How do we make complex water use calculations accessible and understandable to the public? We sat down with the man who thought up the "Water footprint" term. ► INTERVIEW PAGE 7

"This handbook gives an entry pass to understanding the importance of cross-disciplinary collaboration when taking on the SDG targets and indicators" writes SIWI's Dr Jenny Grönwall. ► BOOK REVIEW PAGE 16

STOCKHOLM
# WATERFRONT
THE FORUM FOR GLOBAL WATER ISSUES | # 3-4 | DECEMBER 2016

OPINION

## PUT THE RAIN TO WORK

*Large scale rainwater harvesting is the only way to alleviate hunger in sub-Saharan Africa*

LAST WORD

## *"I want to talk about toilets"*

ANALYSIS

## *Environmental security in the Anthropocene*

## HAS TIME COME TO RE-EVALUATE A SACRED DOCTRINE?

PUBLISHED BY STOCKHOLM INTERNATIONAL WATER INSTITUTE

EDITORIAL

Photo: Thomas Henrikson

# WITH A LITTLE HELP FROM ABOVE

Sub-Saharan Africa is set to see a drastic population increase in coming decades. That is not news. But combine that with vast drylands that hardly can support sufficient food production to feed all peoples, and you have a recipe for disaster. The only way we can have any hope of achieving the Sustainable Development Goal #2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture), is to completely change the way we view and manage green water, that is, rain. That is the argument of Malin Falkenmark, author of this year-end issue's Opinion, on page 5. We will continue to cover this aspect of green water into 2017. Stay tuned.

In the interview, we talk to the person who has worked on and developed the Water Footprint concept for a decade and a half. How the term came to Arjen Hoekstra? Well, in the shower, of course. Read more on page 7.

The Permanent Sovereignty of Natural Resources has been a near-sacred doctrine for decades, originally formulated to protect newly independent nations, mainly in the global south. But this doctrine is now being questioned. Should the sovereignty be absolute, even in the face of grave environmental and security concerns? Read Anna Forslund's Analysis on page 14.

We could not help but publish pictures from some of our favourite moments during this year's World Water Week. Enjoy them on page 10.

Starting with this issue, Stockholm WaterFront Magazine will become a primarily digital publication. It is a direction chosen by many publishers and publications, and something WaterFront, with its global readership, has considered for some time. However, we first wanted to make sure the magazine could be fully enjoyed on screens, and worked to develop the ways in which we are able present the magazine digitally. It can now be read online, through an e-publication tool, as well as offline, by downloading the magazine as a PDF. This is an effort that will continue as we further develop SIWI's digital presence, in several channels, and for various audiences.

Happy reading!

Torgny Holmgren
Executive Director
Stockholm International Water Institute


SIWI

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Stockholm WaterFront is a quarterly magazine that aims to inform the global water debate and be a source of knowledge and inspiration for professionals worldwide with an interest in water issues. Stockholm Water Front mixes popular science articles with news reporting and carries analyses by some of the world's most knowledgeable water writers. It is published in print and digitally by Stockholm International Water Institute, and is free of charge.

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## CONTENT

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# BRIEFING

## SIWI FOCUS ON CITIES AT COP22

In its recent report "Investing in Urban Resilience: Protecting and Promoting Development in a Changing World", the World Bank cautions that cities must invest in resiliency measures or face an estimated cost increase of USD 314 billion annually by 2030 from damages caused by natural disasters.

Cities are a driving force in the global economy, generating more than 80 per cent of global GDP. Sixty percent of areas expected to be urban by 2030 have yet to be built.

As cities expand, so do the social and environmental challenges associated with demands for water, sanitation, energy, food and infrastructure. However, within the challenges of rapid urbanization and climate change, lies opportunity. Investments in climate resilient water infrastructure can save cities millions by reducing the impacts of floods and drought. Therefore, robust green infrastructure planning and water wise climate investments are necessary.

Cities can also play an important role in tackling climate change mitigation and adaptation, as they consume close to two-thirds of the world's energy and account for more than 70 per cent of global greenhouse gas emissions.

On 8 November, SIWI and the City of Stockholm hosted an event exploring successful mitigation and adaptation initiatives for climate and water resilience in cities at the UN Climate Change Convention in Marrakech. The event highlighted climate challenges facing emerging cities and megacities, as well as a presentation of water wise initiatives to help cities mitigate and adapt to the impacts of climate change.

**A webcast of SIWI's event can be streamed at www.ustream.tv/recorded/92673996**

## HYDRO-CLIMATE EXPERTS ISSUE REVOLUTIONARY CALL

A group of hydro-climate scientists and experts, including Malin Falkenmark from SIWI and Stockholm Resilience Centre, Johan Rockström from Stockholm Resilience Centre and Kevin Chika Urama from the African Development Bank, want to revolutionize the way we think about water in Africa, by shifting the focus to green water.

Changing rain patterns and an anticipated population explosion are likely to put substantial obstacles in the way of achieving the SDG 2, ending hunger, in sub-Saharan Africa. Today only about 30 percent of rainfall is used as productive green water flow in crop production. Fifty percent of that is lost as evaporation, resulting in very low crop yields.

In a Call for an African Water Revolution the scientists propose 1) a Green Water Initiative for Africa and 2) a Water Harvesting Innovation Coordination Mechanism under pan-African ownership to coordinate investments in green water innovation.

The Call estimates a minimum of USD 100 billion in green water innovations will be needed to build water resilience for food security.

**Read the Call here**

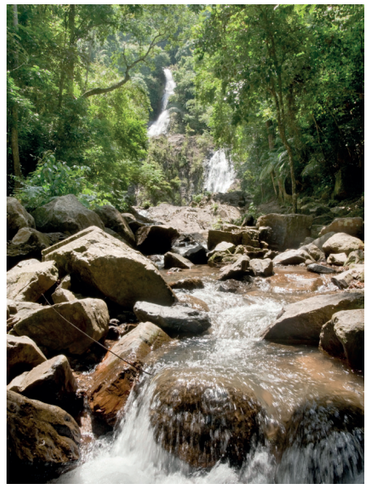
## NEW INITIATIVE TO INCREASE KNOWLEDGE ON WATER-FOREST LINKS

In the past 100 years vast areas of forest have been degraded. But when we think about the value of forests, biodiversity tends to be at the top of the list, not water.

"There is too little awareness of how forests, and the way they are managed, interact with water and affect water flow and quality", says Lotta Samuelsson, programme manager at SIWI. Filling the knowledge gap about the link between forests and water was the starting off point for a Food and Agricultural Organization (FAO) initiative to develop a monitoring framework for forest and water interactions.

"Forests are like big sponges. They store water, and if you take away the forest you severely change water flows and quality," says Samuelson. "Restoring and sustainably managing forests can have a huge impact on improved water cycles and access for local people and cities to water."

In September, experts from all over the world met at a start-up workshop, hosted by SIWI in Stockholm.



They identified three main indicators and sub-indicators for a monitoring framework that are under review and will be tested by the FAO in 2017.

**www.swedishwaterhouse.se/en/events/understanding-the-forest-and-water-nexus**

## USD 314 BILLION

Annual cost of natural disasters to cities by 2030, if investments in resiliency measures are not made.

(Source: The World Bank Group)

## THERE ARE JOBS IN TOILETS, ACCORDING TO WRC

For this year's World Toilet Day (Nov 19) theme toilet and jobs", the South African Water Research Commission showed there are service jobs in sanitation beyond plumbing and maintenance – from building new toilets to converting faecal waste into assets like charcoal substitutes.

A public–private partnership project launched by the WRC in 2009, introduced a social franchising concept for water and sanitation delivery introduced in the Eastern Cape. Four hundred schools were serviced in the pilot, generating more than 20 sustainable jobs and 50 part-time informal employment opportunities.

Another WRC-funded project to install 1,000 off-grid sanitation "pour flush" toilets for low water use created 290 temporary local jobs.

*This is an edited version of an article written by Dr Sudhir Pillya, research manager at WRC.*

## SWEETER SMELLING POOP TO ENCOURAGE USE OF PIT LATRINES

Millions of new toilets are being built worldwide to end open defecation. While great news, many new toilets don't get used because they smell bad. People prefer to relieve themselves in the open, where the air is fresher, wrote Bill Gates in his blog gatesnotes.

Open air defecation causes unsafe water and sanitation and disease. About 800,000 children under age 5 die each year from diarrhoea, pneumonia and other infections caused by unsafe water and sanitation.

Building on a "smell summit" hosted by the Bill and Melinda Gates Foundation a few years ago, Swiss perfumery Firmenich set out to find a perfume to mask the unappealing smell of latrines. After isolating four chemical culprits that cause the bad smell in toilets, Firmenich attacked the problem on a molecular level, developing a flowery scent that blocks olfactory receptors so our brains don't perceive the bad smells.

Now Firmenich is launching pilot projects in communities across India and Africa to understand whether the fragrances will make toilets and pit latrines more inviting for users, and how best to distribute the fragrance – spray, powder or something else.

*This is an edited version of a post by Bill Gates from his blog: gatesnotes.com*

## 2030 WRG LAUNCHES SUSTAINABLE AGRI-WATER INITIATIVE IN MEXICO

About 70 per cent of water consumption in Mexico is used in agriculture, unfortunately with very low efficiencies. Finding new ways to achieve greater agri-water productivity is essential. Toward that end, the 2030 Water Resources Group in partnership with the Consejo Consultivo del Agua (CCA) and the national water commission CONAGUA launched a Sustainable Agri-water Initiative in Mexico.

The CCA is a multi-stakeholder platform that comprises some of the most important industries, sector and professional associations, universities, NGOs and private citizens. The CCA was created to support closer collaboration between government and civil society in the pursuit of water security and sustainable water resources management.

The initiative will comprise a feasibility analysis and development of five business cases and pilot projects. The most successful of the five will be chosen for further design development and implementation.

This initiative is being carried out under the aegis of CONAGUA and the CCA.

*This is an edited version of a news item published on the 2030 Water Resources Group website on September 24.*





# PUTTING RAIN TO WORK

TEXT | MALIN FALKENMARK | PHOTO ISTOCK

**THE SDG 2 ON HUNGER ALLEVIATION HOLDS GREAT HOPE. BUT THE ONLY WAY TO REACH IT IS IF LARGE SCALE RAINWATER HARVESTING IS INTRODUCED IN SUB-SAHARAN AFRICA, WRITES PROF. MALIN FALKENMARK IN THIS OPINION.**

The Sustainable Development Goals have, by the hunger alleviation goal #2, brought a hopeful message to African mothers of getting food enough to feed the millions of poor and hungry children in the vast drylands of sub-Saharan Africa.

This is a region where population pressure is doubling in only one generation; for two reasons: high fertility, which is partly avoidable, but also growing life expectancy, which is partly unavoidable.

Since hunger globally tends to be largest where water is most limited, i.e. in the arid zones, it is a fundamental dilemma that the SDG Programme, as formulated, is taking for granted that there is in fact water enough to produce all that food. In the savannah landscape, most rain evaporates, however, and what is left is not enough to meet the huge water requirements for a full crop yield.

How then to achieve SDG 2? As long as extra water cannot be added, the arid climate allows no more than minimal yields (ca 1 tonne/ha only). Like earlier the Indians, the Africans will depend on a Green Revolution, but that revolution will – as indicated by Kofi Annan – have to be radically different from the Asian one, which brought wealth to the Indians in the second half of the 1900's.

The Asian Green Revolution was made possible by large-scale conventional irrigation, based on rich water resources on the Indian subcontinent. In dryland Africa, however, there is no Himalaya pouring blue water over the landscape, which can be used for irrigation. The limited blue water available has to be carefully shared between all blue water-dependent societal activities – besides water supply of a growing number of large cities, the development of a flourishing industry, and production of enough energy to allow an economic development. Conventional water management with an irrigated agriculture, swallowing most of the available blue water resource is simply not an available pathway for realizing the SDG project on the vast African drylands. Yields large enough to feed more than one billion Africans will simply have to be based on wise use of rain.

Conventional water management has limited its focus to blue/liquid water, i.e. less than ten percent of the amount of water circulating over the African drylands. There, water wisdom will demand a radical shift in water conceptualization, by acknowledging also green water in the soil, as a fundamental water resource. Sound water management will have to reserve blue water for water supply of fundamental societal activities, and find ways to secure enough green•••

**The time has come for African farmers to wage a "uniquely African Green Revolution"**

UN Secretary-General Kofi Annan

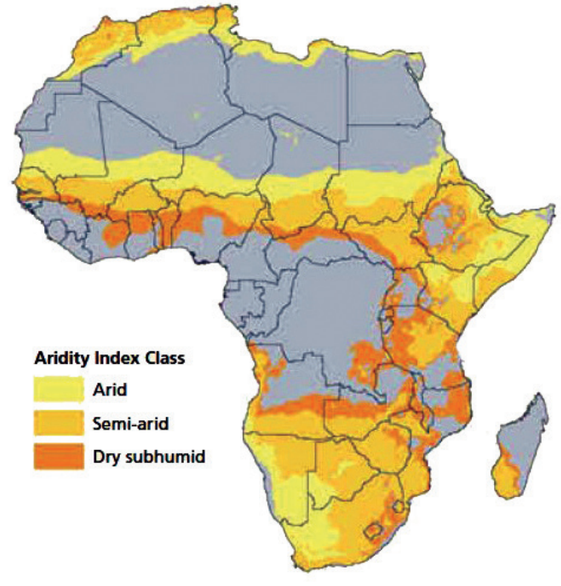



Fig 1. Dryland regions of Sub-Saharan Afruca, defined in terms of the Aridity Index
Source: @Harvest Choice, IFPRI, 2015. Reproduced, with permission from Zhe Guo, 2015; further permission required for reuse.

water for crop production, following examples from India and China.

At World Water Week in 2016, the hunger alleviation challenge of dryland Africa was analyzed, concluding that science clearly shows the necessity of a sustainable, resilience-based agricultural revolution with special focus on how to achieve water resilience in the vast water-scarce regions in Africa. An Expert Call was issued, declaring that it will not be possible to reach the SDG's in Africa without an African Water Revolution, based on green water.

Thus, rain is a core resource for securing reliable food production to alleviate hunger in the semi-arid and dry sub-humid African drylands. The considerable water losses in current rain-fed agriculture will have to be met by agricultural upgrading, turning non-productive evaporation into productive transpiration (vapour shift), and from water harvesting systems providing supplementary irrigation based on rain water flows, harvested from slopes and valley bottoms and stored in ponds or dams for use during dry spells and drought periods. This potential is vast, with e.g., *hopespots* where such simple technology can be applied on the millions of smallholder farms already identified.

*"The considerable water losses in current rain-fed agriculture will have to be met by agricultural upgrading, turning non-productive evaporation into productive transpiration"*

What's needed

- A long-term, and continental-scale innovation plan for a sustainable transformation of the agricultural systems across sub-Saharan Africa. What is suggested is a **Green Water Initiative for Africa** to lead the path towards achieving the food security and hunger alleviation goal, which in turn is a precondition for reaching all the other SDGs in the region.
- A **Water Harvesting Innovation Coordinating Mechanism for Africa** under pan-African ownership. This should take the form of a strategic African Green Water Plan, supported by a minimum of USD 100 billion investments in the green water innovations n eeded to build water resilience for food security and human wellbeing, and to incentivize the business community to invest in small-scale farming innovations and catalyze a Triple Green Revolution in Africa.
- A need for Africa to spark a **Triple Green Revolution** (green for green water, green for productivity, green for sustainability), where rain is the core resource for securing reliable food production in the huge semi-arid and dry sub-humid African drylands.

**Malin Falkenmark** is a globally renowned water expert and currently serves as Senior Scientific Advisor at SIWI, and Professor of applied and international hydrology at SRC (Stockholm Resilence Centre).

Note: Malin Falkenmark has, together with several renowned international water, climate and development experts, issued a Call for an African Water Revolution. **Read it here.**





# WATER FOOTPRINT NAME CAME TO ARJEN HOEKSTRA, OF COURSE, WHILE SHOWERING

TEXT & PHOTO | RANDALL HACKLEY

**HOW DO WE MAKE COMPLEX WATER USE CALCULATIONS ACCESSIBLE AND UNDERSTANDABLE TO THE WIDER PUBLIC? WATERFRONT SAT DOWN WITH THE MAN WHO THOUGHT UP THE "WATER FOOTPRINT" TERM.**

Some people sing in the shower, some people dream and some people think.

As streams of hot water cascaded over his head while showering at home 15 years ago, Dutch engineer Arjen Hoekstra thought about what water means to a thirsty world -- and came up with the name for the concept he'd developed that changed the way humans look at Earth's most valuable resource.

Water footprint. The words encapsulize a sophisticated scientific concept that measures the amount of water it takes to produce an almond, T-shirt or hamburger. Water to grow the grain that feeds the cow, to build the truck that brings the meat to market, for the energy that refrigerates the food and grills the beef that arrives sizzling in a bun on your plate.

With one phrase symbolizing how much water is used to produce goods and services, Hoekstra created a new paradigm that has become essential to scientists, policy planners and businesses worldwide. The best term to describe and quantify water consumed by a country, in a river basin, from an aquifer.

The Delft native also found, ironically, that shorter showers aren't going to solve the world's water problems because household use makes up such a small fraction of overall usage. The elephant in the room sucking up the planet's water resources with its massive trunk is agriculture: Food production accounts for 70 per cent of global water withdrawals. In one swoop, Hoekstra gave us a vital measurement tool. In years of developing a famous concept similar to a carbon footprint that endures to this day, he has mapped out a sustainable road that requires an overhaul of what we grow and eat.

A longtime colleague and collaborator who admires the University of Twente water management professor describes Hoekstra's `aha' moment:

`What I remember most is that some of Arjen's creativity comes under the shower including coining the word `water footprint,'" said Mesfin Mekonnen, who worked with Hoekstra for nine years and is now at Nebraska University in the US involved in Ogallala aquifer research.

The thinking was that people use lots of water not only directly at home for showers and bathing, drinking and cooking, but also indirectly to produce energy and make things like a computer chip and car. Even more is used growing food, especially meat, said Hoekstra, who lives in a rural home near the German border studded with masks from his and his wife's African travels.

Hoekstra felt he was being hypocritical to eat meat in an increasingly thirsty world with rising food and energy demands. His research showed it takes 10 litres of water on average to make 1 kcal of beef, much of that to grow the crops fed to cattle, versus 0.5 kcal per litre for cereals and 1.0 litre per kcal for vegetables or pulses, an important protein replacement for meat.

Showering faster won't solve the impending water crisis though it makes sense because it uses less energy, Hoekstra says, advocating a world where eating less meat is seen as a logical way to help reduce pressure on the environment.

Farming is the biggest user of water and animal products alone account for about one-third of humanity's water footprint. Populations are increasing and meat consumption per capita keeps climbing as incomes grow, Hoekstra says.

Escalating water consumption is a serious concern, even more so with climate change fueling the incidence of drought.

As water usage at home generally comprises between one and three per cent of a person's water footprint, a briefer shower isn't necessarily where savings can occur. Take a closer look at the diet because 25 per cent of the water footprint of many people comes from meat consumption, up to 40 per cent in some countries, his research shows. Of increasing concern are biofuels due to their large impact on land and water use. Solar and wind energy are our only options, Hoekstra said, to reduce both our carbon and water footprint.

`It's about getting diet, trade policies and energy politics right, it's about getting agricultural policies right," he said in an interview at his university office where a bookshelf was crammed with water-related literature, the top stacked with water bottles from around the world.

"If the water system isn't healthy, the economy isn't healthy," said Hoekstra, 49. "Water has always been seen to be exploited but now we see that water is talking back, putting constraints on economic growth."

Hoekstra advocates better pricing of water scarcity: ``If water remains for free, it aggravates the water problem." He favors regulated and enforced water footprint caps so every river basin has a maximum extraction limit to help curb overuse. He further advocates water footprint benchmarks for products so companies can formulate targets to reduce the water use in their operations and supply chain and consumers and governments have a means to measure the water sustainability of brands.

Strictly speaking, a water footprint measures the amount of water used to produce goods we consume and as such helps people understand for what purposes limited freshwater resources are being used or polluted. The impact depends on where the water is taken from and when. If it comes from where water is scarce, like cotton from the Indus basin in Pakistan or asparagus from the desert in Peru, long-term consequences can be significant.

About a half-billion people on a planet of 7.4 billion now live in places with severe water scarcity year-round, with ancient aquifers being depleted, rivers running dry. Lakes and river basins are under increasing pressure; the Aral Sea that's almost dried up from farming and water diversion in 20 years is the latest red flag.

California's Central Valley, the most agriculturally productive land in the US, is overusing underground supplies that are depleting as its historic drought continues. Research by Hoekstra and Mekonnen shows the US with the highest per capita water footprint – twice the global annual average per capita. Meat consumption accounts for 30 per cent of that figure.

Asked who his "water heroes" are, Hoekstra said Peter Gleick of the Pacific Institute was "a great influence, a great source of data." Also mentioned: Malin Falkenmark, senior scientific advisor at the Stockholm International Water Institute renown for her water scarcity indicator and blue and green water distinction, and Hubert Savenije, a professor of hydrology at Delft University of Technology who like Hoekstra is a civil engineer with an expertise in water-resource management.

## The origin of the concept

Professor John Anthony Allan was awarded the 2008 Stockholm Water Prize Laureate for pioneering the development of key concepts in the understanding and communication of water issues and how they are linked to agriculture, climate change, economics and politics.

In 1993, Allan demonstrated this by introducing the "virtual water" concept, which measures how water is embedded in the production and trade of food and consumer products. Behind that morning cup of coffee are 140 litres of water used to grow, produce, package and ship the beans. That is roughly the same amount of water used by an average person daily in England for drinking and household needs. The ubiquitous hamburger needs an estimated 2,400 litres of water. Per capita, Americans consume around 6,800 litres of virtual water every day, over triple that of a Chinese person.

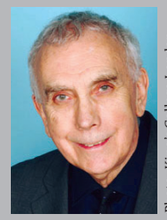


Photo: King's College London

**Prof John Anthony Allan**

**140 LITRES** The amount of water used to grow, produce, package and ship the coffee beans.

**1,700 LITRES** The amount of water needed to produce 100-gram chocolate bar

Water footprints for an almond grown in California and asparagus in southern Peru are all part of the water-resource management concept introduced by Hoekstra as an alternative indicator of water use. It's related to the idea of virtual water trade from John Allan, the 2008 Stockholm Water Prize laureate. Many countries have substantially externalized their water footprint of consumption by importing water in virtual form. The EU's water footprint for instance is 40 per cent outside Europe.

A nation like India has long-established water, sanitation and pollution problems, exporting too much water in the form of virtual water with its cotton, sugar and cereal production. In Hoekstra's opinion, it's not just improving water efficiency that could reduce India's water consumption, "it's growing and producing things in the right place."

Many of India's water-rich crops such as cotton are grown in dry states like Punjab and Haryana that have high evaporation rates. India could grow cotton in less arid states such as Bihar with more efficient irrigation and fewer pesticides to reduce the crop's impact on water resources, he says.

Thirsty crops aren't just almonds, cotton, rice or sugarcane. The water involved in a cup of coffee isn't just what's in the cup: 140 liters of water are – 140 being the amount of water used to grow, produce, package and ship the coffee beans. A 100-gram chocolate bar requires 1,700 liters of water. A hamburger is a veritable water cow, needing an estimated 2,400 liters of water.

Hoekstra, with a master's in civil engineering and a doctorate in policy analysis from Delft University of Technology, says simply of his work: ``Water attracted me most." A childhood memory of summer at the family's favorite holiday spot in the eastern Netherlands involved his creating a landscape of creeks on a mound outside with a water hose.

After his studies and research, he became the first to quantify the water volumes virtually embedded in trade while at UNESCO-IHE. Showing how a global perspective plays in water use and scarcity, Hoekstra helped introduce supply-chain thinking into water management.

With the development of the Water Footprint Assessment, Hoekstra's expertise led to a new interdisciplinary research field that addresses the ties between water management, consumption and trade. Besides his university work and writings, Hoekstra, founder of the Water Footprint Network, now chairs The Hague-based organization's supervisory board.

## The colours of the water footprint

The water footprint is described in three components:

- the green water footprint, the consumption of rainwater;
- the blue water footprint, the consumption of groundwater and surface water; and
- the grey water footprint, the volume of moderately polluted domestic wastewater.

Together, these show a more comprehensive picture of water use by delineating the source of water consumed and volume of fresh water required to assimilate contaminants.

**Arjen Hoekstra**

*"The EU's water footprint for instance is 40 per cent outside Europe"*

# WORLD WATER WEEK IN 2016

As Swedish summer slowly transformed into autumn, World Water Week was organized for the 26th time, drawing over 3,200 participants from 130 countries. It was a week packed with engaging discussions, networking, great speeches, royal prize ceremonies, and much, much more. In these pages, while waiting for the 2017 Week, we share a few memorable moments.

**2016 Stockholm Water Prize Founders:** Bacardi • Borealis & Borouge • Europeiska ERV • HP • Kemira Poul Due Jensen Foundation • Ragn-Sells • Scandinavian Airlines (SAS) • Snecma/Safran • Water Environment Federation (WEF) • Xylem • Ålandsbanken. **Supporter:** Grand Hôtel

### Prof Joan B. Rose, water quality champion, wins 2016 Stockholm Water Prize

Professor Joan B. Rose of the USA is named the 2016 Stockholm Water Prize Laureate for her tireless contributions to global public health: in assessing risks to human health in water and creating guidelines and tools for decision-makers and communities to improve global health.

Three students from Thailand, **Sureeporn Triphetprapa, Thidarat Phianchat** and **Kanjana Komkla**, received the **2016 Stockholm Junior Water Prize** for their innovative water retention device that mimics the water retention of the Bromeliad plant.

Just like last year, a spontaneous march,"**World Water Walk for Peace**", saw delegates chant their way through downtown Stockholm. And just like last year, 2015 Stockholm Water Prize Laureate, Rajendra Singh, was leading the march.

"The weather is perhaps keeping some people from joining us. But we walk. When you work in water scarce areas, rain is not a problem – it is a blessing."

"There are a lot of opportunities and support out there if you, as a young innovator, are willing to do the hard work and grab them"

says **Claire Reid**, social entrepreneur and founder of Reel Gardening in South Africa.

It's been little more than a decade since she was awarded the Stockholm Water Junior Prize in 2003. At the time, she says, the discourse was very different.

The Stockholm Water Junior Prize put her in the limelight. But it didn't take her to the next level.

A few years later, while working at a mining company designing houses for the miners, she realized that she had found a perfect testing ground. People in the community wanted to grow their own vegetable gardens but they didn't know how and water was scarce.

**The elctronic posters** returned again this year, and was very popular amongst the participants.

Another popular new addition from last year, **the SIIW Sofa,** also gave us inspiring sessions. To view them all in full, please visit: **siwi-mediahub.creo.se**

# WORLD WATER WEEK IN 2016

This year World Water Week introduced the **mobile phone app**, as an alternative to the online and printed programme.

Participants were able to plan their own schedule, browse events and interact with each other.

"Disease, poverty, inequality. This is what we really talk about when we discuss water, so let's change the perspective"


Several high-profile speakers gathered to highlight the importance of making water a central element in bringing the SDGs and the Paris Agreement forward during the "Building a resilient future through water" event. **H.R.H. Crown Princess Victoria**, an SDG Advocate, pointed out that water is not an isolated development issue, and cannot be treated as such.

**The Daily** issues are available online, the summaries from each day of World Water Week.
worldwaterweek.org/pressroom

At the "Why waste water? Gearing up for World Water Day 2017 seminar", **Christer Fuglesang**, Swedish austronaut, shared his experiences from space with a special focus on water and water recycling.

"On the space station there is no shower because water doesn't fall down in weightlessness"

The Stockholm Junior Water Prize celebrated its 20th anniversary in 2016. Along with the jubilee SIWI also launched an alumni platform called the "**WaterTank**"



In 2016, over 3,200 individuals and around 330 convening organizations from 130 countries participated in the Week.


**The Closing Plenary** concluded the Week and the outcomes will be presented in the 2016 World Water Week Overarching Conclusions coming out soon.

**The Best Poster Award** was awarded to **Philip Kruse**, Technical University Dortmund.


**The reporting back teams of** 2016 World Water Week.

## DIGITAL WORLD WATER WEEK

Watch videos from the Week and browse our photos from the seminars, social events and prize ceremonies.

**siwi-mediahub.creo.se**

# ENVIRONMENTAL SECURITY IN THE ANTHROPOCENE: TIME TO RE-EVALUATE SACRED DOCTRINE?

TEXT | ANNA FORSLUND | PHOTO ISTOCK

**SHOULD A NATION'S SOVEREIGNTY OVER ITS NATURAL RESOURCES BE ABSOLUTE? THE EFFECT ENVIRONMENTAL DEGRADATION CAN HAVE ON STATE SECURITY RAISES THE QUESTION, WRITES ANNA FORSLUND IN THIS ANALYSIS.**

During the last decades there has been growing recognition that state security depends on a range of factors where environmental degradation can contribute to instability, conflict and unrest. Climate change has also been identified as a threat multiplier which can further exacerbate the conditions causing instability. Some argue that the uprising in Syria that caused the violent unrest in the country was exacerbated by draught and water scarcity caused by climate change. A growing body of reports and policy documents on climate change as a security risk is emerging, many of them stemming from agencies with a military and security background. The UK and US governments have moved from considering climate change as a future risk to a current threat and developed strategic approaches to climate change and conflict in defence strategies. Linking the security and the environmental agenda, the "securitization" of the environmental debate has also been a contested. Opponents argue that security practices are often associated with more confrontational activities and engaging military in environmental issues could undermine environmental work.

*"Can resources sovereignty and the principle of autonomy and self-determination reconcile with the environmental security discourse?"*

Some well-established principles have developed within international environmental law that guide states' cooperation and interaction on environmental issues. One of the most discussed and contested principles include the doctrine of permanent sovereignty over natural resources (hereinafter PSNR). The doctrine developed as a response to former colonies' efforts to reclaim control over their natural resources. It has been debated and in some aspects controversial.

The principle outlines that states have the sovereign right to control and use its natural resources within its territory without external interference. Can resources sovereignty and the principle of autonomy and self-determination reconcile with the environmental security discourse? An increasing state control over environment and natural resources can have spillover effects such as environmental degradation, resulting in unjustified calamity and therefore contribute to increased tension and insecurity in and between countries. With emerging global challenges in the Anthropocene, the issue of fundamentally amending the PSNR has been raised. The fight for access to scarce natural resources and the right to restrict access to such resources will become central.

However states permanent sovereignty of their natural resources is not absolute. Since the establishment of the PSNR doctrine, the understanding of human impact on the environment has increased. Additional principles have developed to guide state-state interaction. They recognize the need for international co-operation, and they accept that environmental pollution can originate within one country's territory but have widespread regional and global impacts. Some of the principles are in contradiction or complementary to the PSNR doctrine as they limit states' unlimited control and free exploitation of its natural resources. The below listed principles have a non-state centric approach and emphasize the need for cooperation, solidarity and global solutions to environmental problems.

**Obligation not to cause harm:** Limits state sovereignty by prohibiting states to cause significant harm to another states' territory

**Sustainable Development:** Limits PSNR, as nations' extraction of natural resources should be done with the consideration of social, economic, financial, and environmental and human rights aspects, and with a global perspective

**Principle of Common but Differentiated Responsibilities:** Recognizes the differences between developed and developing states in contribution to environmental problems, and despite their common responsibility, it highlights the different responsibility to act between developed and developing countries.

There is a risk that the environmental security debate will reinforce the polarization between developing and developed countries. Many of the emerging environmental issues identified as being a potential global security threat originate in developing countries. And it is mainly military and security agencies in developed countries that have the capacity and resources to deal with environmental security. The maintenance of the doctrine will therefore be important to ensure that developing countries can maintain their sovereignty and that extraction of their resources is made without external interference on equitable terms.

In the evolving environmental security debate it will be important to reinforce the fundamental environmental law principles. This includes both the PSNR, to continue to secure the rights of developing nations, as well as the principles that limits those rights. ●

**Anna Forslund** is a climate and environmental law expert with SIWI.

# FROM SWIMMING POOL REGULATION TO WASH MANAGEMENT

## A HANDBOOK OF WATER AND HEALTH

**Prof Joan B. Rose** is the 2016 Stockholm Water Prize Laureate

TEXT | DR JENNY GRÖNWALL | PHOTO ISTOCK

**THIS HANDBOOK GIVES AN ENTRY PASS TO UNDERSTAND THE IMPORTANCE OF CROSS-DISCIPLINARY COLLABORATION WHEN TAKING ON THE SDG TARGETS AND INDICATORS, WRITES JENNY GRÖNWALL IN THIS REVIEW.**

In times characterized by "too much" and "too little" water reported from around the world on an almost daily basis, the 2016 Stockholm Water Prize Laureate, Joan B. Rose, has contributed to putting matters of water quality and health firmly back on the agenda. She also reminds of that this is an unfinished agenda; that the process towards fuller understanding of the problems, and the feasibility and cost-effectiveness of our management strategies, is very much ongoing. An example of how to fill the gap is the Global Water Pathogens Project, which aims to "be a knowledge resource and hub on water pathogens which will guide the goals for sanitation and achieving safe water around the world using the power of new information technology and tools" (**www.waterpathogens.org**).

This approach and source of growing information is imperative not least now that the UN General Assembly in November 2015 recognized sanitation as a distinct human right alongside the right to safe drinking water.

Our body of knowledge and insights is constantly improving and accumulating. We question old truths and presumptions about causality, we shift and expand the frames of the box and add more understanding on complex human behaviour. Modelling and diagnostics become ever-more significant for decision support. At the same time, history – and path-dependency – guide us. For instance, the so-called Sanitary Revolution in 1840s' England contains lessons on mapping of disease outbreaks and the time lag for new behaviour to set in.

The Routledge collection of Handbooks prides itself with covering 600 topics, providing a host of interdisciplinary connections. The Handbook of Water and Health from 2015, edited by Jamie Bartram, addresses our need for a go-to source of reference whether a student or practitioner. It deals with issues that are central to both international planning and policy frameworks, explains rationales behind interventions and implementation, treats water-related hazards, sources of exposure and the how to's of investigative tools, and covers the "distal influences" that cut across all fields of work, such as climate change, poverty, population and demographics, and conflict.

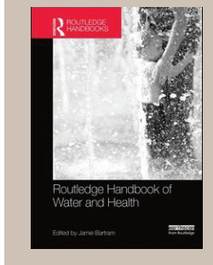
This rich handbook provides knowledge from the very broad to the very specific (Regulation of swimming pools), and among its merits is that it contains relatively under-researched dimensions such as Menstrual hygiene and management of WASH. There are, however, topics less well covered. For instance, the increasing employment of cheap point-of-use devices for reverse osmosis and UV-treatment of drinking water at home may be a health concern where users are not conscious about quality standards and the need for maintenance. The need for proper re-mineralization, at household as well as water service provider scale, is also not dealt with in depth.

*"The so-called Sanitary Revolution in 1840s' England contains lessons on mapping of disease outbreaks and the time lag for new behaviour to set in"*

The handbook format aims less to add something new to the field than to offer an overview of its many interconnected avenues and a refresher to enable the reader to learn from history. Despite being written with examples from the time of the MDGs – and thereby inevitably being somewhat dated already – it gives an entry pass to understand the importance of cross-disciplinary collaboration when taking on the SDG targets and indicators.

Looking ahead, Bartram et al. argue that "contemporary challenges and opportunities point to the need for a fresh cycle of water and health initiatives, which in turn require a new generation of professionals with both the depth of knowledge and the interdisciplinary skills necessary to respond to existing and future challenges". This is an invaluable recipe to deal with the mounting complexities of water for health. ●

**Dr Jenny Grönwall** is a Programme Manager at SIWI and a member of the water governance team, with responsibility for groundwater governance and food security.




**Routledge Handbook of Water and Health**. Jamie Bartram, with R. Baum, P.A. Coclanis, D.M. Gute, D. Kay, S. McFadyen, K. Pond, W. Robertson, and M.J. Rouse (2015). Routledge.

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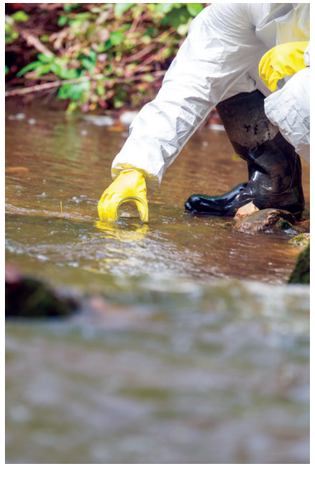

# *"I want to talk about toilets"*

TEXT & PHOTO | JON LANE

As we move from the era of the Millennium Development Goals to that of the Sustainable Development Goals, we have broadened our horizons to serve the whole world. We will no longer be pigeon-holed as development workers who concentrate on poor countries. That change gives an exciting vision and breadth to our work but it also carries dangers that the poorest and neediest people could be neglected in the ambitious sweep of our global visions. The World Water Week in Stockholm – and SIWI as its host organisation – has been ahead of the trend as it has always taken a global view and considered water and sanitation across the whole social, political and economic spectrum.

This excitement with a note of caution applies particularly to sanitation. Many people put huge effort into lobbying for sanitation to be included in the SDGs and then agreeing the precise wording, so here I will not dissect the details: the important point is that sanitation is included with a high aspiration to achieve access to adequate and equitable sanitation and hygiene for all by 2030.

As a sanitation worker, I am of course delighted by this recognition. However, we still have a long way to go to achieve our goal. Over the years we have set (and missed) so many targets that now we need to broaden our thinking on how to achieve this one.

Governments, UN agencies and NGOs will all busy themselves increasing sanitation coverage, and rightly so. As for me, having worked for decades in sanitation within the development community, I am now concentrating more on the role of the private sector to provide sanitation services. The private sector ranges from a village entrepreneur digging pit latrines for her neighbours to a multinational corporation marketing cleaning materials worldwide. Their services cover the full spectrum from construction work to environmental protection. The unifying feature is that a private company functions by responding to the needs of its customers; if the response is right the customers are happy and the company makes a profit and expands its work. We need that perspective, that energy, and that talent to help achieve the SDG targets.

Over the years many development workers have tried to make purposeful links with the private sector, usually with little success (I know because I was one of them). Now I see some progress. One example is the Toilet Board Coalition, in which I must declare an interest because I serve on its Steering Committee as an independent member. Its aim is to help private sector entrepreneurs to improve and expand their sanitation services for poor people. Its crucial characteristic is that it is run by mainstream business managers who perceive that 2.5 billion people can become their customers, not by Corporate Social Responsibility departments who might just give some money or staff time as a charitable activity.

The toilet technology and service will of course depend on the economic situation of the customers but certain fundamentals are not negotiable, for example to safeguard human health and dignity and protect the environment. With proper regulation and encouragement, the private sector must be mobilised worldwide in order to achieve our cherished goal. When everybody in the world has an adequate toilet, I can stop talking about them. ●

**Jon Lane** is an independent consultant in sanitation and water for developing countries who has previously worked as Executive Director of WaterAid and of WSSCC.



## CALENDAR

**16-19 JANUARY**
**ABU DHABI NATIONAL EXHIBITION CENTRE**
**ABU DHABI, UAE**
**The International Water Summit**

The International Water Summit (IWS) is a global platform for promoting water sustainability in arid regions by bringing together world leaders, field experts, academics and business innovators to accelerate the development of new sustainable strategies and technologies.

The conference brings together industry leaders from around the world to share their thinking, exchange expertise and insights and discuss best practice in the water industry.
**www.internationalwatersummit.com**

**25 JANUARY**
**CLEANTECH, SAN DIEGO, USA**
**Smart Water: Tapping Technologies for Water Utilities**

This free, one-day event will bring together water utility and technology leaders to discuss the challenges and opportunities associated with the integration of data-driven technologies across the North American water sector.
**cleantechsandiego.org/event/smart-water-tapping-technologies-water-utilities**

**14-16 FEBRUARY**
**UNIVERSITY OF NEW SOUTH WALES, SYDNEY, AUSTRALIA**
**11th IWA Symposium on Tastes, Odours & Algal Toxins in Water**

We invite the water, algal, and T&O experts across the world to join us in Sydney for this symposium.
**www.unsw.edu.au**

**20-22 FEBRUARY**
**HILTON TOWER BRIDGE, LONDON, UK**
**World Water-Tech Innovation Summit**

The 6th annual World Water-Tech Innovation Summit 2017 focuses on building resilience and accelerating the adoption of commercially viable technologies to meet the demand for sustainable water and urban infrastructure management.
**worldwatertechinnovation.com/**

## NEW SIWI PUBLICATIONS


**OVERARCHING CONCLUSIONS**

SIWI shares its main conclusions from World Water Week. In addition, three teams of rapporteurs attended all events during the Week, and present their key take-home messages from environmental, economic and social perspectives. The chair of the Week's Scientific Programme Committee summarizes the seminars, and we offer a glimpse of the Prize ceremonies, as well as a browse through activity in social media.

**All publications can be found online at www.siwi.org/publications**


**CLIMATE CHANGE IS WATER CHANGE (POLICY BRIEF)**

The coming years, including the stock-taking in 2018, will be an important time to underpin water's key role to achieve the ambitions set out in the Paris Climate Agreement.


**WATER IN THE SUSTAINABLE CITY (WORKING PAPER)**

Cities worldwide are facing growing challenges in storm water management. This publication compiles experiences from Copenhagen, Dordrecht, Hamburg, London, New York and Seattle.

# Water and waste: reduce and reuse

SIWI WORLD WATER WEEK

*27 August-1 September*

## Call for engagement in World Water Week 2017

### New in 2017! The Showcase

In 2017, we will introduce the Showcase – a space where organizations can tell their water stories, promote different approaches and share their perspectives, initiatives and projects. There will also be the option to invite external participants (i.e. non-World Water Week participants). Different room sizes and times available.

**Events • Seminars • SIWI Sofa • Exhibition • Award ceremonies • Social events**


Key Collaborating Partners

CAF DEVELOPMENT BANK OF LATIN AMERICA

IWA the international water association

IWMI International Water Management Institute

**www.worldwaterweek.org**