



**Water Security
and Climate Change
Conference**

—
Nairobi 2018

Programme

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Water Security and Climate Change Conference

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ORGANIZED BY



Kenyatta University

CNRD

Centers for Natural Resources
and Development



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German Academic Exchange Service



Prof. Paul K. Wainaina
Vice Chancellor Kenyatta University

Message from Prof. Paul K. Wainaina (Vice Chancellor Kenyatta University)

Dear Participants,

The third international conference on (Water Security and Climate Change 2018) that has been organized by Kenyatta University and DAAD funded Excellence Centers; Centre for Water Management in Developing Countries (SWINDON) (Technische Universität Braunschweig), Centre for Natural Resources and Development (CNRD) Technische Hochschule Köln, and Centre for Food Security (FSC) (Universität Hohenheim) is the first to be held in Africa. The conference will spotlight the key role that universities can play in the achievement of the seventeen Sustainable Development Goals. The many papers and posters to be presented during the conference will mainly target Goal 2 of ending hunger, Goal 6, pertaining to universal access to water and sanitation and Goal 13 of taking urgent action to combat climate change and its impacts.

Africa continent has a low level of greenhouse gas (GHG) emission but has become a real victim of climate change. The continent is highly affected by severe changes in weather patterns leading to aridity with some regions experiencing an increase in droughts. Climate change is expected to result to the Africa's population living under water stress to increase from 47% as in year 2000 to 65% in year 2025. These effects are generally threatening the continent from achieving Sustainable Development Goals (SDGs).

The conference marks an important phase in the creation of an alliance of universities, research institutions, non government organizations and policy makers in identifying common solutions to overcoming challenges facing water and food security related issues in the face of climate change. When all is said and done, the strength of the alliances will depend on the capacity to assemble talent and create an environment of diversity in which men and women can work together to build a sustainable future.



Prof. Dr. James Biu Kung'u

Dean Sch. Of Environmental Studies - Kenyatta University

Message from Prof. Dr. James Biu Kung'u, Kenyatta University

Climate change is one of the major challenges facing the world though there are a few people denying the reality. Climate change is exacerbating the situation of water stress, and threatens the economic development of many countries. The adverse impacts especially in developing countries are undermining the achievement of Sustainable Development Goals (SDGs). The increase in global temperature, sea level rise, ocean acidification, low agricultural yields and scarcity of water are affecting many communities especially in the coastal areas and low lying coastal countries. The impact is affecting mainly the least developed countries and small islands developing states, making the survival of many societies and of the biological systems of the planet be at risk. The impacts and consequences of climate change on the water cycle are related mainly to variations in the average and the geographical distribution of rains, the upsurge in droughts and heavy precipitations.

Addressing the challenges associated with climate change to achieve the SDGs, especially in developing countries, requires the implementation of actions and significant investments in infrastructure and new technologies in different fields especially in water related sector. There is therefore urgent need to share mitigation strategies, strengthened resilience and adaptive strategies to climate related hazards and natural disasters in all countries. The 3rd International Conference on Water Security and Climate Change 2018 that is held in Nairobi and the first time in Africa provide an opportunity for researchers, policy makers, extension staff and development agents to learn from each other on the best strategies of tackling the challenges of water security and climate change. It encourages stakeholders to integrate climate change measures into their national policies, strategies and plans. The conference provides a roadmap of creating awareness and building institutional capacity for many stakeholders in the area of water security and climate change. It also provide an opportunity for researchers, policy makers, extension agents and development agents to partner and network in the future.



Lars Ribbe

Head of Project, Centers for Natural Resources and Development (CNRD-exceed)
Director, Institute of Technology and Resources Management in the Tropics and Subtropics, TH Köln

Message from CNRD-exceed, ITT (TH Köln University of Applied Sciences)

We still need to make sufficient additional efforts to provide science-based solutions to societal challenges – with water security and climate change at the top of the agenda! For this purpose, stronger bridges need to be built between science and practice. This conference is a clear step towards that.

Water Security and Climate Change are both considered key concerns of the 21st century. This statement can be substantiated by voices from Science, Policy and Economy alike, underlining the broad agreement on that aspect. The annual Global Risk Report by the World Economic Forum in the past years always ranked either Water Crisis or Extreme Weather under the top three risks of our planet! Coping with both issues is without doubt a key ingredient of the successful implementation of the 2030 Agenda for Sustainable Development.

Acknowledging this relevance, WSCC 2018 aims at exchanging the latest insights into corresponding scientific foundations, assessments and analyses as well as experiences and tools towards developing solutions to fundamentally complex challenges. Through the conference we aim to establish vivid dialogue among scientists of multiple provenances and furthermore among representatives from research, policy and practice in order to design innovative approaches towards the sustainable management of natural resources.

We should clearly measure the success of our conference according to the impact it creates. On one hand, we identify topics for all the sessions which reflect the current debate and public interest. On the other hand, we aim to present results towards evidence-based solutions e.g. knowledge products and approaches targeting the implementation of SDGs or the Paris Agreement.

To spread the word, we want to make sure that our accomplishments will be heard! We will reach out to a larger scientific audience by publishing the results through renowned journals.

The key results of the conference should focus on how to link science and policy, bridging different sectors with the aim of coping with water-related disasters and supplying all water users with required quantity and quality of water at the proper time!

Let us all join forces to advance the role of science in decision-making and policy towards achieving water security and climate resilience.



Norbert Dichtl

Chairman, *exceed*–Swindon Excellence Center for Sustainable Water Management in Developing Countries (SWINDON), Technische Universität Braunschweig

Message from *exceed*–Swindon, TU Braunschweig

By 2050, global water demand is projected to increase by 55%, mainly due to growing demands from manufacturing, thermal electricity generation, and domestic and agricultural use. In many cases, over-abstraction of water is the result of out-dated models of natural resources use and governance, where the use of resources for economic growth is under-regulated and undertaken without appropriate controls. Disruption of ecosystems through unabated urbanisation, inappropriate agricultural practices, deforestation, and pollution are among the factors undermining the environment's capacity.

Growing demands, due to population growth and inefficient use of water resources have augmented the risks of water pollution and severe water stress. It can be observed that the time span between catastrophic events is becoming shorter and shorter. Moreover, the intensity of local water crises has been increasing, with serious implications on health, ecosystems, food and energy security, and economic development.

Although the growing recognition that water plays an irreplaceable role in sustainable development, water resources management and provision of water-related services remain far too low on the scales of public perception and governmental priorities. As a result, water often becomes a limiting factor, rather than a contributor, to social welfare, economic development, and healthy ecosystems. Principally, enough water is available to tackle the growing demand. However, the most important problem is the dramatically changing way water is used, managed, and shared.

The augmenting water crisis largely can be attributed rather to governance failures, than to resource scarcity. However, it must be laid emphasis on establishing effective strategies for sustainable water management, which should have a lasting impact on a water secure world.

The Nairobi Conference 2018 on "Water Security and Climate Change" takes place within the gravity field of problems mentioned beforehand. It is the time to develop truly effective ways to meet the challenges related to water problems of the 21st century.



Reiner Doluschitz

Director, Food Security Center (FSC)
University of Hohenheim, Stuttgart

Message from exceed-FSC, University of Hohenheim

Food Security goes hand in hand with water security. Especially in 2018 where many countries have been hit by drought periods with several months of duration. Even Europe and especially Germany lacked of rainfall during summer and harvest damages of e. g. cereals reached in various regions up to 100%. In this context, we again summarize the consequences of climate change and jeopardized water security: No food security without water security. Water security is a prerequisite for food production in terms of quantity and quality.

In the past years, the challenges to meet food security are even cumulating: vast population growth and increasing demand of natural resources, dynamic societies and environments as well as growing variability of weather conditions. The time for action to address these future challenges by finding potential solution strategies is more important than ever. In our conference we expect contributions in the context of the Water-Energy Food Nexus and the UN Agenda 2030.

Water-Energy-Food Nexus

Fresh water availability is crucial for food security as it is required for crop and livestock production. Population growth combined with dietary shifts and increasing relevance of non-food crops heavily increase the pressure on fresh water resources. At the same time, climate change strongly affects the spatial and temporal availability of fresh water. To ensure food security and not only yield it is necessary to understand the impact of irrigation on composition (micronutrients of crops and further food products on food security). Considering these developments, scientifically based solutions are necessary to ensure water and therewith food security for future generations. Studies presented in this session combine multidisciplinary approaches of climate change impact assessment and farmers' adaptation strategies, decision support tool development, and the development of alternative water use strategies.

Water Security, food security, and Climate Change in the light of the SDGs

Innovative sustainable solutions with respect to the UN Sustainable Development Goals (SDGs) shall be highlighted. Besides technical solutions such as water-saving technologies, also ICT based teaching tools, stakeholder involvement or innovative research ideas for future solutions can be presented in this session. SDG Synergies and trade-offs (e.g. conflict of objectives) can be discussed as well. Best-practice examples connecting water security, food security, and climate change are expected.

The conference brings various disciplines together to discuss on latest findings and key actions to contribute to sustainable resource management. I wish you all an interesting event with fruitful discussions and upcoming ideas for future solutions.

Monday

8.00

Registration

9.00 **Opening Session** (Venue: Auditorium)

1. Introduction Prof. James Kung'u
2. Vice Chancellor Paul K. Wainaina
3. Dr. Helmut Blumbach, DAAD Nairobi
4. Hon Keriako Tobiko, CBS, SC, Cabinet Secretary, Ministry of Environment and Forestry
5. Hon Simon Chelugui, Cabinet Secretary, Ministry of Water and Sanitation
6. Her Excellency Ambassador Annet Gunther
7. Prof. Lars Ribbe, Prof. Doluschitz, Prof. Andreas Haarstrick

9.50 **Keynote by Mariana Rufino**

Tropical forests are a critical resource for water and food security in East Africa (Venue: Auditorium)

10.30

Coffee and Tea Break

10.45 **Session 1**

The "Environmental" Angle of Water Security

(Venue: B8)

Organized by Mukand Babel & Victor Shinde AIT Bangkok, National Institute of Urban Affairs

Session 2a

Sustainable implementation of innovative wastewater treatment in developing countries

(Venue: B9)

Organized by Miriam Otoo, International Water Management Institute, Sri Lanka

Session 3a

Community Participation in Water Resource Management

(Venue: B10)

Organized by Felix Mingate & Monica Mucheru Muna, Kenyatta University, Kenya

Session 4a

Groundwater - A valuable limited freshwater resource. A second mainstay for security supply? (Venue: Auditorium)

Organized by Andreas Haarstrick, TU Braunschweig, Germany

12.45

Lunch Break

14.00 **Session 5**

Transboundary Water governance and cooperation

(Venue: B8)

Organized by Mahsa Motlagh, TH Köln University of Applied Sciences, Germany

Session 2b

Continuation Session 2a

(Venue: B9)

Organized by Miriam Otoo, International Water Management Institute, Sri Lanka

Session 3b

Continuation Session 3a

(Venue: B10)

Organized by Felix Mingate & Muna, Kenyatta University, Kenya

Session 4b

Continuation Session 4a

(Venue: Auditorium)

Organized by Andreas Haarstrick, TU Braunschweig, Germany

16.00 **Keynote by Ursula Schäfer-Preuss**

Water Security and Climate Change - the Gender Dimension (Venue: Auditorium)

16.40

Coffee and Tea Break

17.00 **Panel Discussion** (Venue: Auditorium)

Tuesday

8.00 Registration

8.30 **Keynote by Anik Bhaduri**
From a Popular & Contested Concept to its Implementation (Venue: Auditorium)

9.10 Coffee and Tea Break

9.30 Session 6a Reduction of impacts of waste on water quality by an appropriate waste management (Venue: B8) Organized by Klaus Fricke, TU Braunschweig, Germany	Session 7a Water Quality, Quantity, Modelling and Monitoring (Venue: B9) Organized by Tran Duc Trinh, Vietnam Academy for Water Resources, Vietnam	Session 8a Climate Change and Coastal Mangement (Venue: 10) Organized by James Kung'u, Kenyatta University, Kenya	Session 9 Capacity Development towards a Sustainable Africa (Venue: Athi) Organized by Anik Bahduri, Nidhi Nagabhatla, Lars Ribbe, Sudeh Dehnavi & Mahsa Motlagh, Sustainable Water Future, UNU-INWEH, TH Köln University of Applied Sciences
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11.30 Lunch Break

13.00 **Poster Session**

15.00 Coffee and Tea Break

15.20 **Keynote by Tamiru Abiye**
Groundwater from water security and climate change perspective in Africa
(Venue: Auditorium)

16.00 Session 6b Continuation Session 6a (Venue: B8) Organized by Klaus Fricke, TU Braunschweig, Germany	Session 7b Continuation Session 7a (Venue: B9) Organized by Tran Duc Trinh, Vietnam Academy for Water Resources, Vietnam	Session 8b Continuation Session 8a (Venue: B10) Organized by Simon Onywere, Kenyatta University, Kenya	Session 10 Food and Water Security: Adaptation strategies (Venue: Auditorium) Organized by Jenny Kopsch-Xhema & Nicole Schönleber, University of Hohenheim, Germany
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19.00 Gala Dinner

Wednesday

7.30 Registration

8.30 **Keynote by N.N.**

Water Governance in Africa: Challenges and Opportunities (Venue: Auditorium)

9.10 Coffee and Tea Break

9.30 **Session 11**

Food and Water Security: The Southern perspective

(Venue: Auditorium)

Organized by Reiner Doluschitz, University of Hohenheim, Germany

Session 12

Nature-based Solutions (Venue: B8)

Organized by Jorge Leon Sarmiento, The Nature Conservancy, Colombia

Session 13

Water Governance and Water Security

(Venue: B9)

Organized by Prof. Andreas Haarstrick, TU Braunschweig, Germany

Session 14

Water-Energy-Food- Security Nexus (Venue: B8)

Organized by Prof. Lars Ribbe & Prof. Heidi Elisabeth Megerle, TH Köln University of Applied Sciences, Germany & University of Applied Forest Science Rottenburg, Germany

11.30 **Closing Session** (Venue: Auditorium)

12.30 Lunch Break

14.00 Free Time

Keynote by Mariana Rufino

Tropical forests are a critical resource for water and food security in East Africa

Monday, 9:50–10:30 (Venue: Auditorium)

Tropical forests are a key component of the water cycle and critical for water provisioning to both rural and urban populations. In East Africa, increasing human population, rising incomes and competing demands on the land have led to massive forest cover loss. In Kenya, the water towers are the headwaters of the rivers delivering drinking water to most towns in the country. The forests of the water towers are hotspots for biodiversity, and important carbon sinks, however they are under increasing pressure of human encroachment. Since 2014, our team quantifies the importance for water provisioning of the Mau forest, the largest water tower in Kenya. We focused on forests and water because water is a critical currency for most stakeholders: water can be a blessing and a curse, as evidenced by the impacts of drought and floods often observed in the same year. In areas of high rainfall, water can cause crop and infrastructure damage and soil losses leading to community conflicts. Understanding of the dynamics of water flows, water quality and land use is required to improve land management. Our research showed that the largest concerns related to forest and tree cover loss are the large amount of sediments in rivers and streams. The loss of fertile top-soil has direct impacts on food security with enormous consequences for future generations, reducing the amount of crop harvests, the quality of agricultural products and affecting rural incomes. Lack of forest and tree cover undermines water and food security and therefore supporting communities to monitor their water and soil resources is critical to create awareness and empower local decision-making. Our research used a citizen-science approach and demonstrated that communities can monitor their resources and use this information to design and implement sound management plans for forests, water and landscapes.



Mariana Rufino is Professor of Agricultural Systems at Lancaster University, and one of twelve chairs of the HEFCE-funded N8 Agri-food programme, a partnership between eight Northern England Universities. She leads interdisciplinary research in Sub-Saharan Africa dealing with production challenges and environmental impacts of agriculture. She made a significant contribution to new global assessments of the environmental impacts of agriculture and livestock production. Previously, she worked for the Centre for International Forestry Research (CIFOR), where she led the Climate Change Agriculture and Food Security (CCAFS) programme. Mariana held positions at Wageningen University and the International Livestock Research Institute (ILRI), based in Kenya. Her work on carbon and nitrogen cycles at field, farm and landscape levels aims to quantify how land use change relates to food insecurity, incomes and environmental problems such as water scarcity. She collaborates with scientists from several international institutions, and with the private sector (tea and dairy farming in Kenya and Tanzania and the leading Argentine farmers association AACREA).

Keynote by Ursula Schäfer-Preuss

Water Security and Climate Change - the Gender Dimension

Monday, 16:00–16:40 (Venue: Auditorium)

Achieving water security and advancing climate resilience is not possible without addressing the special needs of fifty percent of mankind – women and girls. The gender dimension has to be properly integrated into the agenda of promoting economic and social development as well as resources sustainability.

The rich knowledge of men and women at the local level in preserving our habitat and helping to find pathways to support the SDG Agenda 2030 to be gathered. Local best practice cases have to be scaled up, silo thinking and acting in isolated sectorial boxes has to be opened up. The gender specific data base needs to be strengthened across sectors, and the various inter-linkages between goals and targets of the SDG Agenda related to the transformative Gender Goal 5 and all other relevant goals have to be well documented.

Science has never been in a better position than right now making intelligent use of digitalized communication and information systems across the globe, not forgetting the voices and specific needs of vulnerable groups, including women and girls. By this the dialogue between science and political leaders and practitioners, including communities at the local level, can be opened up in a language we all are able to understand. It will be much easier to introduce innovative approaches on how to implement various pathways of Agenda 2030 aiming at a world that leaves no one behind.



Dr. Ursula Schäfer-Preuss is an economist who has been engaged in the field of development policy for more than 35 years.

She is currently Vice President of UN Women German National Committee and Board Member of ICBA, International Center for Biosaline Agriculture, Dubai/UAE; Senior Advisor to GWP, Global Water Partnership, Stockholm at HELP, High Level Experts and Leaders Panel on Water and Disasters, member of the German UNICEF Committee, and she belongs to the 100 founding members of Women in Global Health Germany, WGH-GER.

Dr. Schäfer-Preuss has been Chair of GWP from 2013-2015. From 2006-2011 she was Vice President for Knowledge Management and Sustainable Development at the Asian Development Bank, Manila, Prior to joining ADB she was Director General of the German Federal Ministry for Economic Cooperation and Development (2000-2006).

She is a member of the advisory board of various research oriented institutes, national and international non-profit organizations, and a member of the German Society for Foreign Policy, among others.

She took her post graduate degrees in political science, economics, and sociology at the Universities in Freiburg and Bonn, Germany, and earned her Doctorate and Master's degree in Economics at the Albert-Ludwig-University, Freiburg.

Keynote by Anik Bhaduri

Water Security: From a Popular & Contested Concept to its Implementation

Tuesday, 8:30–9:10 (Venue: Auditorium)

The academic and political interest in the concept of water security has increased considerably over the past decade as reflected in numerous publications, research and funding initiatives, and conferences. This growing interest may reflect the explosive rise in concern of scientific and policy communities about the state of freshwater resources and the urgent need for sustainable water and land management in an era of rapid change and persistent water and food challenges including access issues.

To improve policy and scholarly capacity in dealing with such problems, claims are made for changes in both science and policy to overcome evident gaps that include more interdisciplinary and comparative studies, for an improved understanding of factors that shape water governance and cause governance failures, for the bridging of levels from local to global, for more sectoral integration to get out of the water box, and for closing the policy implementation gap. This raises the question: Is a new concept required to improve our analytical capabilities and provide an imperative for policy to deal with these challenges? Does the concept of water security hold promise in this respect?

The keynote presentation will provide an overview of the quite fragmented landscape of contributions and approaches to water security, and address the following issues:

- a.) What is their theoretical understanding of the water security concept, what is its potential and limits? And does it provide a better framework for dealing with water governance challenges?
- b.) How can the concept be elaborated at the implementation level, and how such elaboration address water governance challenges?
- c.) What are the global implications of water 'security' challenges?

In short, the presentation will analyse whether and under what conditions the conceptualization of water security will enhance our understanding of water governance and requirements for successful water governance reform.



Anik Bhaduri is the Director of the Sustainable Water Future Programme (Water Future) of Future Earth. Water Future is a global platform facilitating international scientific collaboration to drive solutions to the world's water security problems. Anik coordinates this large network of more than 400 working group researchers. Anik also facilitates integration and synthesis exercises in collaboration with Water Future's fifteen international and interdisciplinary research groups.

He plays a key role in designing and developing key Water Future initiatives like COMPASS, a comprehensive assessment tool for near real time assessment of global water security, as well as the capacity building activities related to water security like 2030WaterSecure.

Anik is also an Associate Professor at the Australian River Institute, Griffith University, Australia and a senior fellow at the Centre of Development Research, University of Bonn, Germany where he works on several topics and projects, ranging from transboundary water sharing to adaptive water management under climate change.

Groundwater from water security and climate change perspective in Africa

Tuesday, 15:20–16:00 (Venue: Auditorium)

Groundwater is less understood, often considered as strategic resource in Africa, the continent that has clean water shortage for its vast population. Predominantly in the arid- and semi- arid regions, groundwater plays vital role in fulfilling an increasing water demand due to its resilient nature for climatic variations. In Africa, groundwater exploitation is unregulated and the storage and recharge history are unknown. The potential impact of climate change on groundwater has been researched in depth in different parts of the world with a prevalent interest in arid- and semi- arid regions due to scarcity of surface water. High evaporation and low rainfall obviously affect surface water availability, which leaves groundwater as a dependable choice. It is a known fact that an increasing global surface temperature leads to change in precipitation and atmospheric moisture and impacts the recharge to aquifers.

Often, the extent of water supply aquifers and storage is not known that has essential contribution to the management of the resource in order to increase water security. In many areas, well fields are supplying water for big cities and irrigation schemes.

Livelihood can be affected by seasonal stress, longer-term drought and flooding due to changing climatic variables that increase water insecurity. Declining access to food and water is a common in Africa. Although groundwater plays a vital role in buffering the effects of climate change, mismanagement of the resource through pollution and over-abstraction could cause difficulties in accessing freshwater has a knock-on effect on food production and environmental sustainability. A more common scenario is a spiral of water insecurity as shallow aquifers get dry or polluted, with additional demands on remaining sources.

The main water security features from groundwater point of view could be due to:

- High groundwater recharge and availability of groundwater at exploitable level: signify high water security
- High groundwater pollution sources and flooding: low water security
- Low rainfall/Low recharge/high ET/drought: low water security from shallow aquifers. High water security if we rely on a deeper aquifer.

Regular monitoring of groundwater availability, recharge and status of water quality could enhance water security in vulnerable areas to ensure early detection of impact of climate change. Above all, increasing the coverage of ground water–based rural water supplies, and ensuring that the design and siting of water points is informed by an understanding of hydrogeological conditions and user demand, can significantly increase the resilience of rural communities to climate variability.



Prof. Dr. Tamiru Abiye, Wits University, Johannesburg

I have got about 30 years of experience in the field of hydrogeology in East Africa and Southern Africa. I am currently based at the School of Geosciences, University of the Witwatersrand, Johannesburg. I have supervised more than 95 MSc and PhD students and published about 117 peer reviewed papers on International Journals, conference proceedings, chapters in books and books. I have actively participated in the establishment and management of Ethiopian Association of Hydrogeologist and Africa Groundwater network. I am a rated researcher by the South African National Research Foundation and am a registered Professional Natural Scientist in South Africa. I participated in different African level activities to advance sustainable use of groundwater to alleviate poverty and enhance economic development owing to the fact that Africa has huge groundwater reserve which is resilient to climate change.

Session 1

The “Environmental” Angle of Water Security

Monday, 10:45–12:45 (Venue: B8)

Organized by Asian Institute of Technology (AIT) and National Institute of Urban Affairs | Mukand Babel & Victor Shinde

BACKGROUND

Water security has multiple dimensions. One of these dimensions is Environmental water security, which is concerned with the flourishing and protection of water-related environments. These include rivers, lakes, streams and other water bodies; wetlands; swamps; and other similar features. Degradation of water-related environments are becoming an increasing concern worldwide. Literature is abundant with examples of biodiversity loss, water pollution, declining environmental flows, and related matters in almost every part of the world. True water security cannot be achieved without securing water-related environments against deterioration. This special session will present some key studies related to environmental water security. The studies will cover multiple facets of environmental water security, from assessment to enhancement.

The session will also seek to engage participants in discussions on the key research needs in this area, and serve as an avenue for collaborative endeavors.

OBJECTIVES

- Present a wide range of research studies related to environmental water security.
- Serve as a platform for exchange of innovative and forward looking research ideas in the field of environmental water security.

ORAL PRESENTATIONS

Mapping the drought using Agricultural Stress Index: Case study of Ethiopia (247)
Soundharajan Bankaru Swamy | Amrita School of Engineering, India

The coastline under attack by erosion: analyses from short term to long term perspectives in Rio de Janeiro Coast (270)
Guilherme Fernandez | Laboratory of Physical Geography. Uff., Brazil

Impact of ecosystem services on human health and well-being of the inhabitants along the white Volta basin in the Upper East Region of Ghana (101)
Rafatou Fofana | Volta Basin Authority, Burkina Faso

Institutional, policy and legal frameworks for comprehensive disaster management in Bangladesh (206)
Mohammad Mahmudul Islam | Sylhet Agricultural University, Bangladesh

Management of Watershed Based on Its Classification of Upper Cisadane Watershed (Cisadane Hulu and Cianteun) (192)
Sugih Mahera Bogor | Agricultural University, Indonesia

Session 2a/b

Sustainable implementation of innovative wastewater treatment in developing countries

Session 2a: Monday, 10:45–12:45 (Venue: B9)

Session 2b: Monday, 14:00–16:00 (Venue: B9)

Organized by International Water Management Institute | Miriam Otoo

BACKGROUND

On-site sanitation systems (OSS), such as septic tanks and pit latrines, are a major pillar for providing access to toilets in rural and urban areas in developing countries. With rapid urbanization coupled with an increase in population, there is an increasing demand for sanitation services, which many developing countries especially in sub-Saharan Africa (SSA) are unable to meet. As municipal authorities face major challenges in managing both solid and liquid waste, resource recovery and reuse (RRR) has the potential to provide a win-win situation by reducing waste flows, ensuring environmental health and creating livelihoods.

Millions of tons of human excreta are generated every day and collected as faecal sludge (FS) in developing countries. This waste is rich in water, nutrients and organic compounds and can be used as a source of energy. Yet in many parts of the world where resources are scarce, the potential value of reusing this waste remains largely untapped. Resource recovery allows for possibilities to apply market-based principles on parts of the service delivery chain where waste can offer incentives for business development and cost recovery. Thus, RRR seeks to shift the focus away from waste that needs disposal toward creating a valuable resource that can benefit different sectors of the economy and generate funds to improve sanitation services. Implementation of RRR of waste, however requires innovative business models with well-formulated cross-sectoral partnerships, supporting policy instruments and financing arrangements. Moreover, use of human waste presents risks and potential benefits to public health that need to be managed.

The International Water Management Institute (IWMI) has identified and analyzed a number of FS-based reuse business cases across the globe and based on these cases, has developed a number of business models with potential for implementation and scaling-up at different scales and contexts. In this session, we present innovative FS reuse business models from developing country cities. The overarching objective is to present innovative FS reuse business models highlighting the factors that drive but may also inhibit their success and sustainability. The seminar will provide the opportunity for public and private sector and civil society actors in the sanitation-energy-agriculture sectors to:

1. Explore a selection of innovative FS reuse business models extracted from global research for potential investment and replication in developing country settings.

2. Evaluate the institutional processes and different constellations of innovative and strategic partnerships necessary for catalyzing business development and sustaining existing FS reuse businesses to go at scale.
3. Evaluate policies, regulations and financial schemes that support implementation and scaling-up of FS-based reuse business models.
4. Expand their knowledge on the use of the Sanitation Safety Planning (SSP) approach as a tool to assess and mitigate any potential health and environmental risks associated with the reuse of FS.

KEYWORDS

wastewater reuse, fecal sludge management, business models, resource recovery and reuse, developing countries

OBJECTIVES

- Explore a selection of innovative FS reuse business models extracted from global research for potential investment and replication in developing country settings.
- Evaluate the institutional processes and different constellations of innovative and strategic partnerships necessary for catalyzing business development and sustaining existing FS reuse businesses to go at scale.
- Evaluate policies, regulations and financial schemes that support implementation and scaling-up of FS-based reuse business models.
- Expand their knowledge on the use of the Sanitation Safety Planning (SSP) approach as a tool to assess and mitigate any potential health and environmental risks associated with the reuse of FS.

ORAL PRESENTATIONS

Effects of open defecation on some selected dams in the Tamale Metropolis, Ghana (128)

Elliot Alhassan | University For Development Studies, Ghana

Renewable energy generation by anaerobic digestion of mixed vegetable waste in a lab-scale BIOCEL reactor (130)

Sandhya Babel | SIIT, Thammasat University, Thailand

Gold mine pit lakes use for aquaculture potential health risk assessment: case study from new mine booming country, Burkina Faso (194)

Wendkuuni Florentin Compaore | University of Gent, Belgique

Constructed Wetland as a Low Cost Wastewater Treatment Technique - a Case Study from Egypt (154)

Rasha El Gohary | Ministry of Water Resources and Irrigation, Egypt

Implications of Anaerobic Co-Digestion of Organic Waste and Sludge in Jordan
Aiming to CO₂ Emission Reduction as Climate Xhange Mitigation Measure (129)

Tayel El-Hasan | Mutah University, Jordan

Reaeration rate coefficients are underestimated by classic predictive equations in
a shallow turbulent river: Gas tracer evidence (196)

Thiago Formentini | Federal University of Santa Maria, Brazil

An approach of utilizing the industry waste in the development of maghemite
functionalized nanostructures for arsenic removal (201)

Ajay Kumar | Indian Institute of Technology Roorkee, India

Sequential membrane treatment of agro-food wastewaters and recovery of the
most valuable compounds by column adsorption runs (121)

Jacques Romain Njimou | University of Yaounde I, Cameroon

Sanitation Safety Planning (SSP) as a tool for ensuring the health and
environmental sustainability of fecal sludge management business models (157)

Miriam Otoo | International Water Management Institute, Sri Lanka

Integrated Faecal sludge-based business models with safe Resource Recovery
and reuse: insights from a compendium of empirical cases in developing
countries (294)

Miriam Otoo | International Water Management Institute, Sri Lanka

Wastewater situation of abattoirs in Africa and decentral treatment options - a case
study from Sunyani (Ghana) (240)

Felix Quick | University of Applied Forest Sciences Rottenburg, Germany

Wastewater savings: matter recovery and valorisation through its reuse in
biofarming (122)

Besem Diana Tambae | Advanced School of Public Works, Cameroon

Assessment Of A Wastewater Treatment Plant Performance And Suitability Of
Treated Water For Irrigation Purpose: Case Of The Brewery Bb Lome (218)

Lallébila Tampo | Univerité de Lomé, Togo

Session 3a/b

Community Participation in Water Resource Management

Session 3a: Monday, 10:45–12:45 (Venue: B10)

Session 3b: Monday, 14:00–16:00 (Venue: B10)

Organized by Kenyatta University | Dr. Felix Mingate & Dr. Monica Mucheru Muna

ORAL PRESENTATIONS

Ensuring Domestic Water Security in Rural India: Role of Technologies and Institutions (164)

Nitin Bassi | Institute for Resource Analysis and Policy, India

Water Security in La Pila, San Luis Potosí, México (126)

Alicia Anahí Cisneros Vidales | Universidad Autónoma de San Luis Potosí, México

Assessing the Performances and Strategies of the Improvement of the Potable Water Distribution Network in a Sub-Saharan Urban Environment, Kribi-Cameroon, West Africa (108)

Celestin Defo | DEFO, Cameroon

Smart Management of Urban Water Systems under Changing Climate (289)

Ibrahim Ethem Karadirek | Akdeniz University, Turkey

Potable Water Crisis amidst abundant Fresh Water Resources: Interrogating Options for Effective Water Management in Urban and Peri-urban areas in Cameroon (185)

Lotsmart Fonjong | University of Buea, Cameroon

Valuing Water Resource Users' Associations in the Peri-urban Drylands of Kenya: What is their Role in Water Access and Affordability? (103)

Stanley Jawuoro | University of Nairobi, Kenya

Assessing Household Water Insecurity in a Rural setting in Wamba, Samburu County, Kenya: Development of a Household Water Insecurity Scale (269)

Cornelius Mutuku | Centre for Humanitarian Change, Kenya

Some indigenous knowledges and approaches in water resources management in Africa (252)

Samuel Pare | University of Ouaga 1, Burkina Faso

Exploring the challenges, opportunities and approaches for private sector engagement to address water security in cities of Nepal (222)

Suchita Shrestha | Southasia Institute of Advanced studies, Nepal

Session 4a/b

Groundwater - a valuable limited freshwater resource. A second mainstay for security supply?

Session 4a: Monday, 10:45–12:45 (Venue: Auditorium)

Session 4b: Monday, 14:00–16:00 (Venue: Auditorium)

Organized by Technische Universität Braunschweig | Andreas Haarstrick

BACKGROUND

Groundwater can be a valuable second freshwater resource in arid semi-arid regions, particularly for irrigated agriculture but also for maritime urban regions. However, the management must take into account the renewal rates, the available water supply, the vulnerability and the hydro-dynamics to meet all requirements for long-term public supplies-strategy. Powerful IT-techniques have evolved to model the large-scale but very slowly reacting groundwater bodies. Fade into obscurity is the fact, that tools are just powerful and practical, if a calibration and validation have been done. The necessity to carry on measuring devices, to understand the groundwater specific circulatory and the architectural must not sink into obscurity. An exchange of view on the performance and limitations of groundwater models can be fruitful if new aspects can be derived from them.

KEYWORDS

groundwater systems for freshwater supply, M3G: monitoring - modelling - management - government

OBJECTIVES

- Primary aim is an expert exchange about the function of numerical groundwater or hydrological models as a kernel of regional management strategies.

ORAL PRESENTATIONS

Young's bargaining model for optimal design of groundwater in-situ bioremediation (173)

Sara Akbarnejad Nesheli | Iranian National Committee on Irrigation and Drainage (IRNCID), Iran

Groundwater Management and Hydrogeological Modeling of the Sminja-Oued Rmel Aquifer in the Zaghuan district (north-eastern Tunisia) (112)

Meriem Ameer | University of Tunis El Manar, Tunisia

Hydrodynamic Numerical modeling for groundwater management in Jeffara of Medenine (South-Eastern Tunisia) (189)

Fadoua Hamzaoui | University of Tunis El Manar, Tunisia

Interactions between freshwater ecosystem services and land cover changes in southern Bangladesh: a perspective from short term (seasonal) and long-term (1973-2014) scale (162)

Nazmul Huq | Nazmul Huq, Germany

Distribution of nitrate and fecal bacterial indicators in urban groundwater under stress at the end of dry season (120)

Wilfried Arsène Letah Nzouebet | The University of Yaounde I, Cameroon

Evaluating the Physical-Chemical Groundwater Quality Parameters of Kenyan. Kenyatta university and Emerging Surrounding Environments (135)

Mary Makokha | Geography, Kenya

Application of forecast information and near real time rainfall monitoring to support mitigate salinity intrusion in Vu Gia Thu Bon river basin – VietNam (230)

Lam Xuan Nguyen | Institute for Water and Environment, Vietnam

Research on contribution ratio of large upstream reservoirs for minimum flow in Vugia-Thubon River System (228)

Thang To Viet | Vietnam Academy for Water Resources, Vietnam

Session 5

Transboundary Water Governance and Cooperation

Monday, 14:00–16:00 (Venue: B8)

Organized by TH Köln University of Applied Sciences | Mahsa Motlagh in cooperation with Centers for Natural Resources and Development (CNRD)

BACKGROUND

As the outcome of the Transboundary Water Governance and Benefit Sharing Session in WSCC 2017 underlined that dialogue, transparency and trust building among involved parties and institutions of a shared basin are the fundamental step towards effective transboundary water management. Transparent and joint actions on monitoring, data and information sharing, along with collaborative practices are needed to facilitate informed decision making. Given the impact of climate change on water resources the integrated and collective form of transboundary water management presents an opportunity to develop adaptation frameworks and response measures that build upon existing knowledge and case-based experiences.

Building on the outcomes of the WSCC 2017, The “Strengthening transboundary water governance and cooperation” session in WSCC 2018, will focus on the need for adequate solutions to foster cooperative strategies around the way the shared watercourses are managed and decided. The session will address critical cross-cutting issues related to transboundary water management to contribute to the science -policy dialogue, ensure multi-level governance, engage stakeholders and assess the results of policies.

KEYWORDS

Transboundary Water Cooperation, Governance, Informed decision making, Water Conflict, Collective Action, Water Security, Capacity building , Integration and Innovation

OBJECTIVES

- Explore a selection of innovative FS reuse business models extracted from global research for potential investment and replication in developing country settings.
- Evaluate the institutional processes and different constellations of innovative and strategic partnerships necessary for catalyzing business development and sustaining existing FS reuse businesses to go at scale.
- Evaluate policies, regulations and financial schemes that support implementation and scaling-up of FS-based reuse business models.
- To present state of arts, recent knowledge, and insights in multi-level governance of transboundary water bodies by building on best practices and lessons learned from existing initiatives

- To enhance the dialogue among science-policy-practice and discuss challenges and strategies for promoting regional cooperation for effective policy support in shared basins and beyond
- To address practical solutions and generated knowledge to transboundary water disputes and challenges of cooperative decision making

ORAL PRESENTATIONS

Hydrosolidarity and the International Court of Justice: the need of the application of this principle for the proper development of International Water Law (233)

Mariana Elvira Nogales Paez | Bolivian Diplomatic Academy, Bolivia

Transboundary Wetlands and International Environmental Security Case Study: Hamoon Wetland (116)

Ehsan Daryadel Ferdowsi | University of Mashhad, Iran

Climate change, transboundary conflict and food insecurity in global south: implication for advancing regional cooperation to attain SDG in South Asia (214)

Md Arfan Uzzaman | Centre for Policy Dialogue (CPD), Bangladesh

Conjunctive transboundary aquifer-catchment management in the Shire basin between Malawi and Mozambique: Principles through fit-for-purpose practice (266)

Anita Lazaruko | International Water Management Institute, South Africa

Panel Discussion

James Kung'u

Sustainable water management

Monday, 17:00–19:00 (Venue: Auditorium)

The role of communities in water and watershed management for sustainable water management: potential for payment for environmental services.

MODERATION

Johnson Mwakazi

PANELISTS

Dr. Jorum K. Kagombe

Kenya Forest Research Institute (KEFRI)

Prof. J. Kimura- Head

Ndakaini Dam Conservation Association

Prof. Julius Gordon Tanui

Ag. Director, Kenya Water Towers Agency

Dr. Mahsa Motlagh

Researcher, ITT Cologne

Hon. Mwangi wa Iria

Governor, Muranga County

NEng. Nahashon Muguna

Ag. Managing Director, Nairobi Water and Sewage Company

Prof. James B. Kung'u

Dean, School of Environmental Studies, Kenyatta University

Session 6a/b

Reduction of impacts of waste on water quality by an appropriate waste management

Session 6a: Tuesday, 9:30–11:30 (Venue: B8)

Session 6b: Tuesday, 16:00–18:00 (Venue: B8)

Organized by Technische Universität Braunschweig | Klaus Fricke

BACKGROUND

On one hand, wastewater and waste management have harmful impacts on freshwater quality, but on the other hand they can also reduce the consumption and pollution of water.

Waste is closely related to the problem of marine littering: the spread of plastic waste via river to the oceans and by the currents across the world. These plastics have severe, negative effects on marine ecosystems, regardless of their size.

In many countries rivers and open waters are still used as a cheap mean to dispose of solid and liquid wastes. In this respect, the main target for wastewater and waste management is to install appropriate systems of wastewater and waste avoidance, collection, treatment and recycling, reuse and disposal.

Waste disposal through landfilling is usually related to the GDP of a country: low GDP means that a high percentage of waste is landfilled and the quality of the landfill sites is often poor in terms of emission control. At the moment, the focus for emissions is set on greenhouse gases, but in many countries with poor landfill technology the impact on groundwater and therefore on the drinking water supply is be more important for the people living nearby these sites.

The future goal of waste management is to avoid and recycle waste as much as possible and to landfill as little as possible on appropriate sites. The production of goods from recycled material is often not only a reduction in the use of new raw materials, but also a substantial reduction in the use of water. Good examples in this context are the recycling of paper or metals.

KEYWORDS

waste management, marine litter, water quality

OBJECTIVES

- Awareness of negative impacts of waste on water quality
- Fundamentals of waste management: avoidance, collection, treatment, waste disposal
- Criteria for adaptation to local conditions and implementation of best techniques and best decision making

ORAL PRESENTATIONS

Developing a Model for the Evaluation of the Impacts of MSW Management on Water (260)

Manal Ali | TU Braunschweig, Germany

Assessment of nutrients and heavy metals constitutes in raw organic agricultural waste and ready compost: The case of Wadi Al-Far'a Watershed, Palestine (107)

Issam Al-Khatib | Birzeit University, Palestinian Territory

Negative externalities of urban waste on the water resources in tropical Africa (273)

Gnon Baba | University of Lomé, Togo

Compost from organic waste as an option for reducing water pollution and improving soil health in Sri Lanka (285)

Maksud Bekchanov | ZEF, Germany

Facing Microplastic Pollution in Wastewater Treatment (137)

Norbert Dichtl | Sanitary and Environmental Engineering, Germany

Natural Products as Adsorbent for Treatment of Wastewater for Reuse (280)

Souad El hajjaji | Mohammed V University in Rabat, Morocco

Wastewater Treatment by Photocalyse, Fenton Oxidation Process and Adsorption (163)

Guy Didier Fanou | Institut National Polytechnique, Cote d'Ivoire

Assessment of treated wastewater quality under different climate change Scenarios in Jordan (125)

Anwar Jiries | Mutah University, Jordan

The main objective of the work is to search for relevant indicators for assessing the impact of waste on water quality of Kpondjo River (277)

Nitale M'Balikine Krou | University of Kara, Togo

Assessing the value of resource recovery and reuse: Social, environmental and economic costs and benefits for value creation and human wellbeing (261)

Anita Lazaruko | International, South Africa

Abundance evaluation of flagellated protozoan cysts in waste water used for urban wetland agricultural practices: case of Yaoundé urban city (Cameroon) (170)

Mboumbouo Mama | University Of Yaounde 1, Cameroon

Removal Of Crude Oil From Wastewater By Sorption On Carbonized Yam Peels (Dioscorea Rotundata): Kinetic Equilibrium And Thermodynamic Studies (115)

Oyedibu Oloyede | University Of Ibadan, Nigeri

Session 7a/b

Water Quality, Quantity, Modelling and Monitoring

Session 7a: Wednesday, 9:30–11:30 (Venue: B9)

Session 7b: Wednesday, 16:00–18:00 (Venue: B9)

Organized by Vietnam Academy for Water Resources | Tran Duc Trinh

BACKGROUND

Good water resources management practice required information from water quantity, quality, modelling and monitoring which are interlinked with each other. Those element are serving the fundamental understanding of the water resources system that is the key for any decision making and research processes. In addition, in any decision making process on a water resources system, the consideration cannot result in comprehensive solution without considering the interaction between those elements.

The session is trying to bring all those fundamental elements of the water resources system into one session to offer the overall picture of the complexity and connectivities of those elements in practice. Putting those studies together will offer the participants in the session another comprehensive picture of Integrated Water Resources Management.

KEYWORDS

water quality, water monitoring, water quantity, water resources modeling

OBJECTIVES

- Bring different key elements of water resources information together to offer a comprehensive and fruitful discussion
- Offer an forum of exchanging and collaboration which results in deeper understanding of the water resources system in reality

ORAL PRESENTATIONS

Bacteriological Safety of Sachet Drinking Water Sold in Benin City, Nigeria (143)

Stephen Akintayo | University of Ibadan, Nigeria

Tracing the sources of groundwater nitrate in the Plateaux Region of Togo, using hydrochemistry and dual isotopic approach (204)

Kossitse Venyo Akpataku | University of Lome, Togo

Smart Cities, Access to Safe Drinking Water and SDGs: Evidences from Indian Cities (176)

Chandra Sekhar Bahinipati | Indian Institute Of Technology Tirupati, India

ITTSmartSense: a cost effective and flexible technology for environmental monitoring (188)

Aaron Firoz | ITT, Germany

- Drinking Water Security via HydroInformatics: a review of the potential with situational analysis of water supply and quality monitoring in Lekhnath-Pokhara Metropolitan City, Nepal (224)**
Amrita Gautam | Technical University of Cologne (TH Koeln), Deutschland
- Assessment of Groundwater Quality for Drinking Purposes in Omdurman Area, Khartoum State, Sudan (202)**
Rabha Idris/Mustafa | University of Medical Sciences and Technology, Sudan
- Variation of nitrate and faecal bacterial indicators in groundwater of a tropical urban area (139)**
Wilfried Arsène Letah Nzouebet | The University of Yaounde I, Cameroon
- Impact of Kulfo River Stream on the Sustainability of Aquatic Life in Chamo Lake (282)**
Daniel Reddythota | ArbaMinch Water Technology Institute, ArbaMinch University, Ethiopia
- Numerical Modeling of Climate Change Impacts on Water Quality Characteristics of Lake Burullus, Egypt (133)**
Ahmed Shalby | Tanta University, Egypt
- Assessment of groundwater quality variation in Lodwar during wet and dry periods using Water Quality Index method (292)**
Florence Tanui | University of Nairobi, Kenya
- Assessment of Drinking Water Quality in Al-Riyadh and Al-Taif Areas (Khartoum, Sudan) (278)**
Reem Tawfik | Environmental Studies, Sudan
- Application of water quality model in studying natural attenuation of pollutants to support the environmental zoning and protection plan for Vu Gia Thu Bon river basin - VietNam (231)**
Trinh Duc Tran | Vietnam Academy for Water Resources, Vietnam
- An analysis of the economic impact of agricultural runoff and nutrient pollution in the Chesapeake Bay (291)**
Na Zhang | University of Hohenheim, Germany

Session 8a/b

Climate Change and Coastal Management

Session 8a: Tuesday, 9:30–11:30 (Venue: B10)

Session 8b: Tuesday, 16:00–18:00 (Venue: B10)

Organized by Kenyatta University | James Kung'u & Simon Onywere

BACKGROUND

Many countries in the world are witnessing drastic effects of climate change, making climate change one of the greatest challenge facing humanity in our time. The adverse impacts of climate change in many countries are undermining achievement of sustainable development. The increase in global temperature, sea level rise, ocean acidification, low agricultural yields and scarcity of water are affecting many communities leading to conflicts especially in the coastal areas and low lying coastal countries. The impact is affecting mainly the least developed countries and small islands developing states, making the survival of many societies and of the biological systems of the planet be at risk There is urgent need therefore to mitigate, strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries. This can only be achieved if societies are encouraged to integrate climate change measures into their national policies, strategies and planning. There is need to improve on the education and awareness on climate change and build institutional capacity of communities and governments on climate change mitigation.

KEYWORDS

Climate Change, Mitigation, Adapatation, Sea level rise, Resilience

OBJECTIVES

- The objective of the session is to share research findings on resilience and adaptive capacity to climate change. The impacts climate in attainment of sustainable development goals especially in developing countries will be discussed. Researchers will share their research findings and methologies they are using in carrying out climate change related reseach

ORAL PRESENTATIONS

Environmentally Induced Displacement And Its Interdependencies With Water Security: A Study On Sea Level Rise In Coastal Area Of Bangladesh And Louisiana (191)

Md Moynul Ahsan | Ankara University, Turkey

Climate change impact on water resources in Amman Zarqa basin: Adaptation scenarios (184)

Abbas Al-Omari | The University of Jordan, Jordan

**Using Hybrid Solutions For Coastal Protection As Part Of The Adaptation Of
The Nile Delta To Sea Level Rise (235)**

Ahmed Balah | Ain Shams University, Egypt

**Bias Correction To Streamflow And Future Streamflow Predictions In The West
Seti River Basin, Nepal (244)**

Aakanhya Budhathoki | Asian Institute of Technology, Thailand

**Coping with climate variability and water stress in rice farming of India: a study
(167)**

Dhananjoy Dutta | Bidhan Chandra Krishi Viswavidyalaya, India

Reliability of Rainfall for crop production. A case study in Uganda (257)

Resty Nansubuga | Makerere University, Uganda

**Assessment Of Ecosystem Diversity, Economic And Health Implications Of
Climate Variability On Rural Dwellers In The Riverrine Areas Of Abia State**

(127)

Chioma Nwakanma | Nwakanma Chioma, Nigeria

**Climate Change and Integrated Water Resources Management in Burkina Faso :
case of Mouhoun River (113)**

Yacouba Sanou | University Ouaga, Burkina Faso

Geological aspects of CO₂ sequestration in saline carbonate formations (219)

Shachi Shachi | Indian Institute of Technology, Roorkee, India

**Building the Adaptive Capacity for Livelihood Improvements of Sahel Savannah
Farmers Through NGO-led Adaptation Interventions (267)**

Abdallah Tahiru | University Of Ghana, Legon, Ghana

Session 9

Capacity Development towards a Sustainable Africa

Tuesday, 9:30–11:30 (Venue: Auditorium)

Organized by Sustainable Water Future Future, UNU-INWEH, TH Köln University of Applied Sciences | Anik Bahduri, Nidhi Nagabhatla, Lars Ribbe, Sudeh Dehnavi & Mahsa Motlagh in cooperation with Centers for Natural Resources and Development (CNRD)

BACKGROUND

Local and global sources of knowledge and information are imperative to understand interconnected water security risk to humans, societies and the environment in Africa. Increasing the knowledge and information available may support decision-making processes and help avoiding decisions that may lead to sub-optimal, or even adverse outcomes. This is particularly relevant in Africa for the implementation of the African 2063 agenda and the global 2030 agenda for Sustainable Development, which are intrinsically multi-scale and characterised by complex interlinkages. It is even more important to orient investments to effectively target continental priorities towards sustainable development in order to support the region to achieve the goals it has set.

2030WaterSecure, a joint initiative of Water Future and the United Nations University is an innovative vision to developing capacity by combining the state-of-the-art water knowledge with modern, personalized communication tools in order to tackle the 21st-century water challenges and facilitate effective implementation of 2030 Water Agenda.

2030 WaterSecure has a special focus on Africa with an aim to provide a comprehensive strategy to enhance capacity needed to achieve water security and related co-benefits on the African continent. While many components of "Water Secure" will be effective as individual measures, it unleashes its full potential if coherently developed together with other measures like infrastructure development, education and in coordination with other sector' programs. It offers a state-of-the-art, personalized and comprehensive capacity development programme that aims to support water security by understanding water related risks in real time, assessing the current and future scenarios and implementing risk management strategies across sectors and scales.

KEYWORDS

Water security, Capacity Development, Risk

OBJECTIVES

After a successful workshop on " Mapping Capacity Gaps and Needs for Water Security" held on 22 June 2018 at UNU-INWEH, Canada, this session has been planned to discuss Science- Capacity Interfacing – Barriers and Opportunities with regard to the vision of 2030 AfricaWaterSecure with the following jey objectives:

- identify and discuss capacity Gaps and Needs for Water Security Assessment in Africa

- Discussion the vision of the 2030WaterSecure? and how might collaboration add value for Africa20230WaterSecure?
- to identify the next steps to initiate projects or concrete partnerships

ORAL PRESENTATIONS

Capacity Development for 2030 Water Security Africa

Mahsa Motlagh | TH-Köln University of Applied Sciences, Germany

Capacity Development needs in assessing water security risk

Anik Bhaduri | Sustainable Water Future Programme, Australia

Water Security Agenda and Sustainable Development Goal 6 – Aligning capacity development efforts for effective implementation and enhanced impacts

Nidhi Nagabhatla | UNU-INWEH, Canada

Women and rainwater harvesting in the drylands: capacity building and challenges faced by women farmers

Agnes Mwang'ombe | University of Nairobi, Kenya

The role of Universities to advance capacity development towards water security

Lars Ribbe | TH-Köln University of Applied Sciences, Germany

Poster Session

Tuesday, 13:00–15:00

The Importance of Security of Water in Supplying Iran's Water Security (220)

Parisa Afrad Irani | Tehran university, Iran

Groundwater exploitation, rural livelihood and the role of governance efficiency in groundwater management (190)

Elaheh Ghasemi Karakani | University of Tehran, Iran

Results-Based Management and Sustainability of Water Supply Projects in Informal Settlement Areas in Nairobi City County, Kenya (245)

Wanjiru Gichohi | Kenyatta University, Kenya

An appreciation of the relationship between the water security index (WSI) and the Sustainable Development Goals (SDG) in Tropical Africa (119)

Ajeegah Gideon | University of yaounde 1, Cameroon

Securitisation of water resource management in Ghana: Debating an emerging paradigm (104)

Dinko Hanaan | University of Ghana, Ghana

Valuing Water Resource Users' Associations in the Peri-urban Drylands of Kenya: What is their Role in Water Access and Affordability? (144)

Stanley Jawuoro | University of Nairobi, Kenya

Water Funds: Nature Based Solutions For Water Security in Developing Countries (147)

Jorge Eduardo Leon Sarmiento | The Nature Conservancy, Columbia

Water sector development in Turkana: Filling the critical sectoral gaps (293)

Dennis Ong'etch

Alternative Type of Organizations: Networks Case Study: International Water Security Network (243)

Zerrin Savasan | Selcuk University, Türkiye

Quest for joint river basin management for building socio-economic resilience in the view of climate change impacts in the GBM basins (160)

Md Arfan Uzzaman | Centre for Policy Dialogue (CPD), Bangladesh

El Niño Effects on Rainfall Patterns and Behavior in Sudan (217)

Maha Abdelrahim/Ismail | University of Medical Science and Technology(Umst), Sudan

Laboratory Study to Determine Runoff Coefficients of Two Types of Permeable Pavements (253)

Zain Al-Houri | Ajloun National University, Jordan

Remote Sensing Applications in Water Resources Management for Nile Delta, Egypt (177)

Abdalmonem Alkhwaga | Faculty of Engineering, Tanta University, Egypt

Impact of Syrian Refugee Camp on Water, Air and Soil Quality at Zaatari Refugee Camp / Jordan (237)

Mohammad Alshirah | Al albayt University, Mafrqa

Suitability Analysis for Managed Aquifer Recharge through Runoff Water Harvesting in Eastern Badia of Jordan (274)

Zryab Babker | TH-Köln University of Applied Sciences, Germany

High Aswan Dam Reservoir Management in Case of Ethiopian Renaissance Dam Failures (275)

Ashraf Elmostafa | Faculty of Engineering, Ain Shams University, Egypt

Drought monitoring as a key component for drought preparedness in Brazilian northeast. (215)

Vinicius Gomes | Water and Climate Agency of Pernambuco State, Brazil

Climate Change Impact on Groundwater Pollution and Nitrate-N Transport: A Case Study of North Bihar, India (232)

Pankaj Kumar Gupta | Indian Institute of Technology Roorkee, India

Water Quality Management Scenarios for Rosetta Nile Branch, Egypt (131)

Ahmed Aly Aly Hassan | Ain Shams University, Egypt

Climate Change Adaptation to Water Scarcity in Glacier-Dependent Town of the Indian Himalayas (150)

Shailendra Mandal | National Institute of Technology Patna, India

Socio Economic Aspects of Groundwater Systems in Kenyatta University and the Emerging Surrounding Settlements (141)

Zachariah Omweri | Kenyatta University, Kenya

Morphological Deformities in Chironomidae (Diptera: Insecta) as indicators of Urban Pollution in River Mezam, North West Region, Cameroon (169)

Enah Dickson Achuo | University of Yaounde I, Cameroon, Cameroon

Water Resources Status in Bihar (India): Current and Future Challenges and Research Direction (136)

Vikram Kumar | Hydrology, India

Assessing drought vulnerability and adaptation in peri-urban agriculture in São Paulo city: a socioecological approach (132)

Silvia Berenice Quintana Sagarnaga | Center for Development Research, Germany

Groundwater Quality Assessment of Unnao District, Uttar Pradesh, India (239)

Apoorv Verma | Institute of Engineering and Technology, India

Sustainability Assessment of two selected Hydropower generating system in Nigeria (284)

Chukwuemeka Diji | University of Ibadan, Nigeria

- Irrigation water use charge to reduce climate change impact on water resources (287)
Daneal Fekersillassie | Addis Ababa University, Ethiopia
- African leafy vegetables: Efficient water users with great potential for reducing micronutrient malnutrition in Kenya (225)
Lucy Kariuki | University hohenheim, Germany
- Enhancing Soil Physical and Chemical Properties using Residue Mulch and Tillage in Kirege, Tharaka-Nithi County (268)
Jane Omenda | University of Embu, Kenya
- Classified Hotels Application of the 4rs to Water and Wastewater Management in Bauchi State of Nigeria (118)
Esther Adebitan | The Federal Polytechnic, Nigeria
- Antimicrobial properties of plants extracts for water treatment (254)
Yvonne Bonzi Coulibaly | Ouaga 1 university, Burkina Faso
- Water Quality Assessment of Drinking Water Intakes on the Nile River, Egypt (148)
Mohamed Elshemy | Irrigation and Hydraulics Engineering, Egypt
- Constraints of Stormwater Sanitation of Cities of Burkina Faso: Case of the Commune of Ouagadougou (100)
Alassane Fayama | Commune de Ouagadougou, Burkina Faso
- Electrocoagulation-flotation as a possibility for domestic wastewater treatment and reuse (187)
Gustavo Holz Bracher | Federal University of Santa Maria, Brazil
- Catechol and Resorcinol removal in wastewater by Activated Carbon prepared from sunflower (*helianthus annuus*) seed hulls (182)
Degninou Houndedjihou | Univesity of Lome, Togo
- Paracetamol removal by vertical flow constructed wetland from domestic wastewater (226)
Ronaldo Kanopf de Araújo | Ronaldo Kanopf de Araújo, Brasil
- Biochar Effect on Biodegradation of free cyanide by bacterial species isolated from cyanide contaminated artisanal gold mining catchment area in Burkina Faso (248)
Hela Karoui | International Institute for Water and Environmental Engineering, Burkina Faso
- Impact of stabilized leachate residues from the controlled landfill of Mohammedia city on the "Oued Nifika" river and on the soil (117)
Jamal Mabrouki | Mohammed V University of Rabat, Morocco
- Assessment of Low-Cost Lab-Base Leachate Treatment Plant and Effluent Toxicity Testing (110)
Olanrewaju Olujimi | Federal University of Agriculture, Nigeria

- The Evaluation of Bioremediation Treatment System in Heglig-Sudan (221)
Ola Omer/Ahmed | Fresh Graduate From University of Medicine Science and Technology, Sudan
- Potential of Aerobic Granular Sludge as Treatment Measure for small Decentralized Factory in Viet Nam (281)
Tran Quang Loc | Institute of Resources and Environment, Hue University, Viet Nam
- Evaluation of pollutants removal in microcosms of artificial wetlands using ornamental plants (223)
Alan Antonio Rico Barragán | Instituto Tecnológico Superior de Misantla, México
- Caffeine and Ciprofloxacin Adsorption from water onto natural zeolite: isothermal, kinetics and thermodynamic studies (114)
Victor Shikuku | Maseno University, Kenya
- Rainfall And Temperature Variability And Its Effect On Food Security In Northern Nigeria-Review (246)
Omolola Balogun | University of Ibadan, Nigeria
- Evaluating the Suitability of Landsat TM to Detect Water Salinity of Coastal Bangladesh (265)
Jannatul Ferdous | Military Institute of Science and Technology, Bangladesh
- Water Security in Coastal Bangladesh: Assessment and Prediction of Salinity Concentration in Aquifer Layers (179)
Md Arman Habib | Military Institute of Science and Technology, Bangladesh
- Climate change adaptive capacities from legislations on agricultural water management and food security aspects (A case study of Iran) (180)
Nader Heydari | Iranian Agricultural Engineering Research Institute (AERI), Iran
- Assesment of availability variation due to climate, population and built infrastructure of small town water supply infrastructure (264)
Charles Odira Maxwell | University of Nairobi, Kenya
- Assessment of seasonal and spatial variation of water quality in a coastal Basin: case of Lake Togo Basin (168)
Ibrahiim Tchakala | University of Lome, Togo

Session 10

Food and Water Security: Adaptation strategies

Tuesday, 16:00–18:00 (Venue: Auditorium)

Organized by University of Hohenheim, Food Security Center (FSC) | Nicole Schoenleber & Jenny Kopsch-Xhema

BACKGROUND

Fresh water availability is crucial for food security as it is required for crop and livestock production. Population growth combined with dietary shifts and increasing relevance of non-food crops heavily increase the pressure on fresh water resources. At the same time, climate change strongly affects the spatial and temporal availability of fresh water. To ensure food security and not only yield it is necessary to understand the impact of irrigation on composition (micronutrients) of crops and further food products on food security.

KEYWORDS: food and nutrition security, agricultural production, climate change, adaptation strategies

OBJECTIVES

— Innovative sustainable solutions with respect to the UN Sustainable Development Goals (SDGs) shall be highlighted. Besides technical solutions such as water-saving technologies, also ICT based teaching tools, stakeholder involvement or innovative research ideas for future solutions can be presented in this session. SDG Synergies and trade-offs (e.g. conflict of objectives) can be discussed as well. Best-practice examples connecting water security, food security, and climate change are expected and shared within a World Café Format.

ORAL PRESENTATIONS

Understanding Climate Change Induced Vulnerability to Food Insecurity: Applying the Livelihood Vulnerability Index in Pastoral Area of Afar Region, Ethiopia (102)
Markos Ware | Hohenheim University, Germany

Edible insects as a chance to achieve better Nutrition Security in Sub-saharan Africa (256)
Nils Nölle | University of Hohenheim, Germany

Water security insights associated to food security: A case study of the Iranian virtual water trade of agricultural crops 2004-2014 (178)
Ali Bagheri | Tarbiat Modares University, Iran

Mitigating Climate Change Impact for Sustainable Agriculture in Southwestern Nigeria Using Crop Models (193)
Chikodi Ehumadu | University of Ibadan, Nigeria

Biological Nitrification Inhibition – a viable strategy to reduce groundwater pollution with nitrate?
Konrad Egenolf | Hans-Ruthenberg-Institute, Universität Hohenheim and CIAT, Germany

Session 11

Food and Water Security: The Southern perspective

Wednesday, 9:30–11:30 (Venue: Auditorium)

Organized by University of Hohenheim, Food Security Center (FSC) | Reiner Doluschitz

BACKGROUND

Fresh water availability is crucial for food security as it is required for crop and livestock production. Population growth combined with dietary shifts and increasing relevance of non-food crops heavily increase the pressure on fresh water resources. At the same time, climate change strongly affects the spatial and temporal availability of fresh water. To ensure food security and not only yield it is necessary to understand the impact of irrigation on composition (micronutrients) of crops and further food products on food security. Considering these developments, scientifically based solutions are necessary to ensure water and therewith food security for future generations.

KEYWORDS

food security, agricultural production, water use efficiency

OBJECTIVES

- Studies presented in this session combine multidisciplinary approaches of climate change impact assessment and farmers' adaptation strategies, decision support tool development, and the development of alternative water use strategies.

ORAL PRESENTATIONS

Water Accounting as an Efficient Tool for Sustainable Water Governance (Case study: Urmia Lake Basin) (197)

Arash Malekian | University of Tehran, Iran

In Situ Rainwater Harvesting and Conservation Technologies Increase Soil Water, Sweet Potato (*Ipomoea batatas*) Growth and Yields on Upland Gravelly Soils in Sierra Leone (198)

Patrick Sawyerr | Njala University, Sierra Leone

Sustainable Adaptation Practices in Ensuring Food Security in highly water stressed Southern Coast of Bangladesh (227)

M. Tauhid Ur Rahman | Military Institute of Science and Technology, Bangladesh

Aquacrop model assessment in simulating bitter-gourd (*Momordica charantia* L.) water use efficiency in semi arid region (263)

Kamran Soomro | Monash University, Malaysia

Session 12

Nature-based Solutions

Wednesday, 9:30–11:30 (Venue: B8)

Organized by The Nature Conservancy Colombia, The Nature Conservancy- Water Funds for Africa | Jorge Leon Sarmiento, Fredrick Kihara in cooperation with Centers for Natural Resources and Development (CNRD)

BACKGROUND

Sustainable water security requires an integration of traditional engineering solutions with nature-based solutions, which in essence is the conservation of natural ecosystems that contribute toward solving challenges in water security, climate change impacts and human health issues related to environmental degradation. Nature-based solutions, often referred to as “green infrastructure”, address water-related problems at the landscape level, and can work alongside gray infrastructure, resulting in reduced operation and maintenance costs of grey infrastructure. In this session we will explore, within the context of developing countries in the tropical regions facing water security challenges, the promising initial evidence on how nature-based solutions help to reduce capital costs, and, in some cases, be more cost-effective than gray infrastructure, contributing to address these water resources management challenges in these regions.

KEYWORDS

Water Security, Nature Based Solutions, Green Infrastructure, Natural Capital, Water Funds, Climate Change, human health, Biodiversity

OBJECTIVES

- Explore the value of nature based solutions for addressing water security challenges in developing countries in the tropical regions
- Present the benefits of the combined “green & grey” infrastructure approach in terms of water security, climate change mitigation and adaptation, human health and biodiversity protection
- Discuss opportunities to mainstream investments in Nature Based Solutions for Water Resources Management
- identify and discuss capacity Gaps and Needs for Water Security Assessment in Africa
- Discussion the vision of the 2030WaterSecure? and how might collaboration add value for Africa20230WaterSecure?
- to identify the next steps to initiate projects or concrete partnerships

ORAL PRESENTATIONS

Nairobi Water Fund: Conservation for Urban Water Security

Elizabeth Mwangi | The Nature Conservancy- Water Funds For Africa

Sustainable solution for unconventional water in arid regions by promoting nature-based techniques with relatively low energy demanding solutions (constructed wetlands, CWs) (272)

Mohamed Abuhashim | Zagazig University, Egypt

Evaluating Potential of Payment for Water Service a Nature based solution to challenges on Water security in Nairobi, Kenya (286)

Joram Kagombe | Kenya Forestry Research Institute, Kenya

Ecosystem services of urban forests in the context of water security and climate change - a case study from the German metropolis Cologne (236)

Jule Niepmann | University of Applied Forest Sciences Rottenburg, Germany

Session 13

Water Governance and Water Security

Wednesday, 9:30–11:30 (Venue: B9)

Organized by Technische Universität Braunschweig | Andreas Haarstrick

BACKGROUND

The issue of water security—defined as an acceptable level of water-related risks to humans and ecosystems, coupled with the availability of water of sufficient quantity and quality to support livelihoods, national security, human health and ecosystem services—has been the object of increased academic and policy interest over the past decade.

Simultaneously, water governance—defined as the range of political, organizational and administrative processes through which community interests are articulated, their input is incorporated, decisions are made and implemented, and decision-makers are held accountable in the development and management of water resources and delivery of water services has been increasingly recognized as a critical contributor to the long-term sustainability of water resources.

Relatively little attention has, however, been paid to the governance dimensions of water security, a gap which this session tries to address, through presentation and debates, and exploring questions for further research.

KEYWORDS

Water governance, water security, sustainability of water resources

OBJECTIVES

- Exploring synergies between water governance perspectives and water security
- Identifying the governance dimensions of water security
- Suggestions for research

ORAL PRESENTATIONS

Hydrosolidarity and the International Court of Justice: the need of the application of this principle for the proper development of International Water Law (290)

Diana Abu-Ghunmi | Institute, Country

Water Ressource Governance as key factor Sustainable Development in Morocco (151)

Abdelmalek Dahchour | Hassan II Agronomy and Veterinary Institute Institute, Morocco

Local governance systems in managing the risks of climate extremes and water crisis: Discussions from the case of coastal Tamil Nadu, India (195)

Devendraraaj Madhanagopal | Indian Institute of Technology Bombay, India

Towards a better understanding of resource management decisions (186)

Mirja Michalscheck | Wageningen University & Research, Netherlands

Impacts of Water Crises on Agriculture Sector and Governance Challenges in Pakistan (183)

Muhammad Mumtaz | Getulio Vargas Foundation, Brazil

Analysis of Local Water Governance Structure and Dynamics in Rusinga Island, Homabay County, Kenya (161)

Lydia Okolla | University of Nairobi, Kenya

Session 14

Water-Energy-Food-Nexus

Wednesday, 9:30–11:30 (Venue: B10)

Organized by University of Applied Forest Science Rottenburg and TH Köln University of Applied Sciences | Heidi Elisabeth Megerle & Lars Ribbe in cooperation with Centers for Natural Resources and Development (CNRD)

BACKGROUND

The Water-Energy-Food (WEF) Nexus receives growing attention in sustainability strategies and in research, which is evident from numerous reports, scientific papers and global and regional conferences. The innovative aspect of the Nexus is that it shifts attention from a single-sector view to a more balanced view of issues linking the three resources and related sectors. In recent years, many integrated approaches to analyse the resource interactions within the Nexus have been developed. Although such approaches have been applied to a large number of case studies explaining and quantifying the trade offs among resources uses and suggesting solutions, there is still a need to develop and apply approaches which are implementable in practice. Further questions arise on how to represent linkages to other key domains or sectors like environment, climate, or health.

Another point of interest in this session is the relation of Water-Energy-Food interdependencies during climatic disaster which often yields to conflicts and migration processes.

KEYWORDS

Water-Energy-Food Nexus, research challenges, implementation

OBJECTIVES

- Exchange on state of art regarding WEF Nexus assessment, modeling and examples of implementation of the WEF NEXus concept
- Analyse the Roles of Higher Education Institutions in sharing knowledge/ practice among academia, research and policy
- Develop recommendations and concrete suggestions regarding future research, science policy dialogue and governance structures which facilitate the application of the Nexus concept

ORAL PRESENTATIONS

WEF-Nexus in peripheral rural areas: Case study Burundi

Heidi Elisabeth Megerle | University of Applied Forest Science Rottenburg, Germany

Demand driven research regarding the WEF Nexus / Case Study Nile Basin

Lars Ribbe | TH-Köln University of Applied Sciences, Germany and Chair of the Working Group "WEF NExus" of the "Sustainable Water Future Programme"

Climate Change Effects on Food Security

Sintayehu Yigrim Mersha | Hawassa University, Ethiopia

Water sustainability indicators in the Water-Energy-Food nexus: A case study in coastal zone (166)

Kieu Lan Phuong Nguyen | Nguyen Tat Thanh University, Vietnam

Artisanal small-scale mining and the threat to the environment, water quality and ecosystems, health and food security: the case of Burundi (315)

Pascal Nkurunziza | University Of Burundi, Burundi

Transboundary management of day-to-day variations in discharge and water levels in the Blue Nile Basin: a water-energy nexus perspective (155)

Mohammed Basheer | TH-Köln University of Applied Sciences, Germany

Aquatic agriculture for lakes in Africa: A proposal (171)

Ricardo Radulovich | University of Costa Rica, Costa Rica