



Professor John Briscoe, 2014 Stockholm Water Prize Laureate, has died. He will be remembered as one of the giants in global water management.

► OBITUARY: PAGE 12

“Practically all urbanised coastal areas are affected by climate variability or change...We need a new and flexible attitude to areal planning.” ► LAST WORD: PAGE 14

“Opportunities to save water by improving “water efficiency” are not as common as some observers suggest.”

► OPINION: PAGE 10

STOCKHOLM

WATERFRONT

THE FORUM FOR GLOBAL WATER ISSUES | # 4 | NOVEMBER 2014



FROM MUCK TO GOLD

The story of super sludge

Interview

MALIN FALKENMARK, TRAILBLAZER

Book review

WHAT'S IN A (WATER) WORD?



A FAREWELL, AND NEW CHALLENGES

As this issue was going to press, we were

reached by the very sad news that this year's Stockholm Water Prize laureate, Professor John Briscoe, had passed away. A life has come to a too-early end and the water world has lost one of its greatest thinking practitioners. Read more on page 12.

At SIWI, we are catching our breath after a very successful World Water Week in Stockholm. We welcomed over 3,400 participants from more than 140 countries who joined the hundred plus workshops, seminars and side events. The discussion, centered around our theme Energy and Water, was intense and would not stop when the week was over!

It is something we welcome. We are eager to provide platforms for interaction, discussion and debate on the most crucial water issues of our time, and we plan to increase WaterFront's part in providing this space. We believe that a lively debate will widen our horizon and sharpen our thinking and our arguments. In this issue, the topic of the opinion piece is water

accounting. It discusses one aspect of water efficiency, a broad and critical subject that will determine the way of life for many generations to come.

But that's not all. This issue's cover story, *From Muck to Gold*, examines the rise of sludge, from being perceived as nothing but waste to get rid of, to a source of energy and a financial asset. A riveting story and a must-read!

We finally managed to get Lady Water herself, Professor Malin Falkenmark, to sit down with us. In the interview, she shared some memorable moments from a long career in water.

Offered this issue's *Last Word*, the Swedish Meteorological and Hydrological Institute's Professor Sten Bergström talks about climate change adaptation in urban areas. How well prepared are the megacities of the world to meet extreme weather?

As always, I hope you will enjoy the read!

Torgny Holmgren
Executive Director
Stockholm International Water Institute

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The printing process and paper have been certified according to the Nordic Swan label for environmental quality.

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Coming up

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COVER PHOTO Istock

STOCKHOLM WATERFRONT

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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Kerry Schneider works with the Transboundary Water Management department at SIWI. He undertakes applied research on topics focusing on water diplomacy and regional integration and is a key member of the Shared Waters Partnership Coordination Team.

"For the past two years I have had the privilege of working with Malin Falkenmark on various research assignments. Working alongside somebody with her experience, dedication and motivation to affect positive change in our world, has been inspirational. I'd like to say that she has forgotten more about water issues than I'll ever learn but I'm not sure Malin Falkenmark has ever forgotten anything!"

Read Kerry Schneider's interview with Malin Falkenmark on page 8.



Photo: Peter Tvärberg

BRIEFING

SIWI NEW HOST FOR AGWA SECRETARIAT

As of August this year, SIWI hosts the Alliance for Global Water Adaptation (AGWA) secretariat and together with the World Bank chairs the steering committee. AGWA is an informal network established to bridge policy and field based activities. The network provides tools, partnerships and technical assistance to improve decision-making in water resources management, focusing on climate change adaptation. SIWI has a long standing involvement in AGWA and coordinates the network's policy group, which consists of like-minded organisations and particularly engages in the United Nations Framework Convention on Climate Change (UNFCCC).



Photo: Danist Soh, SXC

Read more | www.siw.org/agwa

SCIENTISTS WARN THE UN OVER HUNGER



Photo: iStock

During World Water Week, some of the world's leading water, environment and resilience scientists and experts published a call to the UN, saying that rain, and the way it is managed, is what will determine whether hunger and poverty can be eradicated. The scientists, including Professor Malin Falkenmark of Stockholm International Water Institute/Stockholm Resilience Centre and Professor Johan Rockström of Stockholm Resilience Centre, said they are "deeply concerned that sustainable management of rainfall in water scarce regions of the world is missing in the goals and targets

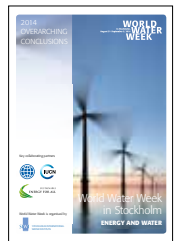
proposed by the UN Open Working Group on Sustainable Development Goals (SDGs). The signatories call upon the United Nations to add a target on rainwater management to any Hunger Goal in the Sustainable Development Goals, which are to be agreed on in 2015.

Read more | www.worldwaterweek.org/concerned-scientists

OVERARCHING CONCLUSIONS FROM 2014 WORLD WATER WEEK

More than 3,400 participants from over 140 countries came to Stockholm to participate in this year's World Water Week. They engaged in discussions on the energy and water theme, and the urgent need to understand the links between the two sectors, so that we can fully develop synergies, strengthen much needed partnerships, and develop smarter solutions for using water more efficiently in the future. During the Week, specially assigned rapporteurs covered all of the more than 100 workshops and seminars. You can read about the messages and recommendations that were distilled from the presentations and discussions on the SIWI website or on the new SIWI Storify page. The conclusions have been divided into four themes: Equitably Balancing Competing Demands; Managing Energy and Waters across Borders; Integrating Water and Energy Policy; and Responding to Global Change. The conclusion through SIWI's eyes can also be viewed here.

Read more | www.siw.org/publication/overarching-conclusions-2014-world-water-week



"WHY WERE PEOPLE IN OTHER PARTS OF THE WORLD SO POOR AND WHAT DID WATER HAVE TO DO WITH IT? IT TURNED OUT WATER HAD EVERYTHING TO DO WITH IT."

Malin Falkenmark



JUNIOR WATER PRIZE WINNER CLAIMS GOOGLE AWARD

This year's Stockholm Junior Water Prize winner, Hayley Todesco, has been awarded first prize in the Google Science Fair for the 17-18 year age group. The Google Science Fair is a global online science and technology competition open to individuals and teams from ages 13 to 18. Hayley received both awards for her invention of a method that uses sand filters to treat oil contaminated water and recover water for reuse. Sand filters have traditionally been used to treat drinking water, but Hayley instead used slow sand filters on contaminated water in oil sands tailing ponds.

Read more | www.siw.org/prizes/stockholmjuniorwaterprize

WASTEWATER AND ENVIRONMENT WINNING CONCEPTS FOR STUDENTS

Teams from the University of South Florida and the University of British Columbia won the 2014 Water Environment Federation Student Design Competition, which promotes real world design experience for students interested in pursuing an education or career in water. The winning teams won in the wastewater and environmental design categories.

Read more | www.wef.org

GLOBAL WATER STORIES INSPIRED BY WORLD WATER WEEK

Five journalists from India, Sri Lanka, Nigeria, Uganda and Zambia were awarded the 2014 World Water Week Journalist Grant. They travelled to Stockholm to report on the critical issues discussed during the Week, and to network with leading water and energy experts. The journalists left filled to the brim with new water insights. Browse the resulting blog entries, news articles and feature stories on the SIWI website. Their work cover such varying water-related topics as the Post-2015 development agenda, climate negotiations, energy infrastructure, and fracking for shale gas.



Read more | www.siw.org/media/world-water-week-journalist-grant

NEW SYSTEM TO HELP MEASURE GLOBAL PRECIPITATION

Fujitsu has launched a system that provides observational data to help understand the mechanisms underlying the earth's hydrological cycle. The data will raise the accuracy of weather forecasts and contribute to water resource management.

Read more | www.fujitsu.com

A DEDICATED PROMOTER OF WATER RIGHTS



Dr. David Jonathan Howell Phillips, known by many in the water community as a dedicated promoter of water equality in the Middle East, died on November 7, 2014.

Dr. Phillips, a graduate of the University of Cambridge, worked extensively around the world during his 40-year career, focusing on the environment and marine sectors, as well as transboundary water.

Professor Tony Allan, a Stockholm Water Prize laureate and long-time friend and colleague of Dr. Phillips, said in a comment that "it has been a rare privilege to be part of his network and be invited

over the past 15 years or so to engage in his passions." He added that "Dave was not just someone who focused high principle and passion. Underpinning it all was an unmatched capacity to plan, budget, manage and communicate."

Dr. Shaddad Attali, Minister and former Head of the Palestinian Water Authority, commented that "Dr. Phillips's contributions to water and environment stretches across the globe, but in particular Palestine benefitted from Dr. Phillip's tireless efforts to advance environmental and social justice, including the cause of Palestinian water rights."



FROM WASTE TO ASSET

THE MAKEOVER OF SLUDGE

TEXT | TOM FREYBERG PHOTO | ISTOCK, LIT UV, LYUBERETSKIYE WWTP IN RUSSIA AND UNITED UTILITIES

WATER UTILITIES ARE CHANGING, FROM WASTE DISPOSAL AUTHORITIES TO ENERGY AND NUTRIENT GENERATING COMPANIES. SLUDGE, NOW BEING SEEN AS COMMODITY RATHER THAN DISPOSAL COST, IS PLAYING A BIG PART.

The topic of sludge may not be best suited to a dinner party conversation. It may also be absent from many politicians' manifestos, failing to attract voters compared to topics such as education and healthcare. Yet, what was once seen as a waste is now being seen as a resource.

In developed nations, what happens to the waste we produce has not been a major consideration for many since the invention of the toilet in the 1800s. After a simple flush, wastewater is transported away from our houses and never seen again. Treatment infrastructure conveniently positioned out of town then takes care of all the hard work. Out of sight, out of mind.

Yet, unbeknown to many, the utility acting behind the scenes and responsible for this complex infrastructure network is changing.

What were once considered wastewater or sewerage companies are now being seen as resource providers; generating energy, nutrients and fertilisers.

For example, in the US, the Alexandria Sanitation Authority located outside of Washington is now called Alexandria Renew Enterprises. Meanwhile the former Green Bay Metropolitan Sewerage District now goes by the name of NEW Water. Utilities are in the midst of an evolution – from waste handlers to energy generators.

"Utilities are not seeing sludge as a problem anymore," says Dennis Heijkoop, business developer for water and energy at consultancy and technology provider, Royal

Haskoning DHV. "The challenge now is not disposal but how to extract as much energy and nutrients as possible."

One unsung hero in the development of utilities is sludge. By definition, sludge is the residual, semi-solid material left from wastewater treatment processes. Traditionally, depending on jurisdiction and local regulations, sludge has been disposed of via three routes: incineration, landfill or applied to agricultural land as a fertiliser. However, such disposal and treatment comes at a price. For example, in Europe, sludge treatment/disposal can amount to as much as 50 per cent of a wastewater plant's operating costs.

Although sometimes confused, sludge and biosolids are very different. Biosolids are a treated, lower odour and marketable form of sludge and must meet regulations for disposal and recycling. Imagine a commoditised form of sludge. ●●●

●●● “Biosolids are like a multi-vitamin for the soil – the organic matter contains major nutrients, such as phosphorus and nitrogen and trace elements that the soil is sometimes lacking,” says Keith Panter, managing director of Ebcor Ltd Consultancy, who has spent his career in sludge management.

Yet, other traditional sludge disposal routes are facing a dilemma. Landfill is becoming more expensive and there is less of it and to incinerate sludge can be energy intensive and costly. As Harald Kleiven, VP of business development for Norwegian firm Cambi says, “sending sludge

anaerobic digestion (AD), meaning to treat the waste anaerobically, or without oxygen. Treated in digesters, a three-phase biological process leads to the growth of methane producing bacteria. Not a new process as such, the first AD plant was built at a leper colony in Bombay, India in 1859. Then in 1895 biogas was recovered in South West England and used to fuel street lamps in the Devon city of Exeter.

Fast forward over a century and it is the production of this methane, or biogas, which has become a game changer for utilities (see fact box).

However, the elements contained in sludge that utilities are trying to unlock can actually work

against them unless handled properly. After sludge treatment, a compound containing phosphorus and ammonia, known as struvite, can build up and clog utility pipes and pumps. Imagine lime scale on your household kettle, but on a large scale. This can cause serious trouble,

additional maintenance costs and potential operation downtime.

Chemicals are commonly used to prevent the problem but at a cost. UK utility Thames Water, for example, estimates that it spends £130,000 to £200,000 per year on chemical dosing alone. A more recent development in wastewater management has been to extract phosphorus – the very problem potentially clogging up equipment – but as a solution, in the form of a fertiliser. Working with Canadian company Ostara, the London utility now extracts phosphorus in the form of 150 tonnes of crystalline, fertiliser pellets. This can be sold to farmers and used as a fertiliser on crops, lawns and gardens.

Interestingly, by harvesting phosphorus as a fertiliser from sludge, it also reduces reliance upon nature's own supplies. In rock form, mineable phosphorus supplies are estimated to be running out. Expected to last for only 30 more years, reserves are down to 6 per cent in North America, 1 per cent in Russia and 39 per cent in China. The remainder is controlled by Morocco and Western Sahara.

“The first anaerobic digestion plant was built at a leper colony in Bombay in 1859”

to incineration as an energy generator is a false prophecy”. This all means that sludge volumes are growing but their traditional routes for disposal are becoming more expensive, or complicated to meet.

One method for dealing with sludge and producing energy is

Waste to energy: Utilities can extract energy contained within wastewater to generate power and make their sites self-sufficient.



UTILITY CASE STUDIES FROM THE UK AND GERMANY

German utility, Berliner Wasserbetriebe, provides services to 3.7 million people in Berlin and Brandenburg. Each year the utility saves 15 million euros on electricity by converting sludge to energy. It produces 77,000 Megawatt hours per year (MWh/a) from processing sludge in anaerobic digesters or its mono-incineration plant.

Meanwhile, the UK's largest utility is also using sludge to its advantage. Providing services to 15 million customers, Thames Water claims that in 2013 it generated over 12 per cent of its total electricity needs by using sludge as a resource. That is 156 GWh and around £15 million saving off its power bills. The utility also uses a combination of thermal hydrolysis pre-treatment followed by anaerobic digestion, high-dry solids dewatering for auto-thermic incineration to extract energy from the sludge. The UK has seen a huge increase in the use of AD over the last decade. In 2005, the water industry generated 60 MW of electrical power. This is now 140 MW and set to increase to 160 MW by the end of the next investment period.

By producing fertilisers from wastewater, utilities could potentially limit agricultural reliance on overseas supply.

Developed nations and advanced, centralised technology to one side, sanitation and basic sludge treatment remains a challenge in many places. For example, in eThekweni Metropolitan Municipality (including the city of Durban) in South Africa, some residents live up to 300 miles apart. Instead of providing full piped infrastructure, the utility instead opted for ecological sanitation. The former head of eThekweni Water and Sanitation, and winner of this year's Stockholm Industry Water Award, Neil Macleod, also believes conventional sludge treatment and nutrient recovery needs rethinking.



Advanced treatment: Activated sludge at the Davyhulme treatment works in the UK – a country which generates 140 MW of electrical power from sludge.

“Present toilet technology was invented in 1860 – it's a high water user,” he says. “It's very inefficient. Water has to be purified, stored, delivered to a house, taken away and pumped to a treatment plant. It doesn't make sense. There must be a better way. South Africa is water scarce and there's both energy and nutrients in sludge that shouldn't get thrown away.”

In collaboration with the Bill and Melinda Gates Foundation, eThekweni has been taking part in the ‘Reinvent the Toilet Challenge’. The utility is trialling pans with a “coating on them

that repels human sludge, so waste slides off into a pit or sewer without needing water – like a self-cleaning toilet”, adds Macleod.

The former head of eThekweni Water and Sanitation believes nutrients should be recovered instead “at the source”. By doing this, the size of pipes can be reduced to simply take away bathwater, not solids.

Elsewhere, private companies are capitalising on the need for advanced sludge treatment. Booming populations mean an increase in sludge. In September Cambi won a contract to supply thermal hydrolysis technology to one of the largest sludge treatment plants in China, with a further four in the pipeline. The installation will be at Beijing's largest wastewater treatment plant in Gaobeidian, which has a wastewater treat-

ment capacity of one million cubic metres per day, serving a population of about 3.2 million people.

Meanwhile major nutrient recovery company Ostara currently has seven facilities operating; six in North America and one in Europe (Thames Water in the UK), with another under construction in Amersfoot, the Netherlands. Several more are being planned, with China to be targeted in the future.

“China is building its infrastructure up from the ground,” says Steve Wirtel, senior VP of technology for Ostara.

“The elements contained in sludge that utilities are trying to unlock can actually work against them unless handled properly”

“For telephones, in many places instead of building landlines they're going straight to cellular infrastructure. For wastewater, they're building facilities that immediately manage nutrients. They do have nutrient problems in China. They are building their infrastructure with the biological phosphorus process in place and often with AD to recovery the energy from their plants. These are going to be readymade facilities.”

With water utilities morphing into clean tech energy companies with the potential to change the global fertiliser-food market, it seems sludge might well make dinner party conversation after all. ●

Based in the UK, **Tom Freyberg** is an environment journalist and the chief editor of WWi magazine (Water & Wastewater International), a PennWell Corporation title.

FALKENMARK, TRAILBLAZER

TEXT | KERRY SCHNEIDER PHOTO | MIKAEL ULLÉN AND THOMAS HENRIKSON

CELEBRATED, RESPECTED, AND A ROLE MODEL FOR GENERATIONS OF HYDROLOGISTS. BUT 25 YEARS AFTER HER OFFICIAL RETIREMENT, LADY WATER HAS NO INTENTION TO REST ON HER LAURELS. STOCKHOLM WATERFRONT SAT DOWN WITH PROFESSOR MALIN FALKENMARK.

A glance around Malin Falkenmark's living room reveals a lifetime of achievements. Prizes and awards crowd the shelves and walls. When asked what they mean to her, the response comes without hesitation: "The prizes mean I was doing good work – nothing more."

For her, solving problems – water problems – is what brings joy. Her passion for discussion and detangling complex problems has touched many fellow water professionals in the past several decades. Her presence; tall, always impeccably stylish, with pearls around the neck and glasses pushed up on the forehead, is near iconic.

Malin Falkenmark will turn 90 next year. In the past 60 years she has been credited with over 400 publications – including her first book (co-author Arne Forsman) "Vattnet i vår värld" (i.e. World water) that she wrote while on maternity leave with her third child. Life hadn't begun with water, though. "Growing up, I never thought about rivers or lakes. I never knew what I wanted 'to be'. Things just happened and I was guided by serendipity."

After excelling in mathematics when graduating from her girls-only high school in Stockholm, she was encouraged to study mathematics, chemistry, and physics at Uppsala University. Among a small group of women studying those subjects at the time, she became enthralled with problem solving. "I've always had a problem in the back of my mind and the mind never stops working."

After graduation in 1951 as Fil.Mag. (Master's degree) she married and began looking for work with companies that could make use of her proficiency in mathematics. She found a series of jobs: numerical assistant at the Stockholm Royal Institute of Technology (KTH), at the Swedish Computer Development Board, and as an official at the State Pension Administration, administering the funeral expenses funds under closure. "It was cute but I was bored!"

A former university friend recommended that she apply for a physicist position advertised in the newspaper. She could not find that particular advertisement but instead found one seeking an assistant in the Ice Department of the Swedish Meteorological and Hydrological Institute (SMHI). To this day, that job remains the only water-related position Malin Falkenmark has ever had to apply for.

She was asked to study the carrying capacity of ice sheets on Swedish rivers and lakes, and wrote environmental impact reports – before that concept even existed – for Swedish Water Courts on the effects on river ice from hydropower development in regulated rivers. Impressed, her director at SMHI suggested that she return to university to specialise in hydraulics and hydrology. Since there was no established curriculum on hydrology in Swedish universities at the time, one was created for her and a SMHI colleague. In 1964 she became the first licenciate (Swedish equivalent of PhD at the time) of hydrology in Sweden.

On return from maternity leave in 1965, she was offered a position with the Natural Science Research Council (NSRC). "I was used as a snow plow. Whenever a new problem was introduced, I was asked to work on it." As the Executive Secretary of the National Committee for IHD (International Hydrological Decade), a research programme under the auspices of UNESCO, she built a broad international network and became exposed and awakened to hydrological problems in developing countries "Problems in the developing nations were completely different from the ones we had in Sweden. It was fascinating to me and through my travels my curiosity developed. Why were people in low latitudes so poor and what did water have



Malin Falkenmark

1951

GRADUATES WITH A
MASTERS DEGREE IN
MATHEMATICS, PHYSICS
AND CHEMISTRY

1953

STARTS AT SMHI
(SWEDISH METEO-
ROLOGICAL AND HYDRO-
LOGICAL INSTITUTE)

1964

SWEDEN'S FIRST
HYDROLOGY
LICENCIATE

1965

STARTS AT NSRC AND
PUBLISHED HER FIRST
BOOK

to do with it? It turned out water had everything to do with it.”

As work with the NSRC progressed, others took notice. Malin Falkenmark had become a leading authority on comparative global hydrology and in the mid 1970's, the Foreign Ministry asked if she would be willing to accept the role as one of the UN Conference Officers at the upcoming Water Conference in Mar del Plata in March 1977. “I’ve always been terribly shy. Not shy in my profession but shy as a person, so I agreed while thinking that nothing would come from this request, anyway.”

She was wrong. Professor Falkenmark was nominated Rapporteur General. When asked to take her seat at the podium she was met by a never-ending applause.

“I will never forget that moment. It was an applause of astonishment. The just elected rapporteur turned out to be a lady! Women were not frequent in those positions at the time.”

Following her time as UN rapporteur, Malin Falkenmark helped build the water resources programmes at several Swedish universities. As Professor in Applied and International Hydrology, she supervised a series of young doctors-to-be at the Water and Environmental Studies programme at Linköping University. It was after giving a guest lecture at the Agricultural University in Uppsala in 1989, that she had a chance encounter with a young agronomy student who approached her. The student had decided to attend the lecture on a whim and, fascinated, asked her to supervise his Master study. That student was Johan Rockström – now

“I was used as a snow plow. Whenever a new problem was introduced, I was asked to work on it.”

an internationally highly renowned scientist and Director of Stockholm Resilience Center. During the last 25 years, the two have collaborated on numerous research projects highlighting the blue/green water paradigm, written two books, and developed the water resilience and planetary freshwater boundaries concepts where humans and hydrology intersect.

In 1991, Malin Falkenmark was asked to help organise the first Stockholm Water Symposium for the City of Stockholm. That event blossomed

into World Water Week in Stockholm, which gave rise to Stockholm International Water Institute (SIWI), where she is still active as Senior Scientific Advisor. She intends to continue her work with the role of green water for sustainable development.

“It is a fundamental concept that is still not broadly accepted after all these years. Green water is a key to food production and eliminating hunger. A goal would be to close the yield gap and take an integrated approach between blue and green water management. Water is the bloodstream of the entire biosphere, supporting energy, agri-culture, economic development, and ecosystems. It’s a far bigger issue than drinking water, as important as it may be.” ●



1977

RAPPOREUR GENERAL
ON UN WATER
CONFERENCE,
MAR DEL PLATA

1986

THE FALKENMARK
INDICATOR: USED TO
DESCRIBE WATER
CROWDING



1991

FIRST STOCKHOLM
WATER SYMPOSIUM
(WORLD WATER WEEK
IN STOCKHOLM)

1993

BLUE AND GREEN
WATER CONCEPT
INTRODUCED

2009

PLANETARY
BOUNDARIES
CONCEPT
PUBLISHED



THE MYTH THAT “WATER EFFICIENCY” WILL ERADICATE HUNGER AND POVERTY

TEXT | CHRIS PERRY, DENNIS WICHELS AND PASQUALE STEDUTO PHOTO | ANNIKA BÖRJE

SCIENCE-BASED WATER ACCOUNTING IS ESSENTIAL TO REVEAL THE IMPACT OF INTERVENTIONS TO “SAVE” WATER AND INCREASE CROP YIELDS, WRITE CHRIS PERRY, DENNIS WICHELS AND PASQUALE STEDUTO IN THIS OPINION.



This year’s World Water Week in Stockholm emphasised “water efficiency” as critical to eradicating hunger and poverty. The goal seems both noble and necessary, particularly in irrigated agriculture, where much of the world’s developed water supplies are used. Yet when evaluating water efficiency, there is much more to the story than simple estimates of how much of the water applied to farm fields is used productively by crops.

Typically, we are told that irrigation is only 40 per cent or 50 per cent efficient. This certainly sounds like a problem in need of a solution. But what does an estimate of 40 per cent irrigation efficiency really mean? Usually, it means that only 40 per cent of the water applied is needed for crop use while the remaining 60 per cent is lost.

Where does the 60 per cent excess water go? Is it all lost or wasted? Is some used by other farmers, or returned to groundwater or in-stream flows? Would improving irrigation efficiency from 40 per cent to 80 per cent make more water available for other uses? That question can only be answered by scientifically based water accounting.

Some of the 60 per cent of the water not used by the crop likely runs off the farmer’s field and into a drain or stream, from which the water can again be withdrawn for irrigation or some other use. Any eventual runoff contributes to in-stream flows that may be essential to the environmental status of a downstream area. The rest of the excess water applied to the field often percolates to groundwater, where again it is a resource at times or places where other sources of water are inadequate.

In such cases, improving local irrigation “efficiency” reduces the water available for use by other farmers, or the amount of water flowing downstream, without saving “lost water”. Rather, it is likely that some farmers or

communities using water that had been excess on one farmer’s field will lose access to that water when upstream “efficiency” is improved. Such outcomes make no contribution to improving food security or reducing poverty.

Higher technology irrigation systems, such as drip and micro-sprinklers, have many benefits: facilitating diversified, higher value cropping; conserving fertiliser; reducing water logging; and saving labour. Sometimes, energy is saved. Farmers using drip and sprinkler systems may also achieve higher yields due to improvements in the timing and uniformity of irrigation deliveries. Yet, higher technology irrigation rarely saves water.

Furthermore, for most field crops – wheat, rice, maize, sugarcane, fodder – yield is a near linear function of crop water consumption. Thus, higher yields achieved with higher technology irrigation systems are achieved at the cost of greater transpiration. As a result, the consumptive use of water on a farm field increases. Again, no new water is made available for use on other fields or in other sectors.

To be sure, there are cases where some of the excess water delivered to farm fields is lost to evaporation or the water flows to a saline sink. Reducing those losses through improvements in irrigation technology would indeed save water. Yet we must first conduct a careful water accounting exercise to identify the scale of such opportunities.

In sum, opportunities to save water by improving “water efficiency” are not as common as some observers suggest. Interventions to improve efficiency when excess water is used productively by others will not save water, reduce hunger, or eradicate poverty. ●

Chris Perry is Editor, Agricultural Water Management. **Dennis Wichelns** is Editor, Water Resources and Rural Development. **Pasquale Steduto** is Former Chair, UN-Water and Deputy Director, Land and Water Division, FAO.

WHAT'S IN A (WATER) WORD?

TEXT | DR. HÅKAN TROPP

THE WATER WORLD WRESTLES WITH WHICH TERMS TO USE, AND FOR WHAT. WHILE SOME VERY RELEVANT WATER CONCEPTS ARE COVERED IN THIS BOOK, OTHERS ARE MISSING, AS IS AN ANALYSIS OF THE DEVELOPMENT OF THE CONCEPTS, WRITES SIWI'S HÅKAN TROPP.

The water sector is laden with different concepts, and people working to develop and implement various terminologies have their fair share of headaches over inconsistencies, conflicting views and interpretations, not to mention the challenges to operationalise them.

It is not an easy task to make a selection among the many concepts that float around in the water pond. The authors go through water scarcity, water governance, water security, water productivity, virtual water and water footprints, and green and blue water, as the key water concepts. While these are very relevant there are a few missing from the list. The greatest omission is the analysis of integrated water resources management (IWRM). The omission is deliberate, but for sure IWRM has been one of the key water concepts, although its importance is diminishing. It may be the concept that has had the biggest financial implications of all, since different versions of IWRM is very much part and parcel of many countries' water reform. Among other important key concepts that could have been analysed is the river basin approach – the idea of administratively managing water along the entire basin, replacing other traditional administrative borders.

One may be tempted to think that water – through its multi-use by society and nature – would be over-burdened by various concepts. A quick look at some other sectors indicates that they too wrestle with similar conceptual

debates and issues. For example, integrated ecosystem management, ecosystem approach, ecosystem services, environmental governance, and integrated coastal management are some other related concepts that face similar types of debates on better consistency in definitions, interpretations and usefulness. It would have been very useful for the contextualisation and analysis if the authors better had brought up water concepts in relation to some other sectors. This would have allowed for a broadened analysis, pointing to the need for water as well as other sectors to break out of their silos to overcome intellectual as well as implementation fragmentation.

The authors cover each key concept on a few pages. It comes at the price of

can be more openly addressed. Similarly, the chapter on green and blue water makes some interesting points on concepts being used for advocacy to tap into the minds of non-technical audiences. Hence, the politics of terminology is something the authors could have explored more.

Despite that the book could have developed certain aspects more, it gives great impetus to revived debate and development of clearer definitions and understanding. A pertinent question is: What new concepts are lurking around the corner? ●



Lautze, Jonathan (Ed) (2014). **Key Concepts in Water Resource Management: A review and critical evaluation.** Earthscan/Routledge.

“The concepts have different development trajectories, some originating from academia while others come from practitioners.”

having to leave out certain aspects. More attention should have been put on contextual analysis of the development of the concepts. The concepts have different development trajectories, some originating from academia while others come from practitioners. For example, problems to implement IWRM led to a need of working with governance to enable various management responses. A concept like governance in water has opened up for more political economy analysis, and issues such as corruption and ethics

ABOUT THE EDITOR

Jonathan Lautze is a researcher at the International Water Management Institute-Southern Africa office in Pretoria. He has been involved in a range of applied research and development projects focused on topics such as Water Governance, Water Security, Transboundary Water Management, Climate Change and Water, and Water and Health.



JOHN BRISCOE

1948-2014

TEXT | VICTORIA ENGSTRAND-NEACSU **PHOTO** | THOMAS HENRIKSON

JOHN BRISCOE, GIANT AMONG THINKING PRACTITIONERS, HAS DIED.

Professor John Briscoe passed away on November 12, 2014, after having fought cancer for more than two years.

In March this year, he was named the 2014 Stockholm Water Prize Laureate, “for his unparalleled contributions to global and local water management, inspired by an unwavering commitment to improving the lives of people on the ground.” As the Swedish summer was moving into autumn, John Briscoe came to Stockholm and World Water Week. He held speeches,

and participated in debates with peers as well as inquisitive young professionals, always accompanied by his characteristic wit, curiosity and fondness for controversial statements.

At the Stockholm Water Prize Royal Ceremony in Stockholm’s City Hall on September 4, Margaret Catley-Carlson gave the laudatory speech on behalf of the Stockholm Water Prize Nominating Committee. We publish an excerpt:

“Even among the illustrious Laureates of the Stockholm Water Prize over the last two decades, John Briscoe stands tall. He is truly one of the water greats.

In his career lifetime, he has inspired, led, persuaded, annoyed and upset, but above all – influenced major players and principal developments in the global management of water.

Few, if any, have had his impact on national and international policies and on the directions of major investments in our sector.

There are perhaps three reasons for the extraordinary esteem in which he is held.

First, John Briscoe is very good at what he does. Diligence, knowledge and experience combine with a good deal of very hard work. (...)

Second, his is truly a holistic view of water issues. He passionately believes that good policy is an essential backstop for good governance which underpins well performing systems. He godfathered the Global Water Partnership to bring water policy people together across the world. (...)

Third, John tells it as he sees it. This tendency has strengthened over the years. Whether setting out for the Government of Pakistan exactly where their water policies are taking the country, or convincing the management and – more difficult by far – the Executive Directors of the World Bank that no country has ever developed without infrastructure, John has spoken out. (...)

John, we are in the land of the Norsemen. Wise King Canute took his followers to the Ocean to show them that no man could change the power of the water’s flow. But some can guide and change the direction of impact of that flow – and make waves. The waves you have made have been big waves.

It is for this reason that the 2014 Stockholm International Water Prize is awarded to you.” ●

Read Margaret Catley-Carlson’s full speech on: www.worldwaterweek.org/media-facts

Read the interview with John Briscoe, as well as his opinion piece, in WaterFront #2-2014 www.siwi.org/publication/stockholm-water-front-no-2-2014



Photo: Enny Nuraheni, Reuters

JAKARTA, 2013: A boy on a flooded road in the Indonesian capital. It was estimated that the January 2013 flood affected 250,000 people.

NEW JERSEY, 2012: The remains of a home in Union Beach, New Jersey, shattered by Hurricane Sandy, stands near the shore surrounded by debris and personal belongings.

COPENHAGEN, 2011: A violent rainstorm over eastern Denmark, put parts of its capital under water. Almost all urbanised coastal areas are affected by climate variability and change, hence resilience and adaptation is not only a concern for deltas and coastal areas in developing countries. But creating adaptation plans for big cities is not easy, since the time horizons for megacities exceed what scientists can meet in their assessments.

Read more | Last Word, page 14.



Photo: iStock



Photo: Bae Lindhardt, Scanpix

“Almost all urbanised coastal areas are affected by climate change”

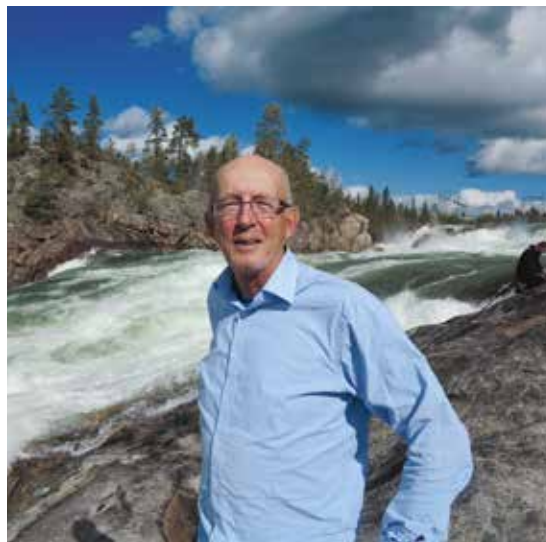
TEXT | STEN BERGSTRÖM PHOTO | MATS ANDRÉASSON, SWECO

On July 2, 2011, a heavy rainstorm hit Copenhagen and became an eye opener for city planners in northern Europe. Since then, the Copenhagen cloudburst has become the new reference for the worst that can happen to a city in the region, in terms of rainfall. Its magnitude by far exceeded existing standards for design of drainage systems in this part of the world. But it should not have been a surprise! Urbanisation is growing dramatically all around the world and megacities occupy ever more of the low lying coastal areas. Events like the one in Copenhagen are occurring almost everywhere. Exposure is increasing and societies' possibilities to cope with extreme weather events are shrinking. Climate change comes on top of this concern.

The effects of future sea level rise are worrying and so are the consequences of increasing intensity of future rainstorms, as described in most climate projections. Extreme winds and short lived coastal flooding is also an issue, but in this case the scientific message is less clear, at least at high latitudes.

At the conference on Deltas in Times of Climate Change, held in Rotterdam late September this year, it was evident that vulnerability, resilience and adaptation is not only a concern for deltas and coastal areas in developing countries. Examples were given from Hong Kong, New York, Stockholm, London, Jakarta and the Mekong delta to mention just a few places. Practically all urbanised coastal areas are affected by climate variability and change.

There are also examples of comprehensive adaptation programmes, like the newly adopted new Dutch Delta Programme and the climate change adaptation plan for the city of New York. The latter is a response to the devastating hurricane Sandy in 2012. These plans attempt to address the impacts of climate change and particularly future sea levels. This means that the scientific assessment work by IPCC plays a key role. But the interpretation of the messages from science is not straightforward or easy. A city planner has to consider risks, cost benefits and a number of conflicting interests. And the time horizon for a future megacity by far exceeds what scientists can meet in their assess-



ments. IPCC focuses on the coming 100 years or so, while cities will be there for a far longer time. Who can, for example, deliver reliable outlooks for sea levels, storms or cloudbursts for several centuries beyond the year 2100?

The conclusion must be that we need a new and more flexible attitude to areal planning. This means that we need a plan B in case science and observations bring new surprising insights. We also need real understanding of the meaning of the words risk assessment and risk management. This includes basic understanding of the concepts of probabilities, frequencies of occurrence and uncertainties. And all this in a non-stationary context, where our long term historic data do not any longer represent future statistics.

Fortunately the problem is universal and global in its character. This means that a large community of scientists, around the world, is now addressing the issue. We can look forward to an exchange of experience and data that will help us all understand what can really happen and how to build a resilient city, without necessarily having experienced the disaster ourselves yet. ●

Sten Bergström is a professor and former head of research at SMHI, the Swedish Meteorological and Hydrological Institute. His expertise and advice is often sought on issues related to adaptation to climate change.

CALENDAR

NOVEMBER 24-25

4th Water Governance Initiative

The OECD Water Governance Initiative provides a platform to convene key stakeholders within and outside the water sector in order to share experiences and lessons learnt in improving water governance.

Venue: Paris, France
www.oecd.org

NOVEMBER 27-28

Water Food and Energy Nexus Global Forum

The Forum will focus on four areas that can contribute to more integrated policy making. Topics for discussion includes the need to understand long-term impacts of the nexus on growth; improving coherence between national, regional and local planning and priorities; the importance of promoting private sector investment in the nexus; and how to mainstream the nexus into the broader development agenda.

Venue: Paris, France
www.oecd.org/environment/nexus.htm

JANUARY 11-15, 2015

3rd Arab Water Week 2015

The Arab Water Week (AWW) is a regional meeting in the Arab region which tackles water management issues through establishing innovative partnerships and platforms of collaborative work on water issues in the region. The importance of this meeting lies in providing a platform for greater coordination among the existing network of key partners active in the water sector in the region. The Week will be held in Jordan.

www.arabwaterweek.com



DECEMBER

1-12

UNFCCC COP 20 conference

To date, 195 countries have submitted their instruments of ratification.

These countries meet once a year, during two weeks, in order to evaluate the application of the Convention and develop the negotiation process between the Parties in front of new commitments. SIWI will engage and co-convene two side events during the conference.

Venue: Lima, Peru
www.cop20.pe

DECEMBER 2-4

1st Specialist Conference on Municipal water management and sanitation in developing countries

The conference aims at discussing the wastewater and sanitation challenge from an integrated perspective and different angles, following the “from toilet to source” concept, which means that any toilet wastewater sooner or later becomes a water source. This conference is supported by three IWA Specialist Groups. The conference is also co-organised by the Japan Sanitation Consortium, the Wastewater Management Authority (Thailand), the Faculty of Engineering (Prince of Songkhla University, Thailand) and Environmental Engineering Association of Thailand with GIZ as a strategic knowledge partner.

Venue: Bangkok, Thailand
www.iwa2014ait.com

JANUARY 18, 2015

Abstract and event proposal submissions close

SIWI's World Water Week is a platform for over 200 collaborating organisations to convene events about water and development issues. Individuals from around the globe also present their findings at scientific workshops.

www.worldwaterweek.org

WORLD WATER WEEK
in Stockholm,
August 23-28, 2015

APRIL 12-17, 2015

7th World Water Forum

Every three years, the World Water Forum mobilises creativity, innovation, and know-how around water. Serving as a stepping-stone towards global collaboration on water challenges, the Forum is a unique multi-stakeholder platform where the water community and the policy and decision makers from all regions of the world can work together to find joint solutions. It is the largest international event which seeks to advance the cause of water. It is being held in Daegu-Gyeongbuk, South Korea.

worldwaterforum7.org/en



2015 World Water Week

In 2015, both Stockholm Water Prize and World Water Week turn 25. To celebrate this silver jubilee, World Water Week will move back into the heart of Stockholm, where everything started a quarter of a century ago!

The 2015 Call for abstracts and event proposals has been published and is available on www.worldwaterweek.org

**WORLD
WATER
WEEK**
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STOCKHOLM
WATER
PRIZE