and course systems in the different countries, it was decided to host the course at Karlstad University, Sweden, and to have contributions from all universities and other SAWA partners. The WP3 leader, Lars Nyberg (Karlstad University/Sweden) and Mariele Evers (Leuphana University Lüneburg, now Wuppertal University/Germany) volunteered to be the two course leaders of the Master Course.
- 2) To develop a plan for all full master programme (1-2 years), where the implementation should be made outside of SAWA. The major focus would be about the theory and practice around the two important water directives: the water framework directive and the floods directive.

2.3 Masters course Integrated Flood Risk Management

2.3.1 Design and didactic format

A Masters course of 15 credits was developed and given first time during spring semester 2011. Six of the seven SAWA universities have contributed, and Karlstad University in Sweden has hosted the course.

The scope for the course is flood risk management principles and practices. The relation to neighbouring management perspectives, like water quality and land-use, is elucidated. There is a need for an integrated approach which has to consider economic, social and ecological aspects of vulnerability and potential risk-reducing measures. Interdisciplinary and trans-sectoral work as well as collaboration among stakeholders is needed. The EU Flood Directive and its requirements is central in the course content, as well as the interface between the Flood Directive and the Water Framework Directive as illustrated in the Fig. 12.



Fig. 12. Scope of the IFRM Master Course.

| Governance and legal framework | Flood risk analysis | | |
|---|---|--|--|
| • Floods directive (& WFD) | • Hydrological/hydraulic modelling | | |
| Risk governance | • Vulnerability analysis | | |
| Integrative planning | Adaptive measures | | |
| T | | | |
| Flood risk management plans | Structural/non-structural | | |
| Flood risk management plansDSS/PSS | Structural/non-structuralRelation to sust. development | | |

The course content is structured into four areas:

The course is both offered to students in masters programs and to professionals that need wider and deeper knowledge about the Flood Directive and flood risk management. Suitable disciplinary background for the participants are for example water management, risk management, environmental science, physical planning, geography, ecology, technical infrastructure, contingency planning and education. To be admitted to the course, the students needed at least 120 credits at bachelor level from previous studies, or at least three years of work experience in the area.

With a unique SAWA profile the course is based on the broad and wide expertise that can be found at the SAWA universities, and also with contributions from all SAWA partners. The SAWA specialities are:

- Trans-European and inter- and trans-disciplinary learning in order to develop capacity for integrated flood risk management

- Synergies between and coherence of Floods Directive (FD) and Water Framework Directive (WFD)

- Development and application of instruments for integration and implementation such as integrative planning

- Identification and implementation of measures which are regionally and temporally adaptive (e.g. adapted to local conditions or flexible for future adjustments)

- Development, implementation and testing of governance approaches in order to include stakeholders and citizens in decision processes

- 22 SAWA partners from five countries contribute case studies and examples for good practise for different measures and methods.

From the syllabus, approved at Karlstad University, you can read the following

Upon completion of the course, students should be able to:

- explain how water management and flood risk management can contribute to sustainable development,

- give an account of legal and planning instruments included in the EU floods directive and other pertinent directives,

- contribute to vertical integration (local, regional, national and international) and horizontal (different sectors, disciplines and institutions) with regard to flood risk management,

- present a broad view of various European strategies and methods,

- present specific analysis tools and use them,

- apply adaptive measures and analyse their effect on people, society and ecological system.

For the 'Content and Form of Instruction' we formulated:

The course includes basic and in-depth knowledge of principles and practices for managing flood risks. The relation to adjacent management areas such as water quality and land use is also treated. Economic, ecological and social aspects on vulnerability and potential risk reducing measures are considered in the work process. Cross-disciplinary and sector approaches are necessary as is cooperation between different actors. The EU floods directive and its demands are central to the course along with close and overlapping parts of the EU water framework directive.

Thus the didactic format is a blended learning approach which consists of online courses, webseminars, assignments and a group work and excursions within SAWA countries where partners demonstrates case studies and different approaches of handling flood risk issues.

2.3.2 Implementation of two course events (2011 and 2012)

The course of 15 credits was given for the first time between February and May 2011. A second course event is held in spring 2012. The design and course material is similar the second year.

The schedule from the course events 2011 and 2012 are attached as Appendix 1 and 2.

The course consists of four learning components:

- Lectures
- Excursions in the SAWA countries
- Individual assignments, about:
 - o EU Floods directive implementation process in member states
 - o Climate change impact on hazards, and models for vulnerability
- Project group work, about
 - o Producing a Flood risk management plan for a fictive city 'Waterstadt'

Lectures

14 lecture themes plus an introduction to the flood phenomena have been available for the students. The standard format for the lectures was a 20-40 min session of streamed video (taped), uploaded on the web platform, slides in Powerpoint format and further documents and/or literature. The lecture themes could be seen in the schedules for the two course events (Appendix 1 and 2). The lectures were provided by seven SAWA partners: six universities and SMHI.

Excursions

For the first course event, in 2011, two excursions were made to:

1) Germany/Netherlands: Hamburg/Lüneburg area, Elbe, Blauestadt/Almere/Rotterdam

Main topics were: flood protection in urban and rural areas, flood adaptive city planning, awareness rising activities, flood risk and nature protection and agriculture, synergies in WFD and FD, structural and non-structural measures, super dykes

2) Sweden/Norway: Göta älv and Lake Vänern, Karlstad/Arvika, River Klarälven and River Glomma in Norway

Main topics were: water supply, landslides, flood risk management and sustainable development, awareness rising activities (flood walk, flood model), different types of dike protection, conflicts with hydropower and nature protection

Each excursion lasted for 5 days. The students were obliged to participate in one of the two excursions. Both excursions were partly videotaped and could be experienced via the web-platform. The costs for each student were covered by the students themselves, but some reimbursement was arranged by SAWA for the course in 2011. The programmes of the two excursions are attached in Appendices 3 and 4.

A total of 12 SAWA partners contributed actively to the excursions, via lectures, study visits, and much practical support.

For the course event in spring 2012 a 5-day excursion is planned in May for Sweden/Norway. This year the excursion is voluntary, and a virtual excursion (video-taped) is available for those students that do not follow the real excursion.



Group photo from excursion in Germany and Netherlands, February 2011.



Group photo from excursion in Sweden and Norway, May 2011.

Student groups

For the course event in 2011, 31 students were registered for the course. 23 students were examined partly or fully. Among these 23 students, 12 nationalities (from Europe and other regions of the world) were represented. 15 out of 23 course participants were studying other courses or programmes, whereas 8 were professionals. The disciplinary background was very

differing, e.g. engineering, hydrology, risk management, environmental science, business administration, law, and economy.

The student group for the course in 2012 includes 10 students from 5 different countries.

Evaluation

The course event in 2011 was evaluated with a web questionnaire. 13 students contributed to the questionnaire and the mean grades on a five-degree scale (1 = bad, 5=good) were as follows:

| Overall grade for the course | 4.1 |
|--|-----|
| Course literature | 3.8 |
| Excursions | 4.3 |
| Group task | 3.0 |
| Individual tasks | 4.0 |
| Quality of lectures | 3.7 |
| Information before and during the course | 4.3 |

Apart from the quantitative grades, much qualitative information was gathered from the questionnaire, comments that were used to improve the design of the second course event in 2012. Here are some quotations from the questionnaire:

"The integration of the different themes was necessary since water and flood need an integrated perspective"

"The international exchange was very important. For me it wasn't only important for the topic flood risk management but also for general cultural under-standing. I learned very much from all of the members in our group and I was surprised how well the communication went."

"The excursions were very important. First of all it was good to get to know the group and it was also very helpful to have space for discussions. The examples we got to learn about were very helpful for understanding the complexity of flood risk management."

I went on the Germany/Netherlands excursion and I was very impressed with all of it. From the organisation to the lectures and the people! It was a great week and I came away having learnt a lot!

It was so interesting to meet people from different countries with different background. Normally I don't have the opportunity to do that. I learned a lot just with chatting with the others in the breaks.

2.3.3 Parallel use of modules at Heriot-Watt University and Technical University Hamburg-Harburg

Parts of the educational material produced for the master course hosted at Karlstad University were also used at Heriot-Watt University in Edinburgh and at the Technical University in Hamburg-Harburg (TUHH). In both cases the modules were used for master education. At <u>Heriot-Watt</u> a total number of 267 students had used modules from the SAWA-course.

At the <u>TUHH</u> the aspects of integrated river basin management has been addressed within two courses as a part of the Master's programmes JEMES, ERASMUS, International Master in Environmental Engineering (EN) and Water& Environment (bilingual- DE, EN.

1. The course of Environmental Hydraulic Engineering- EHE, held in winter term, focuses on the aspects of good ecological and morphological conditions of the water bodies (watercourses) in accordance with the Water Framework Directive. During the SAWA lifetime, the course has been held twice in winter term 2010/2011 and 2011/2012 where the material prepared for the SAWA master course could be tested and the feedback obtained. The evaluation results obtained after the winter term 2010/11 indicate rather high acceptance of the course (overall grade 1,4 (scale 1-5)). The e-learning material (including the e -lectures prepared for the SAWA mater course) has been highly appreciated.

2. The course Sustainable Flood Management-SFM has been taught since summer term 2008. The main objective of the course is to introduce students to the paradigm shift in flood management towards "living with floods" and flood risk management as given in Flood Directive in urban areas and to the methods and tools to be used in this transfer process. During the SAWA lifetime, the course has been held twice, in summer terms 2010 and 2011. In both cases the Wandse catchment area has been taken as a study area for the exercises and the results of the student's mini projects have been used and presented at the LAA Sessions (June 2010). Also the e lectures prepared for the SAWA Master Course could be used. The results obtained after the summer term 2011 indicate high acceptance among students (overall grade 1,6 (scale 1-5). Also the e-learning material (including the e lectures prepared for the SAWA mater course) has been highly appreciated.

Both courses are planned to be held in future. The material developed within SAWA and used within the SAWA Master Course will be further used at the TUHH. For the exercises, the students will learn how to use KALYPSO Planer Client and FLORETO. This also contributed to the legacy of the SAWA project.

2.3.4 Sister-course on upper bachelor level at Karlstad University

After having started the SAWA-course at master level, there was a demand from interested students for a course in Sweden at bachelor level. The course was developed during 2011 with some common educational features as the master course. The course is not at basic level but demands at least one semester of previous studies.

In spring 2012, there are 23 active students at the bachelor course. Those students will be offered the same excursion in May as the master course students.

2.3.5 Number of SAWA students

One of the important SAWA indicators regarding WP3 is the number of students, male and female, that has tested the master education. In the following table the total number are shown:

| Course event | No of students in total | Students examined (partly/fully)* (is regarded as students that tested the course) |
|---|-----------------------------|---|
| Integrated flood risk management, 15 credits SAWA masters course, spring 2011 | 32 11 female / 21 male | 23 9 female / 14 male |
| Integrated flood risk management, 15 credits SAWA masters course, spring 2012 | 10 2 female / 8 male | 7 2 female / 5 male |
| Water and flood risk management, 15 credits SAWA bachelor course, spring 2012 (in Swedish) | 23 14 female / 9 male | 18 13 female / 5 male |
| TUHH masters courses | 51 26 female / 25 male | 51 26 female / 25 male |
| Heriot-Watt master course | 267 44 Female / 223 Male | 267 44 Female / 223 Male |
| Total | 383 97 female / 286 male | 366 94 female / 272 male |

2.3.6 Future for the master course

The master course Integrated Flood Risk Management (15 credits) is now a regular course at Karlstad University. It will be given every spring semester the coming years. The intention is to keep and develop the European dimension of the course. To use the implementation process of the EU Floods directive as an interesting case and to educate those persons that should work with the same implementation. In Sweden it is common to study university courses also as a professional, to keep up with the knowledge development. If we can reach these target groups also in other European countries, the market for this course increases. One benefit is that the course is free of charge for people from EU member states.

The number of students for the second year was a bit lower than expected. For coming years a more structured marketing will be done at European websites within the education field and other professional water and environment networks such as IAHS. Still the network of 22 SAWA partners will be a major channel for future marketing of education.

There will be an on-going joint leadership/coordination of the Master course by the WP 3 leaders. Although Mariele Evers (former professor at Leuphana University of Lüneburg) moved to University of Wuppertal (Germany), the course will also be offered in the future at Wuppertal University as an optional offer in Geography and Civil Engineering.

2.4 Master programme

In the group of SAWA universities, an idea of a 1- or 2-year Master Programme was discussed. The idea was later developed by the late Prof. Erik Pasche from TUHH and is here described by Wolfgang Dickhaut from HafenCity University. Until now, this work has not been implemented within SAWA.

The following objectives were fixed in the discussions. The programme should provide expertise and knowledge for the Integrative Management of River Basin:

- by covering Water Quality and Quantity Issues in River Basin Management
- adressing both the EU Water Framework Directive and the EU Flood Directive

The students should come from different European countries with different professional backgrounds, e.g. water resource engineering and management, urban and landscape planning, geography or economy.

The universities which are partner in SAWA should participate in the Master programme and should be integrated in lectures, seminars and projects, the students should study in at least two countries.

To reach the objectives the group agreed upon the following elements of the structure:

- 4 Semester (2 years) course
- Degree: Master of Science
- Joint Master Programme

As ways to integrate all universities in the programme the group discussed the following elements:

- . Rotation Principle: The students rotate after each semester to another university Hamburg/Lüneburg Karlstad Edinburgh.
- Combination of Distant Learning and Workshops-Seminars at different places

The following contents and modules were discussed in the group of SAWA universities.

Fundamentals:

Chemistry, Hydro-Biology, Hydraulics, Hydrology, Mathematics, GIS

Main Basic Modules:Urban DrainageFlood Risk ManagementWater TreatmentWater Resources ManagementSustainable River Basin ManagementHydrological ModelingSustainable River ManagementHydraulic ModelingWater Quality ModelingGroundwater ManagementGovernanceSpecial Modules:Design Modules (urban drainage systems, flood protection systems, fishways, RMBP, etc)

In the discussion the group decided on the following steps to develop the new MSc-Programme :

- Before further development of a complete programme (4 Semester, 120 CP) the group should gain experiences in the cooperation. For this goal the Master course on "Integrated flood risk management" (15 CP) was developed under the lead-management of Karlstat University which was in progress in 2011.
- The programme needs funding from EU, the Erasmus Mundus funding could be a realistic option. But: application-process needs a lot of work.
- There already exist some other Master programmes with similar objectives in the EU, so the group should get in contact with them to learn from their experiences.
- The question of the certification of study-programmes should be solved.

As consequence of these aspects the group decided not to realize the Master Programme within the SAWA-funding until 2012, because:

• None of the SAWA-Universities has the current capacity to develop the new Master programme in 2011/12, because of a lot of other Master Programmes which are just in the starting phase (e.g. REAP-Master at HCU-Hamburg)

But as consequence the group decided:

• The Universities agreed to keep in contact with this idea and to meet again probably after SAWA-funding in 2013 to discuss the opportunities to develop the MSc "River Management – Quantity (FD) and Quality (WFD)"

2.5 EU-dimension of SAWA education

SAWA was a very good platform for developing European flood education. The large partnership and the many participating universities gave the education products both width and depth. The educational efforts so far have reached more than 300 students and there has been a spin-off in Sweden as a bachelor course. Many of the SAWA partners have actively contributed to the activities which have given valuable examples and case studies from the 5 SAWA countries.

Changing hazards and vulnerabilities over time create new needs of knowledge and education. The on-going implementation of the Floods directive in Europe also calls for new education.

The course has used the variety of European examples but also addressed the common features in European flood risk management. Trans-boundary and trans-disciplinary approaches have taken the SAWA master education to an integrated level.

3. SAWA student exchange program

3.1 Purpose

In line with the intentions in SAWA a Student Exchange Program (SEP) was developed, which mainly was directed towards (integrated) flood risk management.

In the Application to Interreg 4B, the SAWA consortium presented the plans for a Student Exchange Program (SEP) as phase 7 in SAWA. The project wanted to develop a basic concept for international exchange between schools and universities, and also exchange activities in relation to other SAWA activities (e.g. SEC activities).

A concept paper was written by Leuphana University after the starting exchange activities in 2009 and 2010. The aim was to answer the following core questions:

- What are the prerequisites for the SEP?
- How should the SEP be organised?

Before answering these questions it seemed suitable to clarify the meaning of the SEP. The main purpose of a SEP should be that students from different countries and universities with different (scientific) backgrounds work together on a specific topic, learn about country-specific approaches, and thereby develop new technical and social competences/capacities.

The first important question that must be answered for the SEP deals with its prerequisites.

It is crucial that both sides have enough resources (e.g. financial, manned and time) for an exchange and that students are willing to and have the capacities to attend the program. The financial resources refer in particular to the costs for face-to-face exchange and possible reimbursements for students, as for example excursions that could be assumed to be costly.

Moreover it must be considered that the study systems in the EU Member States are different. The successful organisation of the SEP depends on the clarification of the differences and similarities between the systems before setting up the SEP. It could be assumed that the interest in the SEP will be higher, if the program fit in the students' schedules. Furthermore it must be clear who is responsible for the SEP at the universities (unambiguous contact persons) and how long the SEP should last – should it be an on-going program independent from other university schedules?

The organisation of the SEP should be subdivided into two major aspects: the design of the platform and the design of the face-to-face exchange of students.

With regard to the face-to-face exchange it is necessary to develop/design a diversified program with enough time slots for professional input, student presentations, discussions and free time. To guarantee enough time for the stated aspects a 5 day excursion seems to be a suitable framework⁴.

The space of time for the face-to-face exchange depends on the different systems. For German students the education-free periods between the semesters would be a good opportunity.

⁴ It should be kept in mind that the travelling times during the excursion are not too long.

Highly relevant during the face-to-face exchange is the input from practitioners (e.g. representatives of municipalities) about water and flood risk management aspects (e.g. planned measures).

A further issue concerning the organisation of the SEP deals with the participants. It must be clarified how many students could participate in the SEP. This question is linked to several other questions and depends on the final design of the SEP, but nevertheless the maximum size should be 12 (to 15) from each country (with regard to for example excursions).

A further aspect that should be mentioned here concerns the course achievements of the students. Should the achievements be based on presentations and written elaborations or could the organisation of excursions or the development of guided tours also be a course achievement?

Finally it must be clarified how the SEP participants should become familiar with each other – the SEP could either start via a web-platform or via a first excursion. The latter would be a good opportunity to ensure that the participants/students become acquainted with each other at an early stage and develop a feeling of togetherness.

It should also be mentioned that the SAWA Master course and the SEP could be linked.

3.2 Student exchange activities in SAWA

The student exchange activities in SAWA were integrated in other work such as SEC activities and the Master education. The major exchange was following:

- 1. Exchange between universities
- 2. Exchange in relation to master course
- 3. Exchange during SEC study tour

1. Exchange between universities

Two exchange activities were made between SAWA universities and affiliated universities:

• Leuphana University – Rotterdam University. In June 2009 a group of bachelor students from Rotterdam University of Applied Sciences, Dept of Water Management, visited Leuphana University in Lüneburg, Institute for Sustainability Sciences. During the visit lectures were held and study tours made to the nearby river Ilmenau. 14 students took part in this exchange.



Student group from Rotterdam visiting Leuphana University in Lüneburg.

• Karlstad University – Leuphana University. In May 2010, 12 students at bachelor level from the Environmental Science education at Leuphana University visited Karlstad University for 3 days. They met 3 students and several staff members from Karlstad University. Lectures at the university were mixed with study visits in Karlstad and Arvika where representatives from the municipalities presented their flood risk management. The students presented group works that had been prepared "at home". Also the county administration in Värmland was visited. An island in the great Lake Vänern was visited during the last night and day of the visit. 5 staff members from the two universities followed the full visit.



Students from Leuphana University presenting student work in Arvika, Sweden.

2. Exchange in relation to master course

The two excursions during the master course in spring semester 2011 were excellent examples of intense student exchange:

- Excursion during 5 days in Germany and Netherlands in February 2011. 9 students represented 3 different universities in 3 different countries.
- Excursion during 5 days in Sweden and Norway in May 2011. 11 students represented 6 different universities in 4 different countries.

In total 6 staff members from Karlstad University and Leuphana University followed each of the excursions.

3. Exchange during SEC study tour

The SEC at Karlstad University arranged a flood study tour during 9 days in Germany and Netherlands in October 2011. The 35 participants of the tour were students at doctoral level and professionals from Sweden and Finland. 7 students from two Swedish universities were among the participants. The group met several flood experts from the SAWA partners.



Students at a visit to Blauestadt, Netherlands.

3.3 Future student exchange

The SAWA network is a tremendous basis for future student and staff exchange activities. One concrete follow-up that already is taking place is cooperation between Leuphana University and Karlstad University in the German *Bachelor Plus* programme. Students within Environmental Science can take one year at the exchanging university. The program starts in autumn 2012. It was the SAWA network that created this exchange which will last for several years ahead.

The SAWA master course that is now a permanent course at Karlstad University will be a platform for student exchange and for continuous cooperation between the SAWA universities.









Appendix 3. Schedule for excursion in Germany and Netherlands, February 2011.

| SAWAIW | aster Cou | ISC/ISCIIC | uuip | | |
|--------|-----------|---------------|-----------------------------------|---------------------|---------------------------|
| day | time | place | activity/program | leader / guide | accommodation |
| - | | Hostel | | | |
| | | Meininger | See separate program for | | 21-22 Hamburg Hostel |
| 21-feb | 8.15 | Hamburg | Hamburg | Wolfgang Dickhaut | Meininger |
| | | | | | |
| | | | Main tonic: storm surge and city | | |
| | | Hamburg | development in flood prone area | | |
| | | Tambarg | Main tonia: fluvial flood and | | 22.22 Hamburg Hostel |
| 22.6-1 | | Unmburn | Main topic, nuviar noou and | Welferne Diskbaut | 22-23 Hamburg, Hoster |
| 22-1eb | 08-00 | Hamburg | SUDS etc | wongang Dicknaut | meininger |
| 20-160 | 00.00 | | bus to Luneburg | Marchine Photos | |
| | 0.00 | 14/- | Integrated river basin | Manele, Philipp, | |
| | 9.00- | winsen, | management, flood risk | Monika | |
| | 12:00 | Luneburg | management river limenau | i ischbierek, Julia | |
| | 12:00- | 17 market and | h-m-th | | |
| | 13.00 | luneourg | | | |
| | | | flood risk management and | | |
| | | | sustainable development river | | |
| | | | Elbe (biosphere reserve) and | | |
| | 13:45 - | Bleckede/El | event management (with | M | |
| | 10:30 | pe | agricultural tocus) | Monika V. Haaren | 22.24 Coherenda, Ohn, 1 |
| | late | | Transfer for the second second | | 23-24 Scheemda, Stayokay |
| | atternoon | | Travel by bus to NL (Scheemda) | | Hostel |
| 24-feb | | | bus to Veendam | | |
| | | | | | |
| | | | room for rivers North east of The | | |
| | | | Netherlands, urban development | | |
| 24-feb | | | in flood prone areas | | |
| | | | Introduction: Catchment area of | | |
| | morning | Veendam | Veendam/measures | Jan den Besten | |
| | | | field trip: Flood polder and SAWA | | |
| | | Veendam | pilot project "Blauwe stad | | |
| | | area | /Oldambt meer" | Jan den Besten | |
| | | | Travel by bus to LeyIstad/Almere | | |
| | | | (at least 2 h) | | |
| | | | Urban development under the | | |
| | | LeyIstad/ | sea level (super levee, planning | | |
| | | Almere | options etc.) | Rens Huisman | |
| | | | Travel by bus to Rotterdam | | |
| | | | day: Adapted flood architecture | | |
| | | | and water management | | |
| | | | structures and institutes | | 24-25 Rotterdam, Stavokav |
| 25-feb | | | (Rotterdam and Delft) | | Hostel |
| 20.00 | | Rotterdam | | | |
| | | city | | | |
| | | information | Guest lecture about the city of | | |
| | 9.30 | centre | Rotterdam | Rick Heikoop | |
| | 10.30 | | Short excursion | | |
| | | | Departure boatride to RDM- | | |
| | 11.10 | | campus | | |
| | | | arrival RDM campus Tour Lunch | | |
| | | | and presentation about cityports | | |
| | 11.30 | | developments | | |
| | | | Workshops and assignment on | | |
| | | | watercafety and adaptive | | |
| | | | measures in the cityports area | | |
| | | | (Stadhavens) with assistance of | | |
| | | | the Rotterdam department of | | |
| | | | public works. Rotterdam | | |
| | 13.00 - | | university of Applied Sciences | | |
| | 17.00 | | and cityports project team | | |
| | 17.00 | | and onypoits project team. | | |
| | | | End of excursion: Two oboicor: | | |
| | | | an home from Detterdam or | | |
| | at 17.00 | | back to Hamburg by burg | | |
| | at 17.00 | | back to Hamburg by bus | | |

SAWA Master Course/1st field trip

Appendix 4. Schedule for excursion in Sweden and Norway, May 2011.

Excursion "Integrated Flood Risk Management" - Programme for the visit to Sweden/Norway 09.05.2011-13.05.2011 :

| Monday | | | |
|-------------|------------------------------------|---|---------------------------------------|
| 09.00-11.00 | County administrative board | Implementation of the Floods Directive in Sweden. The Swedish activities in SAWA | Susanna Hogdin, Länsstyrelsen |
| | | Presentation: Flood prevention in housing and infrastructure construction | Caroline Valen, Länsstyrelsen |
| | | Presentation: Future drinking-water supply for the larger Gothenburg area | Elisabet Athley, Göteborgs Vatten |
| 11.15-11.45 | Water plant Lärje | Visit to water-intake site by the river | Elisabet Athley, Göteborgs Vatten |
| 12.00-12.45 | | Lunch | |
| 13.45-14.45 | Intagan | Landslide problems in the Göta älv River | Åke Johansson, SGI |
| 15.00-16.00 | Trollhättan slussar/power plant | Shipping River Göta älv- Lake Vänern (Swedish Maritime Administration) | Björn Månsdal |
| 19.00 | | Accommodation Glava | |
| Tuesday | | | |
| 08.30-11.00 | Arvika city | Flood year 2000 | Maria Dåverhög |
| 11.00-12.00 | Bus transfer | To Karlstad | |
| | | Lunch | |
| 13.00-14.30 | Karlstad city | Flood walk Joint activity with another EU-project: Waterways Forward Interreg 4C | Lars Nyberg |
| 15.00-17.00 | Karlstad University | Meeting the group Centre for climate and safety, workshop | |
| Wednesday | | | |
| 8.00 | Meeting point train station | | |
| 8.00 | start bus trip along Klarälven | The trip will include stop at different places of geological, cultural- and biological interest. including presentation about Climate change and adoptation in Värmland | Lars Nyberg /Andreas Pettersson |
| 8.30-9.00 | Forshaga hydropower plant | Introduction to River Klarälven And Fish management in relation to hydropower | |

| 10.30-11.30 | Ekshärad | Water regulation and biodiversity | Sven-Åke Berglind |
|-------------|--|--|---|
| 13.00-14.20 | Ransby | The Pilgrim Tapestry/Lunch | |
| 15.00-16.00 | Höljes power plant | | Fortum |
| 16.00-17.00 | Bus transfer to Trysil | | |
| 17.00-18.00 | Trysil | Group talk | |
| Thursday | | | |
| 09.00-10.00 | Trysil centre | Flood protection in Trysil, guidance | Kari Reistad Svelle, NVE (for two days) |
| | Bus transfer | | |
| 10.15-10.30 | Jordet | Information: Flood protection | |
| | Bus transfer | | |
| 11.00-11.30 | Nordre Osensjø | Guidance: Erosion protection measures | |
| | Bus transfer | | |
| 12.30-13.15 | Norwegian forest museum | Lunch | |
| 13.30-16.00 | Norwegian forest museum, Elverum <u>www.skogmus.no</u> | Guidance with focus on Glomma River. Exhibitions both inside and out in the water park and a stream workshop | |
| | Bus transfer | | |
| 16.10-16.40 | Heradsbygd | Guided tour of the flood protected area | |
| | Bus transfer to Hamar | | |
| 17.10 | Check-in at hostel Hamar | | |
| Friday | | | |
| 09.00-11.30 | NVE, Hamar | Information on NVE | Region Chief Stein Nordvi |
| | | Sawa / flood directive | Roar Øvre |
| | | EU Water Framework Directive | Kristin Selvik |
| 11.30 | | Lunch | |
| 16.00 | Karlstad train station | | |