WATER (addendum) 2013

InnovationsAllianz
DER NRW-HOCHSCHULEN E.V.

THE UNIVERSITIES OF NORTH RHINE-WESTPHALIA: YOUR PARTNERS FOR EUROPEAN RESEARCH PROJECTS

TABLE OF CONTENTS

INTRODUCTION OF UNIVERSITIES' COMPETENCES AND RESEARCH
Projects are ordered according to universities

UPDATE NEW

TABLE OF CONTENTS

5.3 ZEF/UNESCO LANDSCAPE RESTRUCTURING PROJECT



Laser-leveler training in Urgench with farmers - Landscape of Amu Darya river floodplain, irrigated areas and desert, Khorezm - Eddy covariance tower in the project region, Copyright: ZEF

ABSTRACT

Creating resilient and sustainable agricultural- and ecosystems is urgently needed in Central Asia. To achieve this, an over-arching concept, coordination, cooperation and vision for this region is required. Uzbekistan, as the other countries in Central Asia, is confronted with the degradation of natural resources that is not likely to be halted in the near future. In this sense, the ZEF/UNESCO project "Economic and Ecological Restructuring of Land- and Water Use in the Region Khorezm (Uzbekistan)" addressed challenging issues such as: How can science, knowledge, and innovations reduce the loss of natural resources and resource use inefficiencies, benefit livelihoods and sustain environmental health?

Sustainable management and use of natural resources in Khorezm, a region in the Aral Sea Basin in Central Asia was thus the overall goal of this research and education project - with a focus on land and water. This region receives all the water it needs for its main economic activity, agriculture, from the Amu Darya river. For centuries it provided a decent livelihood, however, it was under Soviet rule that the irrigation system was scaled-up to an extent that triggered the environmental and economic problems the region faces today. Uzbekistan has inherited these challenges, which were exacerbated by the economic transition. ZEF's concept was therefore guided by the principle of efficiency and aimed at defining sustainable options for land and water use: namely ecologically and economically sound practices to increase resources use efficiencies, fight land degradation, mitigate greenhouse gas emissions, and increase rural incomes.

The project was developed and implemented by ZEF in cooperation with the science sector of UNESCO, German Space Agency (DLR), the University of Würzburg, and the State University of Urgench (UrDU), Uzbekistan. Next, KRASS (The Khorezm Regional Advisory Support Service, a project-initiated local NGO composed out of project alumni and employees of UrDU) supported dissemination activities. Due to the long-term commitment of all stakeholders, the necessary infrastructure to support advanced Science & Technology (S&T) activities in natural and social sciences could be set up. It also allowed for the training and academic education of a large group of Uzbek researchers that carried out the research, to obtain their Bachelor or Master degree at the State University of Urgench, or a Ph.D. degree at ZEF. The intensive collaboration of local scientists with international counterparts enabled the project to develop a unique learning atmosphere and helped to get embedded in the local and international science community. This unique and exemplary partnership in higher education and S&T resulted in positive media coverage and parliamentary support and the development of options for the use of the natural resources that will be sustainable for a long time, and that will be equally acceptable to farmers making their living, decision-makers facing tough political decisions, and those worrying about the environment. The successful human and institutional capacity building enabled locals to take over the project after its lifetime of 10 years.

LIST OF PARTICIPANTS

Main partners in Europe:
Center for Development Research (ZEF), University of Bonn
German Aerospace Center (DLR), Oberpfaffenhofen
University of Würzburg
Institute of Meteorology and Climate Research (IMK-IFU), Garmisch-Partenkirchen
UNESCO-Science Sector, Paris

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: ZEF/UNESCO landscape restructuring project Uzbekistan: 1.11.2001-31.12.2010 (cost neutral extension till 31.12.2011)

Costs: 8.1 Million Euro

Funding: Federal Ministry of Education and Research (BMBF), Center for Development Research (University of Bonn), Federal State of North Rhine-Westphalia, DAAD, Bosch Foundation

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The research and educational goals were in compliance with the Millennium Development Goals of eradicating poverty and hunger and achieving food and water security, but also with the United Nations conventions on desertification/land degradation and climate change. During the latest German presidency of the EU, a comprehensive and long-term Central Asian strategy was agreed upon by the European Council of Heads of State in June 2007, which formed also the basis for the German engagement in this region which is geopolitically important to the EU. The identified priority areas included, next to promoting security and stability in the region, education (particularly youth), supporting economic development (including trade and investment), and environment and water. Many of these key points are exactly the areas in which this project had engaged in.

The impact of climate change also threathens Central Asia. The latest information indicate, that the present, sufficient availability of irrigation water will become limiting. In case this gets confirmed, the pressure on irrigated agriculture, still a center piece of the livelihoods of the rural population will increase.

CONTACT: Center for Development Research(ZEF), Div. Ecology and Natural Resources, **Prof. Dr. P. Vlek, Dr. J. P. A. Lamers**

5.4 WASCAL – WEST AFRICAN SCIENCE SERVICE CENTER ON CLIMATE CHANGE AND ADAPTED LAND USE

Irrigation scheme near Dano, Burkina Faso / Meteorological station near Bolgatanga, Ghana; Copyright: Bernhard Tischbein/ZEF, 2013

ABSTRACT

West Africa is among the most vulnerable regions to climate change due to its high dependence on natural resources and agriculture for ensuring food security, generating income and providing livelihoods. Yet, this dependence is in sharp contrast to the region's limited adaptation capacity to climate change. WASCAL – the West African Science Service Center on Climate Change and Adapted Land Use - is a research-focused Climate Service Center mandated to tackle the impacts of climate change in West Africa. Its overall objective is to identify resilient land and water use measures to conserve or restore functional ecosystems that support sustainable human development. This is addressed through strengthening the research and analytical infrastructure and capacity in West Africa related to climate change and by pooling the expertise of ten West African countries and Germany. WASCAL was established by its ten member countries Bénin, Burkina Faso, Côte d'Ivoire, The Gambia, Ghana, Mali, Niger, Nigeria, Sénégal and Togo through the initiative by and the support of the German Federal Ministry of Education and Research (BMBF). WASCAL is organized around three Departments: Climate Service, Research, and Graduate Studies.

Building on national research communities, the Climate Service Department organizes observation networks on weather, hydrological cycles, land use, biodiversity and human coping strategies. The Planning and Policy Network of the Department ensures that the adaptation options to climate change are evaluated with relevant stakeholders before being formulated as management and policy actions.

The Research Department develops models and tools linking bio-physical and socio-economical processes including management interventions using inter- and transdisciplinary approaches. These tools will allow developing alternative land and water use options which can help societies to cope with the vagaries and impacts of climate change. The five core research clusters, climate and weather, landscape dynamics, agricultural systems, markets and livelihoods, and risk management, provide input for the sixth cluster integrated assessment. The Climate Service and Research Departments are housed at the WASCAL's Competence Center, in Ouagadougou, Burkina Faso. The Research program promotes common research within West Africa in cooperation with a German research consortium coordinated by ZEF, University of Bonn. To develop human capacities WASCAL runs a Graduate Studies Program to support and facilitate academic education among West African Universities in association with German counterparts. The Graduate Studies program consists of six Doctoral and four Master's programs, each based at a West African University.

Water-related research covers all scales: impact assessment of climate change on the hydrological cycle at regional level down to deriving measures at the local level (supplemental irrigation, decentral storage and use of shallow groundwater) to assist people in adapting better to variability of water resources.

LIST OF PARTICIPANTS

Partners in Germany:

Center for Development Research (ZEF), Department of Geography, Faculty of Agriculture, all University of Bonn; Department of Geography, University of Augsburg; Institute of Biological Sciences/ Botany, University of Rostock; Faculty of Biology, Department of Geography and Geology, all University of Wuerzburg; Deutsches Klimarechenzentrum (DKRZ), Hamburg; German Aerospace Center (DLR-DFD), Oberpfaffenhofen; Forschungszentrum Juelich (FZJ); Karlsruhe Institute of Technology (KIT, IMK-IFU), Garmisch-Partenkirchen

Partners in West Africa (summarized):

Universities, National Agricultural Research Systems, National Meteorological Services, National Water Resources Authorities in the ten member countries of WASCAL and more than ten regional and international organizations

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: WASCAL (from February 2010 to February 2016)
Costs: 56.6 Million Euro
Funding: Federal Ministry of Education and Research (BMBF)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

WASCAL contributes to the Millennium Development Goals of eradicating poverty and hunger, improving food and water security, ensuring environmental sustainability and supporting a global partnership for development. The research provides options towards resilient, adaptive and sustainable land and water use systems especially in rural areas. Thereby, the perspective of people to stay in their home region is strengthened and the pressure towards migration from rural to urban areas or from Africa to Europe is lowered. WASCAL is an initiative being open for cooperation with European and global research institutes and organizations. The focus of WASCAL activities on education, capacity development, transfer of knowledge, mutual learning and implementing of innovations in a transdisciplinary way is in compliance with the development agendas and strategies of European countries.

CONTACT: Center for Development Research (ZEF), **Prof. Dr. Paul L.G. Vlek; Dr. Manfred Denich**

7.2 LUCCI – LAND USE AND CLIMATE CHANGE INTERACTIONS IN THE VU GIA THU BON RIVER BASIN, CENTRAL VIETNAM

ABSTRACT

Background:

In Central Vietnam land and water resources are under pressure due to population growth, economic development and changing climatic conditions. Vietnam with its long coastline belongs to the most severely affected countries worldwide by climate change impacts. The rising sea level and salt water intrusion into rice fields is currently jeopardizing the existence of rural population.

Objectives and Activities:

The overall objective of the LUCCi project is to provide a sustainable land and water management framework that considers socio-economic development, population growth and expected impacts of climate change on land and water resources. Present contributions of land uses to greenhouse gas emissions are quantified on the one hand while current and future climate change impacts on land and water resources are analyzed on the other. Based on dynamical downscaling results, historical hydro-meteorological and geo-spatial data analyses, modeling and projections on socio economic development, alternative scenarios for land and water resources management are developed.

The Vu Gia Thu Bon river basin (VGTB), located in Central Vietnam, serves as case study and is investigated as a proxy for the whole Central Vietnamese region.

Data collection and scenario development is conducted in close collaboration with the national and local stakeholders and during the last phase of the project, these strategies will be jointly elaborated and implemented in the project region and offered to be transferred to further Central Vietnamese and other similar regions.

The LUCCI Project provides strategies for sustainable land use and water resources management in the Vu Gia Thu Bon River basin through:

- Integration of stakeholders in a multi-level approach for land use and water resources planning and decision making.
- Dynamical downscaling of regional climate change scenarios for the VGTB.
- Quantification of greenhouse gas emmissions from both, land use and land cover change.
- Scenario development based on newly generated knowledge about climate change, land uses, water availability and socio-economic development.
- Understanding the tradeoffs between socioeconomic growth and CC mitigation measures.
- Identifying and mapping relevant ecosystem services in the VGTB.
- Exploring policy measures to find opportunities for incentives to land use change.

Andreas Havemann, ITT

LIST OF PARTICIPANTS

German Partners:

CUAS, ITT Cologne University of Applied Sciences, Institute for Technology and Resources Management in the Tropics and Subtropics (ITT)

FSU, DGHM Friedrich-Schiller-University of Jena, Dept. of Geoinformatics, Earth Observation, Hydrology and Modelling

FSU, DEO Friedrich-Schiller-University of Jena, Dept. for Remote Sensing

IMK, KIT Karlsruhe Research Center, Institute for Meteorology and Climate Research

RUB, EEE Ruhr University Bochum, Institute of Environmental Engineering and Ecology, Faculty of Civil Engineering and Ecology

IHP/HWRP Secretariat, Federal Institute of Hydrology, Koblenz

Vietnamese partners:

VAWR Vietnam Academy for Water Resources

HUAF HUE University of Agriculture and Forestry

HCE HUE College of Economics

IMHEN Institute of Meteorology, Hydrology and Environment

MARD Vietnamese Ministry of Agriculture and Rural Development

MONRE Vietnamese Ministry of Natural Resources and Environment

MOST Ministry of Science and Technology

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: July 2010 - July 2015

Costs: approx. 4 million Euro

Funding: Federal Ministry of Education and Research (BMBF)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The consortium forms part of an international network consisting of research institutions, private and public sector institutions in South East Asia, Europe, Germany and worldwide. With regard to the research funding program Horizon 2020, the project consortium is preparing applied research projects in the field of disaster risk management, water resources and irrigation management, hydrology and climate research. Target regions are the Mekong river basin and different regions in South-East Asia as well as catchments in the different EU partner countries.

CONTACT: ITT, Prof. Dr. Lars Ribbe, Alexandra Nauditt

7.3 WATER SCIENCE IN CHEMICAL INDUSTRIES, BIOTECHNOLOGY AND ENVIRONMENT

ABSTRACT

Main targets of the newly founded research institute STEPS are process development and control for chemical, sonochemical (AOP) and microbiological (combined anaerobic-aerobic) processes through online (LC-IC-MS-MS) and inline (FTIR sensor technology) process-analytical methods, data validation and simulation. Competences are available in the area of sewage plants, process water, drinking water production and water management. Interdisciplinary projects aim at reaction mechanism and degradation pathway of industrial and environmental relevant substances and metabolites for process development and process engineering. The principles and methods of green chemistry and green engineering are applied for sustainable water use and management.

LIST OF PARTICIPANTS

FOI-STEPS participants:
www.steps.fh-koeln.de

Partners:
University of Cologne and several Technical Universities

Industrial partners:
CLARIANT, LANXESS, Bayer Health Care, Bayer Material Science, GECO-C and several other smaller companies in the region of NRW.

Contact for coordination:
Dr. Anne-Kathrin Hillenbach, anne-kathrin.hillenbach@fh-koeln.de

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: Foundation as Research Graduate School by the Cologne University of Applied Sciences,
June 2013 – June 2018

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

- Establishing of international research projects in the field of Green Chemistry and Green Engineering as cooperative graduate school.
- Cooperation with Universities in Germany and intenational companies in the European Union.



STEPS research centre of excellence: membrane technology and process analytics

CONTACT: Research Institute "STEPS" (FOI-STEPS), **Prof. Dr. Astrid Rehorek**

7.5 AGENT-BASED INTELLIGENT AND INTEGRATED CONTROL OF SEWERAGE NETWORKS AND WWTP'S

Gummersbach Environmental Computing Center
GECO▶C

ABSTRACT

Most sewerage systems in Germany are still operated in a static way. In many cases, this leads to inefficient utilisation of the hydraulic capacities. When there is heavy rain, some storm water tanks are only partly filled while others already discharge into the associated river. This leads to unnecessary water contamination for the affiliated rivers.

Application of intelligent control strategies to sewerage systems represents a cost-efficient approach for a better utilization of the existing hydraulic capacities. It also contributes towards environmental protection. The research team GECO▶C at the Cologne University of Applied Sciences has addressed these problems by utilising modern simulation tools, innovative control approaches, and data processing structures.

The best advantage of software agents exists in their universal applicability. This means they can be easily transferred to sewerage networks with deviating characteristics and/or different configurations.

LIST OF PARTNERS

Cologne University of Applied Sciences, Cologne/Gummersbach

Aggerverband (public corporation), Gummersbach

Gelsenwasser AG, Gelsenkirchen

Technische Werke Emmerich am Rhein GmbH, Emmerich

Kläranlage Wetzlar, Wetzlar

Steinhardt GmbH Water Technology, Taunusstein

Queen's University Belfast, Questor Centre, Northern Ireland

National University of Ireland Maynooth (NUI), Dept. of Electronic Engineering, Prof. Dr. Sean McLoone, Ireland

Cologne University of Applied Sciences, STEPS Sustainable Technologies and Computational Services for Environmental and Production Processes, Prof. Dr. Astrid Rehorek, Cologne

Fritz Husemann GmbH & Co. KG, Gütersloh

and others

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

More than 3 national and European, ongoing and finished, research projects – 3 projects in preparation.

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The working group GECO▶C of the Institute for Automation & Industrial IT of the Cologne University of Applied Sciences deals with environmental engineering since the middle of the nineties. The team of Prof. Dr. Bongards has worked out a high competence in numerous, also international research projects in the automation engineering.

Our goal is to develop intelligent measurement systems for sewerage structures with a low energy consumption by using self-organising wireless sensor networks. The perspectives for such measurement systems are very promising since they are a prerequisite for the practical application of innovative control and optimisation strategies.

Special requirements apply for the development and test of control and optimisation systems because of a lack of EU infrastructure with respect to small, decentralised sewerage systems. To address this particular problem of sewerage systems with minimal infrastructure, the existing methods could be adapted to provide different solutions for the optimal configuration and installation of innovative control systems.

Agent system (laptop), pumping station GECO▶C

Exit of the sewerage system GECO▶C

CONTACT: Institute for Automation & Industrial IT, **Prof. Dr. Michael Bongards**

7.6 CAPWATER – DEVELOPING CAPACITIES IN THE FIELD OF MONITORING AND ASSESSMENT OF WATER RESOURCES

Training courses: Water Monitoring and Data Management (Pictures: Jens Bogula/Rike Becker/Andreas Havemann)

ABSTRACT

The overall goal of the proposed project is to significantly contribute to the education of experts in the field of water resources sciences and management especially in developing countries. The project aims at strengthening the practical and technological know-how of young professionals from Vietnam, Bangladesh, Brazil and Germany in Water Monitoring, Hydrological Modelling and Data Management as well as enlarging cooperation partnerships with university and business partners in the water sector.

To successfully achieve these goals, the following objectives shall be fulfilled:

- Establish an expert consortium with private sector partners and university partners.
- Jointly develop practice oriented modules and learning units on water quantity and quality monitoring, data management and modelling.
- Training of Trainers – improve the capacities, intercultural working and teaching skills of lecturers and trainers in the consortium.
- Disseminate the course curricula beyond the consortium to the network of each partner.
- Develop entire training modules to be offered to Official Development Assistances (ODA) as well as governmental institutions and universities.
- Provide access to local markets for private sector companies and environmental institutions and educate potential staff and representatives in the partner countries.

LIST OF PARTNERS

University cooperation partners:

Cologne University of Applied Sciences, Institute for Technology and Resources Management in the Tropics and Subtropics (ITT)

Vietnam Academy for Water Resources, Hanoi/Vietnam (VAWR)

Fluminense Federal University, Niteroi, Rio de Janeiro/Brazil (UFF)

International Centre for Climate Change and Development - Independent University Bangladesh, Dhaka/Bangladesh (ICCCAD-IUB)

SME cooperation partners:

ribeka Software GmbH, Bornheim

SEBA Hydrometrie GmbH, Kaufbeuren

DHI-WASY Software GmbH, Berlin

Public institution cooperation partner:

BGR - Federal Institute for Geosciences and Natural Resources, Branch office

Hanoi/ Vietnam

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: October 2013 – December 2016

Costs: approx. 325.000 Euro

Funding: DAAD (University-Business Partnership Programme)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

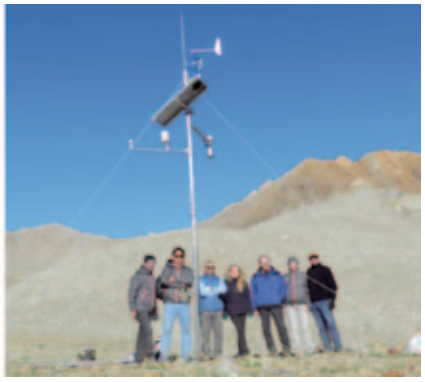
The need for practical training in developing countries in the context of water resources will grow in the coming years because both society and governments are getting more aware of the emerging environmental problems in their countries. The developed practice oriented and relevant competencies will help the students to find employment and additionally strengthen the market potentials for the involved SMEs and thus promoting German engineering capacities abroad. Furthermore the partnership will create a multitude of new opportunities for all involved partners. The companies will obtain access to new markets, contacts to ODA and relevant water related institutions and later also to new possible partner institutions in the existing partner networks. At the EU level, the consortium will be able to jointly develop further research and funding proposals to develop future research projects in the field of monitoring and the assessment of water resources.

CONTACT: ITT, **Prof. Dr. Lars Ribbe** (Project Leader), **Dipl.-Geogr. Rike Becker** (Coordination)

7.7 DEVELOPMENT OF AN INFORMATION AND MONITORING SYSTEM TO IMPROVE WATER USE EFFICIENCY IN CENTRAL CHILE – WEIN

Measuring discharge in irrigation canal

Cultivated Limarí valley



Climate station at 3500m of elevation

ABSTRACT

Background:

Water resources are under high pressure due to climate change, economic development and population growth. A very important concern of further water management especially in semiarid regions is to design adequate strategies for efficient water use considering regional, environmental and climatic aspects.

The study area is the semi-arid Limarí river basin in Northern Central Chile. The region is highly vulnerable to climate variability and change as it relies on the snow melt driven hydrology originating in the high Andes cordillera. The long term drought period during 2008-2013 has been further increasing the interest to improve the knowledge on hydrological processes under climate variability and to provide reliable water availability projections for different climate scenarios.

Main Goal and Activities:

In the scope of the WEIN project, a monitoring, modelling and information system is developed, combining climate and high elevation catchment research with water management strategies considering socio-economic, institutional and environmental aspects.

By combining the application of appropriate hydro-meteorological assessment methods and models with high quality SEBA measurement devices and the Ribeka information system, a research oriented technical solution is provided to improve transparency on water resources quantity and quality and hence to increase water use efficiency.

In the first project period valuable measuring stations have been contributed to the existing climate stations and discharge monitoring network and monitoring gaps are being identified. Based on historical and monitored data as well as geochemical and isotope tracer analyses, different hydrological models are applied to predict future water availability. Each year takes place conferences with the water users, private sector companies and researchers in the region to discuss the research and technological demand.

LIST OF PARTNERS

German partners:

Cologne University of Applied Sciences, Institute for Technology and Resources Management in the Tropics and Subtropics (ITT)

SME: Ribeka Water / Resources Information Systems

SME: Seba Hydrometry / Water Resources Measurements and Monitoring

Chilean Partners:

The Center for Advanced Studies in Arid Zones (CEAZA)

Faculty of Agricultural Sciences of the University of La Serena

National Institute of Agricultural Science Instituto de Investigaciones Agropecuarias, (INIA)

National Chilean Water Authority, Dirección General de Aguas (DGA)

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: July 2012-July 2014

Costs: 372.000 Euro

Funding: Federal Ministry of Education and Research, BMBF

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The consortium forms part of a European network consisting of Universities, research centres and private sector companies in Spain, Norway, Scotland, Sweden, Czech Republic, etc. and is preparing applied research projects in the field of disaster risk management, water resources and irrigation management, hydrology and climate research as well as water-food-energy security nexus related research. Target regions are the Mekong, the Nile river basin, different regions in Latin America as well as catchments in the different EU partner countries.

CONTACT: ITT, **Prof. Dr. Lars Ribbe, Alexandra Nauditt** (Coordination)

7.8 IWRM

INTEGRATED WATER RESOURCES MANAGEMENT – FOR YOUNG PROFESSIONALS

ABSTRACT

Water resources, indispensable basis for development, food, and health, become ever scarcer and more polluted.

The concept of Integrated Water Resources Management (IWRM) offers solutions to the water crisis in linking water to other vital resources and viewing the whole water cycle together with human interventions as the basis for sustainable water management. As it is a relatively new concept there is a high demand for experts adequately trained in the concept of IWRM. Next to the technical and managerial knowledge related to water resources these experts should also have knowledge of the practices of project funding and international cooperation.

For bilateral projects between Germany and Arab countries there is a need for experts being familiar with the culture, language and politics of both sides and are skilled in intercultural communication.

The MSc »IWRM« has the objective to form such experts and to promote the concept of IWRM in the context of German-Arab cooperation.

Teaching contents and aims:

The studies cover a period of three semesters. The first semester takes place in Amman, second semester in Cologne. The third semester is dedicated to the master thesis.

The didactic concept consists of two components: a technical and a social. The technical component provides the participants with the relevant and up to date knowledge necessary to take decisions towards a sustainable management of water resources. The social component is equally important and aims at equipping the participants with the communicative, intercultural and managerial skills necessary to take up leadership positions in the water sector and to work effectively in the framework of international cooperation.

In class, modern methods of teaching should be applied such as problem based learning, interactive teaching, concept mapping and computer based learning.

Degree:

The participants receive a double degree Master of Science »Integrated Water Resources Management«, issued by the Cologne University of Applied Sciences and the University of Jordan.

LIST OF PARTNERS

Implementing Universities:

CUAS Cologne University of Applied Sciences

UJ University of Jordan

International partners:

GIZ Deutsche Gesellschaft für Internationale Zusammenarbeit

DAAD Deutscher Akademischer Austauschdienst

UN-ESCWA United Nations Economic and Social Commission for Western Asia

BGR Bundesanstalt für Geowissenschaften und Rohstoffe

Excursion to Wadi Musa WWTP, Jordan Group Work Excursion to Petra, Jordan

KfW Kreditanstalt für Wiederaufbau

ACWUA Arab Countries Water Utilities Association

CEDARE Center for Environment and Development for the Arab Region and Europe

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: June 2006 - December 2014

Costs: approx. 2.2 million Euro

Funding: GIZ and DAAD on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The graduates are able to analyse complex economic and technical processes taking into account relevant resources and ecological problems. They are also able to analyse the complex regional economic and ecological problems, to find the appropriate technologies and concepts to solve these problems on an interdisciplinary way and to develop management strategies for the international cooperation.

Integrated Water Management is one of the key sustainable development priorities of Jordan and the wider MENA region which is characterised by severe water scarcity. It is also the focus of German development cooperation in the region with the aim of supporting governments to achieve sustainable water resources management, whereby IWRM is widely recognised as the conceptual approach which is being followed. As capacity development is increasingly understood as an indispensable component of IWRM the master programme has received financial support and appreciation by donors – initially from BMZ and recently also from the Arab Fund and the OFID (Office of International Development of OPEC), the latter two exclusively to provide scholarships for Arab students.

Furthermore, through long-term cooperation relationships and intensive exchange of ideas and experiences, the IWRM programme has also contributed and will continue to raise the educational capacities of partner country institutions.

CONTACT: ITT, **Prof. Dr. Lars Ribbe, Jörn Trappe, Aline Bußmann**

12.1 DRINKING WATER HARVESTED USING RADIATION EXCHANGE

ABSTRACT

The project's goal is to develop an efficient process for collecting water from air humidity. Tools for harvesting water from fog have recently been demonstrated in the trade wind zones. The use in semi-arid zones of such methods for harvesting water from dew requires energy and cooling facilities. However, a surface can be cooled down without any energy input by using radiation exchange with the upper atmospheric layers.

We have developed an absorber which can be cooled by 6°K compared to the ambient environmental temperature. Using this device, we could harvest up to 970 ml water per m^2 per night with a mean value of 520 ml water per m^2 per night. This approach can be used both to collect drinking water in critical regions and to supply re-forestation programs with water.

LIST OF PARTICIPANTS

Project partners:

South Westphalia University of Applied Sciences, Iserlohn (Coordination)

Koch Anhängerwerke GmbH & Co KG, Winsen/Luhe

Münchenbernsdorfer – Folien GmbH, Münchenbernsdorf

Instituto de Radio Astronomia Milimétrica (IRAM), Granada, Spain

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: April 2004 - November 2009

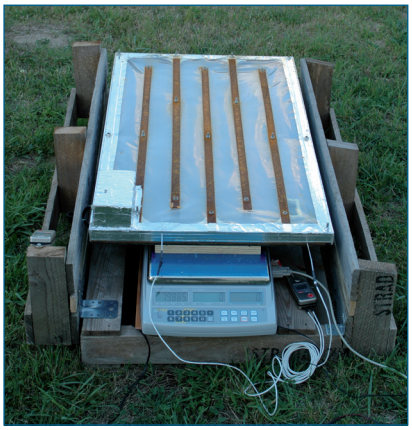
Costs: 219,395 Euro

Funding: Federal Ministry of Education and Research (BMBF)
FKZ: 02WD0458

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Pilot runs are being conducted in Spain and France. Subsequently, we want to carry out long-term tests, for example, in the Extremadura region of Southern Spain, which is currently under partial re-forestation or other regions in the semi-arid zone for example Arizona in US. For this purpose we need new cooperations and partners. We are interested in forming a European Research Association that develops the production framework and facilities for water harvesting and delivery to plants under economic conditions.

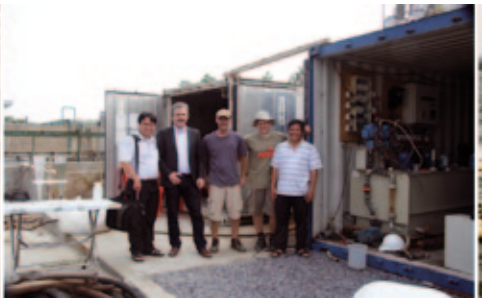
1st generation water sampler on the roof of IRAM



2nd generation water sampler in France

CONTACT: Interdisciplinary Centre of Life Sciences, **Prof. Dr. Dieter Ihrig**; Ihrig.Dieter@fh-swf.de

14.2 TECHNOLOGIES FOR WATER AND ENVIRONMENT PROTECTION OF COASTAL ZONES IN VIETNAM (EWATEC-COAST) SUB-PROJECT 8: INDUSTRIAL WATER MANAGEMENT



Production of leather in a Vietnamese tannery: Joachim Fettig, HS OWL
Members of the project team at the pilot-plant: Joachim Fettig, HS OWL
Thi Vai river: Volker Pick, HS OWL

ABSTRACT

The main target of the joint research project is the development and application of water and environmental protection technologies and the development and preparation of a comprehensive model-based water management system in order to improve the environmental and general living conditions in the Thi Vai river basin and the Can Gio mangrove forest in South Vietnam, taking the natural climate variability and future climate changes into account. The Thi Vai river which is the receiving water for wastewater from several newly built industrial zones, is heavily polluted because the techniques and facilities applied for wastewater treatment are inadequate.

The joint project has two interacting core areas with altogether 9 sub-projects. Within sub-project 8 "Industrial Water Management" the treatment of tannery wastewater by operating an innovative multi-stage pilot-plant at a company in the Thi Vai area will be investigated and optimized. In addition, reuse options for the treated wastewater will be evaluated. The components of the pilot-plant were produced in Germany and have been shipped to Vietnam. The treatment train includes both physical-chemical and biological stages.

Following the proof of its applicability and operation, the treatment concept will be used to plan a treatment plant at technical-scale and calculate its costs in order to provide decision-making support for future treatment of tannery wastewater under the boundary conditions in Vietnam and other countries in Southeast Asia. The results of this sub-project will also be incorporated in the model-based water management system for the Thi Vai region.

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PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: 2012 - 2015 (36 months)

Costs: 3,021.622 Euro

Funding: Federal Ministry of Education and Research, Germany
National University of Vietnam

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

- Wastewater treatment in developing countries as well as in countries in transition is a global scientific problem that necessitates cooperation between local authorities and international partners. Establishing a network with universities, organisations, and municipalities on a European level should facilitate the dissemination and transfer of the project results to other places.
- Development of a comprehensive water pollution control management system in industrialised countries will provide a valuable tool for planning purposes in other parts of the world.
- Working together with international partners will allow them to more easily gain access to the European Research Area (ERA) and could result in a higher level of research mobility and exchange of knowledge.

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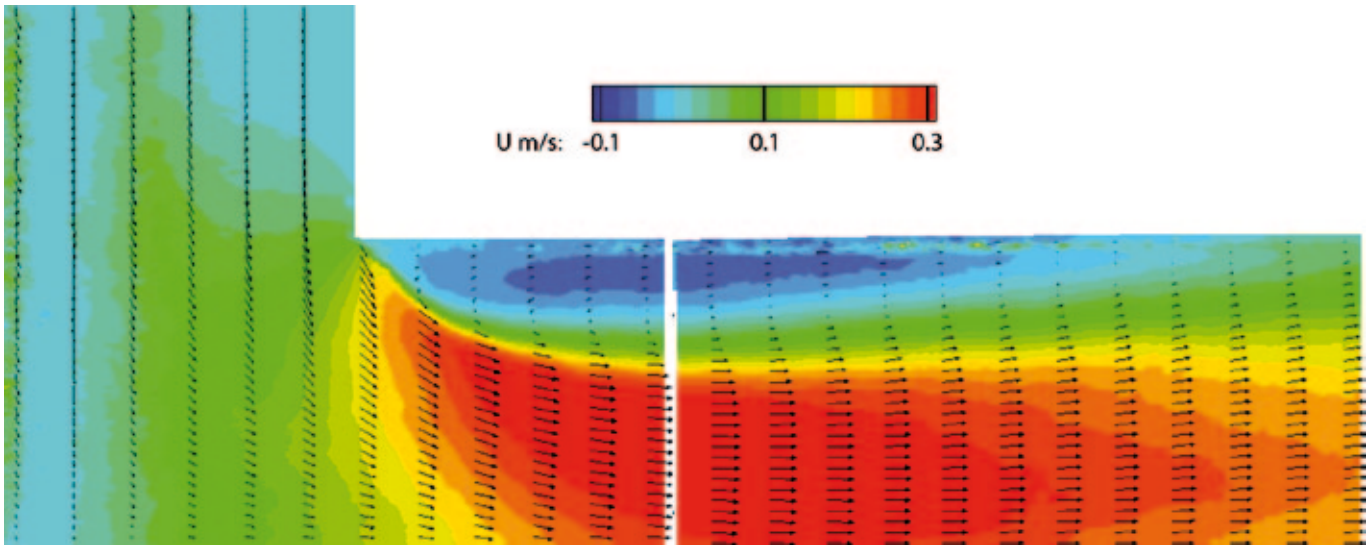
15.4 FLUKZ

DISCHARGE MEASUREMENT IN DISTURBED SECTIONS OF FLOW PROFILES IN THE SEWER SYSTEM



PIV-measurement: Disturbed velocity field after a redirection (Ebbert 2013)

ABSTRACT

Data from discharge measurements in sewer systems are not only very important for their design and operation, but also for the protection of water bodies and the prevention of floods. Additionally, data from waste-, infiltration- and storm water flows are vital for the construction design and are of crucial economical relevance, because they provide the data basis for considerable investments in sewer systems and wastewater plants.

Currently, we have high-tech measurement instrumentation, which need a fully developed flow profile in a non-disturbed measurement station in order to calculate the discharge from the locally measured flow velocities and water depths. Due to junctions and installations such conditions are very rarely available at the measurement stations.

Accordingly, the aim of FLUKZ is to identify the reason of the disturbances and to evaluate them regarding the correctness of the discharge measurement. For this computational fluid dynamics (CFD) and particle image velocimetry (PIV) will be used.

FLUKZ results will allow drafting application guides and correction practices for discharge measurements at selected disturbed sections in sewer system. Furthermore, the results of the CFD simulations and the PIV measurements will be implemented into a database connected to a visualization tool for future work of the project partners. The application of the results will help to improve the state of the art of discharge measurement and their correctness.

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- NIVUS GmbH
- Dr. Pecher AG
- Ingenieurgesellschaft für Stadthydrologie mbH
- Emscher Gesellschaft für Wassertechnik mbH
- DWA Landesverband NRW
- Stadt Münster

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: 2012 - 2014

Costs: 251.000 Euro

Funding: Ministry of Innovation, Science and Research of the German State of North Rhine-Westphalia

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