Water initiatives at TU Dresden, Commission on Water Research, UNU FLORES

Peter Krebs

GWSP SSC Meeting

Bonn, 9 December 2010
DFG Senates commission on Water Research (KOWA)

UNU FLORES in Dresden

Water initiatives at TU Dresden
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Water initiatives at TU Dresden
Mission

Promote inter- and trans-disciplinary basic understanding and research

Identify core work areas in water research

Promotion of national and international collaboration on research and funding level

Support decision making in politics and authorities

Linking water research in Germany – and on an international level
Guests:
- BMBF
- Young Scientists, Prof. B. Planer-Friedrich
- Office International Hydrological Program, Dr. J. Cullmann
- Review board Water Research
- Helmholtz Association, Prof. G. Teutsch
- Leibniz Association, Prof. K. Tockner

present KOWA members

Germany

- S. Crewell
  Meteorology
- M. Exner
  Environmental Medicine
- H. Vereecken
  Soil Physics
- U. C. E. Zanke
  Hydraulic Engineering
- W. Aeschbach-Hertig
  Hydrophysics
- A. Bárdossy
  Hydrology
- R. Helmig (Spokesperson)
  Hydromechanics
- I. Neuweiler
  Hydromechanics
- M. Jekel
  Hydrochemistry
- U. Gaedke
  Limnology
- E. Günther
  Environmental Management
- P. Krebs (Deputy Spokesperson)
  Urban Water Management
- K. Küsel
  Aquatic Microbiology
- M. Ahlheim
  Environmental Economy

DFG:
- Dr. Ute Weber
  Programme Director
Operational means

Working groups, open to external scientists

Round table discussions, workshops, summer (spring) schools on an international level

Interdisciplinary research proposals, often linking basic and applied research
KOWA activities

**Research topics**
- Water, viruses and health
- Urban water resources and compounds management
- Data and monitoring

**Strategic & research topics**
- Integration of social and economic sciences into water research
- Scenario building
- Infrastructure for environmental research

**Strategic activities**
- Structures in national and international water research
- Promoting independent development of young scientists
  - Water Science Alliance
KOWA round table discussion, June 2008

“Meeting the new challenges in international water research – discussing strengths and weaknesses of existing centers and potential for developing new structures”

Vision
Carrying out
- interdisciplinary research
- on relevant topics
- on a high scientific level
- in a stimulating environment

→ DFG/KOWA is part of the process and actively contributes to the development of WSA
DFG Senates commission on Water Research (KOWA)

UNU FLORES in Dresden

Water initiatives at TU Dresden
Challenges in resources management

- Non-renewable resources are depleted
- Renewable resources are deteriorating in quality
- Overuse and incomplete recycling
- Diffuse distribution
- Complex flux patterns
- Coupling of agriculture, land use, water and waste on an international level
- New compounds, priority substances
Loss of phosphorous

### UNU FLORES
Integrated management of material fluxes and resources

#### Systems and flux analysis

**Global change**
(climate, demography, socio-economic, land use)

**Water management**

**Soil and land use management**

**Waste management and contaminated sites**

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#### Capacity development

Develop tools to evaluate options

Develop scenarios

Identify drawbacks

Analyze processes

Develop options

Implementation concepts
The UNU postgraduate programmes (Master and PhD) on “water”

Dresden based Graduate School

Master of Science programme
Goal:

to strengthen UNU’s presence in developing and transitional countries

to intensify research and teaching interaction with those countries

build sense of ownership of various research and capacity development activities in those regions
Twin institute Mozambique

Rationale: Mozambique facing serious water-related problems
  → government ready to address those challenges
  → Consolidated Plan for Action for Science & Technology in Africa (CPA) identified “water” as core subject of one of the regional centres of excellence
  → water management among crucial problems globally

Establishment of water-focused twin institute could have strong regional impact / capacity strengthening through UNU collaboration and presence in Africa

Goal: Twin institute to be operational by 2013
DFG Senates commission on Water Research (KOWA)

UNU FLORES in Dresden

Water initiatives at TU Dresden

- Meteorology
- Hydrochemistry
- Hydrology
- Hydromechanics
- Hydro Engineering
- Urban Water Management
- Waste Management
- General Ecology
- Hydrobiology & Limnology
- Soil Science & Site Ecology
- Groundwater Management
- Contaminated Site Treatment
- Environmental Development & Risk Management
- Remote Sensing & Geodata Analysis

→ linked to UFZ, IÖR, IGB, UNEP/CIPSEM, UNU FLORES
Surface water quality, matter sources and pathways, evaluation of measures

Water management and land use in climate-sensitive regions

Groundwater recharge, safe yield and agriculture

Waste, wastewater and sludge reuse for energy, groundwater recharge and agriculture

Urban water management under rapid population growth
Nutrient flux modelling on catchment scale

Helm & Blumensaat (2010)
Project REGKLAM
Regional climate change adaptation program

Module 1
Integrated Regional Climate Change Adaptation Programme

TP 1.1
Climate change adaptation programme

TP 1.2
Innovation strategies for the economy

TP 1.3
Transfer strategies

Module 2
Regional scenarios

TP 2.1
Climate parameters

TP 2.2
Atmospheric parameters

TP 2.3
Scenarios of economic change

TP 2.4
Integrated scenarios

Module 3
Adaptation options for the Region of Dresden

Sub-module 3.1
Urban infrastructure

TP 3.1.1
Structures of buildings and cities

TP 3.1.2
Green and open space, bio-climate

TP 3.1.3
Climate sensitive industrial production

Sub-module 3.2
Water systems

TP 3.2.1
Operation of reservoirs

TP 3.2.2
Groundwater

TP 3.2.3
Water supply

TP 3.2.4
Waste water disposal

Sub-module 3.3
Land use

TP 3.3.1
Adaptation strategies of agriculture

TP 3.3.2
Adaptation strategies of forestry

TP 3.3.3
Integrated evaluation

Module 4
Scientific management of the project

Regional Co-ordination office

Regional Co-ordination office

Safeguard link to national and international research

Scientific advisory board (external experts)

Scientific advisory board (external experts)
Projected extreme rainfall

Example: rain heights for return period = 20 a, Duration = 15 min

The diagram illustrates the projected extreme rainfall with a return period of 20 years and a duration of 15 minutes. The bars represent the rain heights for different locations: Aachener Straße, Botanischer Garten, Obergorbitz, and Tolkewitz. The chart compares the reference period (1996-2010) with the projected period (2036-2065) and shows the difference in rainfall accumulation.
Extreme “event” analysis

Continuous integrated long-term simulation with detailed models

Part of sewer system of Dresden, adapted WWTP, self-purification of river is weak

10 years rain series, 14 rain gauges, 5-min temporal resolution

Extreme value analysis

Application on

Extreme values of NH$_3$ and O$_2$ concentrations in river

Scenario analysis

Development of control strategies, extreme value analysis as major criteria
The most intense rain events are not critical for receiving water quality.

Schindler et al. (2008)
Micro pollutants = f(Demography)

**Lipid regulator:**
Mainly older people

**Sexual hormone and Gynaecologicum:**
Young and mainly older people, resp.

**Antibiotics, anti-infectivum:**
Regular distribution over age classes

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**Population growth**
- Bezafibrate
- Estriol
- Amoxicillin

**Population decrease**
- Bezafibrate
- Estriol
- Amoxicillin

**Population const. Increasing age**
- Bezafibrate
- Estriol
- Amoxicillin
Do not only model...