



LUND UNIVERSITY

Fewer, tastier tomatoes: Expanding the use of saltwater in agriculture

Zhang, Linus Tielin; Persson, Kenneth M

Published in:
Stockholm Water Front

2016

[Link to publication](#)

Citation for published version (APA):

Zhang, L. T., & Persson, K. M. (2016). Fewer, tastier tomatoes: Expanding the use of saltwater in agriculture. *Stockholm Water Front*, 1(1), 10-11. <https://siwi.org/publications/stockholm-water-front-no-1-2016/>

Total number of authors:

2

Creative Commons License:

Unspecified

General rights

Unless other specific re-use rights are stated the following general rights apply:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: <https://creativecommons.org/licenses/>

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00



As the world experiences increasing fresh-water crises, researchers turn to saline waters. Can its use be expanded? Absolutely, write Kenneth M Persson and Linus Zhang. ► FOCUS: PAGE 10



Despite water crises having been declared the top risk for the coming decade, it does not reflect in the global agreements on development and climate. Why?, was the big question at a recent lecture in Stockholm. ► WATER TALK: PAGE 8

STOCKHOLM

WATERFRONT

THE FORUM FOR GLOBAL WATER ISSUES | # 1 | MARCH 2016

HOW SAFE ARE THE WATER UTILITIES?

DON'T BLAME THE DROUGHT!

The dangers of over-simplifying the case of Syria

THE LAST WORD

"This is what climate change looks like"

PUBLISHED BY STOCKHOLM INTERNATIONAL WATER INSTITUTE

Photo: Thomas Henriksson



DIG DEEPER FOR ANSWERS!

We had planned a story on cyber security in water utilities for quite some time. As this issue was going to press, we

were reached by news that the official webpage of South Africa's Department of Water and Sanitation had been hacked. It shows with stark clarity the need for the water sector to be aware of new threats. Read our cover story on page 5.

Just a few weeks after this issue is published, I will stand on a stage during World Water Day celebrations in Geneva to announce the 2016 Stockholm Water Prize laureate. I expect you look forward to learning who this year's laureate is! In the meantime, you can enjoy reading about the 2015 laureate, the Water Man of India Rajendra Singh, who recently visited us in Stockholm to give a Kapuscinski Development Lecture at Stockholm University. Water Talk on page 8.

In the Focus section of this issue, two researchers from Lund University show how the use of saltwater in agriculture can be expanded. Read and learn from Fewer, tastier tomatoes on page 10.

Syria is currently synonymous with war, suffering, involuntary migration, and water scarcity. For long, the discourse about the reasons behind the conflict has centered around climate change and water scarcity as primary drivers for migration and instability. Too simple an answer, writes Anders Jägerskog, in "Don't blame the drought!"

In line with our aim to become ever more environmentally friendly, and do our share in working for a sustainable (and well informed) future, we are asking our subscribers to reconsider their need for a printed version of the magazine. While we want everyone interested to read WaterFront in the way they find most comfortable, we are also mindful that an excessive print circulation demands both large quantities of paper, and long transports.

Please check the back cover for more on this!

Happy reading!

Torgny Holmgren
Executive Director
Stockholm International Water Institute

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.

STOCKHOLM INTERNATIONAL WATER INSTITUTE

Box 101 87
Visiting Address: Linnégatan 87A
SE-100 55, Stockholm, Sweden
Tel: +46 8 121 360 00
Fax: +46 8 121 360 01 | www.siwi.org

PUBLISHER

Torgny Holmgren | Executive Director

EDITORIAL STAFF

Victoria Engstrand-Neacsu | Editor
Elin Ingblom | Graphic Designer
Claes Halvarsson | Graphic Designer

EDITORIAL BOARD

Jens Berggren
Moa Cortobius
Anton Earle
Karin Lexén
Jan Lundqvist
Josh Weinberg

CONTACT THE EDITORIAL TEAM:
WATERFRONT@SIWI.ORG

CONTENT



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

03 BRIEFING
Water news round-up

05 COVER STORY
How safe are the water utilities?

08 WATER TALK
We need a new water literacy

10 FOCUS
Fewer, tastier tomatoes

12 ANALYSIS
Don't blame the drought!

14 LAST WORD
"This is what climate change looks like"

15 CALENDAR
Coming up in the water world



BRIEFING



SIWI CO-CONVENES HEADS OF STATE PANEL ON WATER

Together with partners, SIWI has joined in the establishment of a Heads of State Panel on Water, a global undertaking aimed at mobilizing support for implementing the water-related Sustainable Development Goals. The panel was launched during the World Economic Forum in Davos.

The announcement, which came only a few days after the Global Risk Report listed water crises as the top risk for the coming decade (read more on page 4), was made by UN Secretary General Ban Ki-moon and World Bank President Jim Yong Kim.

“The new panel can help motivate the action we need to turn ideas into reality”, said Ban Ki-moon.

The Heads of State Panel on Water is the first global effort at Heads of State level that mobilizes an integrated agenda for strengthening economic resilience to ensure growth and sustainable development in a climate-change exposed and water-insecure world.

The panel will be supported by a partnership between the World Bank, World Economic Forum, SIWI, World Water Council, and the World Resources Institute with support from the Government of the Netherlands.

“Achieving the water global goal would have multiple benefits, including laying the foundations for food and energy security, sustainable urbanization, and ultimately climate security. My hope is that this panel accelerates action in many countries so that we can make water more accessible to all,” said the World Bank’s Jim Young Kim at the launch.

“We need to use our scarce and finite water resources more efficiently. It is encouraging to see that CEOs, city mayors and government leaders around the world are becoming more aware of the water challenges we all face, because we are all essential to the solution. SIWI is honoured to be part of this important undertaking with world leaders to help navigate the way forward”, said SIWI’s Executive Director Torgny Holmgren.

“This magnificent landscape will burn again and again, until only ash remains of the forests of Gondwana” Karl Mathiesen in the Last Word

THE WHITE HOUSE UPS THE WATER EFFORT



Photo: iStock

On World Water Day, 22 March, the White House will host a water summit, informally called “a moonshot for water”. The focus will lie on potential solutions and “innovative, long-term strategies for making sure we have enough water when and where we need it”.

FOUR BILLION IN SEVERE WATER SCARCITY, SAYS NEW REPORT

A new article puts the number of people affected by water scarcity much higher than previous estimates. In “Four billion people facing severe water scarcity”, published in *Science Advances* in February, Mesfin M. Mekonnen and Arjen Y. Hoekstra argue that previous water scarcity assessments have failed to capture the seasonal fluctuations in water consumption and availability. According to the authors, four billion people, or two thirds of the global population, live with severe water scarcity for at least one month every year. Almost half of them live in China and India.



Photo: iStock

Previous studies have estimated that the number of people living under severe water scarcity is between 1.7 and 3.1 billion.

Read more: <http://advances.sciencemag.org/content/2/2/e1500323.full>

WATER CRISES TOP RISK FOR NEXT DECADE

The Global Risks Report 2016, published by World Economic Forum ahead of the annual Davos meeting in January, put water crises at the top of global risks for the coming decade.

Based on the Global Risks Perception Survey, the annual Global Risks Report synthesizes the perceptions of 750 experts and decision-makers globally. It was published in the run-up to the World Economic Forum annual meeting in Swiss town Davos.

In 2015, water crises ranked top risk in terms of impact. For 2016, water crises dropped to the third highest risk in terms of impact. However, the 2016 report states that water crises constitute



Photo: iStock

the biggest risk to the world during the next ten years.

Following water crises, the other risks of highest concern for the next decade are Failure of climate change mitigation and adaption, Extreme weather events, Food crises and Profound social instability.

“If we look at the main risks in the ten-year scenario, we can see that they

are all connected. Climate change causes extreme weather events, most resulting in too little or too much water. Unpredictable water availability also has dire consequences for energy and food production, which in turn exacerbates already difficult living conditions for many people around the world,” says Torgny Holmgren.

“What is obvious to us working for water every day, is that good water management is the key to mitigating most, if not all, of these risks. We are pleased to see that more CEOs and other decision-makers are starting to see it too”.

Read more: <http://weforum.org/reports/the-global-risks-report-2016>



YOUTH VIDEO CONTEST WINNERS EXPLORE WATER CHALLENGES IN GROWING FOOD

Young filmmakers were invited to submit a video exploring the theme “Who’s growing tomorrow’s food”, for a video competition run by the Asian Development Bank. The issues highlighted by the three winning entries were irrigation, water shortages, climate change and migration populations. The

winning video from Saraswati Upadhaya, Nepal, explores the challenges of growing more food with less water in the face of youth migration to cities and climate change. Read more: www.adb.org/news/youth-video-contest-winners-explore-water-challenges-growing-food

POUL DUE JENSEN FOUNDATION NEW FOUNDER OF STOCKHOLM WATER PRIZE

Poul Due Jensen Foundation, owner of Danish pump company Grundfos, has become a new Founder of the Stockholm Water Prize.

The Poul Due Jensen Foundation donates grants to support projects within humanitarian aid, social inclusion, research and innovation. Water projects account for approximately 75 percent of the grants.

The Stockholm Water Prize honours individuals or organ-

izations whose work contributes broadly to the conservation and protection of water resources and to improved well-being of the planet’s inhabitants and ecosystems.

“Water and the moving of water has – via the ownership of Grundfos – been key to the establishment of the Poul Due Jensen Foundation’s fortune. What could hence be more natural than for the Foundation to be addressing one of the world’s most pressing chal-

lenges of providing access to safe water and to show our support for the voices of this agenda through the sponsorship of the Stockholm Water Prize?”, said Christian Hartvig, Executive Director of Poul Due Jensen Foundation.

The 2016 Stockholm Water Prize laureate will be announced on World Water Day,

22 March, by SIWI’s Executive Director Torgny Holmgren.

Read more: www.siwi.org/prizes/stockholmwaterprize/



HOW SAFE ARE THE WATER UTILITIES?

TEXT | GÖRREL ESPELUND PHOTO | ISTOCK

REPORTS OF CYBER THREATS AGAINST UTILITIES ARE ON THE INCREASE. BUT WHAT DO THE THREATS CONSIST OF, AND HOW WORRIED SHOULD WE BE? WATERFRONT TAKES A CLOSER LOOK.

In recent years, cyber-attacks against critical infrastructure, such as water utilities, have been on the increase globally. However, growing awareness doesn't necessarily translate into the implementation of better security protocols and safer systems. And, in the developing world, water distributors also face a range of other challenges to maintaining safe water distribution.

When discussing cyber crimes, focus is often on security breaches in the private sector, especially retail and banking. But according to several studies conducted in the last few years, cyber attacks on vital infrastructure such as electrical grids and water distribution systems have escalated.

In a blog in *The Huffington Post* Business, Michael Deane, Executive Director of the National Association of Water Companies in the U.S. explains how the evolution of computer-based management systems has, on the one hand, improved the reliability and quality of water services, but on the other has increased the possibility of targeted or accidental cyber events that could lead to disruption in the water

supply. He concludes: "In the drinking water and wastewater sectors, a cyber attack could hone in on four different threat vectors: chemical contamination, biological contamination, physical disruption and interference with the highly specialized computer systems controlling essential infrastructure known as Supervisory Control and Data Acquisition (SCADA) systems.

A successful attack resulting in consequences in any of these areas could cause major damage, resulting in long periods of operational downtime, financial losses and most importantly, a threat to public safety."

According to Deane, the awareness of possible cyber attacks is steadily growing. Since 2013, November has been designated as "Critical Infra- ●●●



●●● structure Security and Resilience Month” with the aim of recognizing the importance of protecting critical infrastructure in the U.S.

Even so, last year the U.S. Department of Homeland Security received 159 reports involving “vulnerabilities in control systems components”. Most of the vulnerabilities involved systems used in the energy sector, but water utilities and wastewater are also considered at high risk of cyber attacks, according to Water Online.

“Companies like robust and dependable systems. Unfortunately that runs contrary to security”

Dr Renier van Heerden

But cyber attack on vital infrastructure is not a phenomenon occurring in the U.S. alone.

The Ponemon Institute, a research centre that specializes in data protection and information security policy, released a study in 2014 in which two thirds of 599 IT security executives in 13 different countries admitted to having had “at least one security compromise that led to the loss of confidential information or disruption of operations” in the previous year.

However, there is a large discrepancy between being aware of the risk and protecting the systems from it.

Dr Renier van Heerden, Principal Engineer and Researcher at the CSIR (Council for Scientific and Industrial Research) in Pretoria, South Africa, points out that because the risk of cyber attacks on a country’s infrastructure is still considered fairly low, companies have yet to take the threat seriously enough to start investing in safer systems.

“Companies’ main concern is uptime, to keep the systems running without disruption. To achieve this, they’d like

robust and dependable systems. Unfortunately that runs contrary to security,” he says.

The reason behind this is simple: if you add a layer of security to systems such as Supervisory Control and Data Acquisition (SCADA), used to control dams, power plants and water treatment facilities, it increases the risk of small configuration faults – which, in turn, can cause major problems or lead to down-time.

Firewalls and encryption, the most commonly used industrial cyber security programmes, are complex systems, and their configurations can be difficult to understand and verify. “So we find that we have two competing mechanisms. Traditionally, because the world wasn’t so interconnected, the openness and the robustness of the systems used to be more important than security. But with the technology changing and the world being more interconnected, security has become more important.

Companies – state-owned or private – look at the history when they make risk analyses. And up to now it hasn’t been worth it to invest in that extra security measure. In my opinion, it’s a mistake,” van Heerden says.

The most infamous cyber attack on physical infrastructure in the world is the Stuxnet malware. It is believed to have been built jointly by the U.S. and Israeli governments to sabotage Iran’s nuclear programme in 2007/2008. It then accidentally spread in 2010 and became widely known.

Malware such as Stuxnet, BlackEnergy and Havex are specifically designed to target industrial control systems – and attacks on vital industries and infrastructure are frequently reported in various Internet and computer magazines. However, when it comes to the developing world, things look a bit different.

Neil Macleod, former head of eThekweni Water and Sanitation that won the 2014 Stockholm Industry Water Award, points out that no matter how secure you try to make your system, it is only as good as your last password and the integrity of your staff.


“You have to be sure that you have a staff of happy workers and that they comply with the very rigorous security protocols in place. Compared to developed countries the issues are slightly different in the developing world. Richer countries have more computer-based solutions and therefore they are more vulnerable to these kinds of attacks. In developing countries we tend to have teams on every site. We do our work with limited computer-based systems, limited remote operations and a lot of on-site operations,” says Macleod.

“Poor people who try to tap into the water utilities illegally do most of the damage caused to our systems.”

Neil Macleod

It is only large cities like Cape Town, Johannesburg and Durban that have started to move towards a computer-based management of operations, which also makes them more prone to cyber attacks. But Macleod is not worried.

“People can start hacking into the systems of the big cities and cause



interruption to the service for a few hours before we notice what is going on. On the sewage side, there is a possibility that hackers could mess up the dosage [of chemicals] and then the river will be polluted, which is unacceptable, but recoverable. In the case of water purification plants, however, the impact could be more severe in terms of public health in that the water may not be safe to drink if the disinfection or coagulation processes are affected,” says Macleod.

eThekwini Water and Sanitation received the Stockholm Industry Water Award as a recognition of its work to provide, within a few years, 1.3 million people in greater Durban (eThekwini) with piped

water and 700 000 people with access to toilets.

“The biggest problem for developing countries, where the level of IT and computer-based technology is pretty low, is not cyber attacks but poverty. Poor people who try to tap into the water utilities illegally do most of the damage caused to our systems. Another big problem causing disruption is theft of the metals, valves or copper cables. That is a constant scourge that we, and most developing countries, face. The people sell the goods to be able to buy bread, but the value of the metal is many times less than the cost of the repairs,” says Macleod. ●

WE NEED A NEW WATER LITERACY

TEXT | ROWENA BARBER PHOTO | NIKLAS BJÖRLING

DESPITE WATER CRISES HAVING BEEN DECLARED THE TOP RISK FOR THE COMING DECADE, IT DOES NOT REFLECT IN THE GLOBAL AGREEMENTS ON DEVELOPMENT AND CLIMATE. WHY?, WAS THE BIG QUESTION AT A RECENT LECTURE IN STOCKHOLM.

Water crises - the number one risk for the next decade according to the World Economic Forum's Global Risk Report. Hardly an improvement from its place as the number one risk in 2015. Why then, is freshwater not on every page of the Climate Agreement and Agenda 2030 Framework?

Shri Rajendra Singh, 2015 Stockholm Water Prize Laureate, was in Stockholm in February to hold the keynote speech at the Kapuscinski Development Lecture *Life without water: What happens when the glass is empty?* During the lecture, Rajendra reminded the audience of the change-making power of local communities.

"When they see the change, they believe. When they only listen, they don't believe."

Achieving real change, he argued, requires a deeper understanding of the importance of water to life by actors at all levels. Only then will true engagement - and action, be taken.

"We need a new water literacy. Not just reading and teaching about water problems, but the realization of the importance of water to life. After realization comes action, and from that, we can create an atmosphere of water management".



"Recognition is increasing," Torgny Holmgren said.

The reality is though, we currently overconsume water. "We have the same amount of water we had in the 15th century. Increases in manufacturing, energy, and agriculture in particular, are all helping to drive demand for freshwater resources – demand which is set to increase by some 55 percent by 2050," he said.

Stockholm University researcher, Dr Fernando Jaramillo added another dimension to the discussion when he introduced his recent study that raised the global human freshwater footprint to a higher level than was previously thought.

"We think about how we use water, but how are we affecting the water cycle by using it?" he asked the audience, as he explained water consumption and how it relates to the hydrological cycle. "Through this study, we have discovered quite a lot, but the most important thing we have learnt is that we don't really know that much about water." ●



Torgny Holmgren, Executive Director, SIWI



Moderator Karl Mathiesen with Rajendra Singh



Participants at the lecture

Kapuscinski development lectures

Top global thinkers discuss development in the European Union countries. The series "Kapuscinski development lectures", named for Ryszard Kapuscinski, a Polish reporter and writer who covered developing countries, is organized jointly by the European Commission, the United Nations Development Programme and partner universities and development think-tanks.

Over 80 lectures gathered since 2009 over 25,000 participants.

<http://kapuscinskilectures.eu>

FEWER, TASTIER TOMATOES

EXPANDING THE USE OF SALINE WATER IN AGRICULTURE

TEXT | KENNETH M PERSSON AND LINUS ZHANG PHOTO | ISTOCK

AS THE WORLD EXPERIENCES INCREASING FRESHWATER CRISES, RESEARCHERS TURN TO SALINE WATERS. CAN THE USE OF SALINE WATER BE EXPANDED? ABSOLUTELY, WRITE KENNETH M PERSSON AND LINUS ZHANG.

The development of appropriate practices for the use of saline waters for irrigation requires an adequate understanding of how salts affect waters, soils and plants, as FAO states in their book *The use of saline waters for crop production*, 1992. Plants can grow in saline waters, if the salinity of the soil is controlled and monitored, and the soil salt content is not allowed to increase past a level that damages the plants. Irrigation of salt tolerant plants with slightly saline waters offers a substantial opportunity to increase the yearly crop production of the world.

All natural waters contain more or less salts, i.e. minerals. A common classification of water salinity is that if the electrical conductivity is below 0.7 dS/m (deciSiemens per metre), corresponding to a salt content of less than 500 mg/l, the water is fresh and can be used with little problems for irrigation and other water supply purposes. Slightly saline waters, sometimes useful for irrigation, have a conductivity from 0.7 up to 2 dS/m (500-1500 mg/l) while another group is the highly saline waters which have a conductivity of 10-25 dS/m (7000 – 15 000 mg/l). Sea waters can have up to 45 dS/m (>40 000 mg/l).

Saline waters can be used for crop irrigation and moreover have been used for millennia. In a recent paper in PLOS One by Zhai, Yang and Hou on the effects of saline water drip irrigation on tomato yield and quality, a three-year study on the effects of saline water irrigation was presented for different soil salt contents. Saline water differing in electrical conductivity (from 3 dS/m to 5.5 dS/m) was supplied to the plant after the seedling establishment. Irrigation water with 5.5 dS/m salinity reduced the maximum leaf area index and chlorophyll content most significantly when compared with other salinity treatments. However, compared with the

freshwater control treatment, a slight increase in leaf area index and chlorophyll content was observed with 3–4 dS/m salinity. Saline water decreased the yield with around 20 per cent compared with the control, but improved tomato quality, including fruit density, soluble solid, total acid, vitamin C and the sugar-acid ratio.

Actually, a number of plant species can grow also in moderately saline soils and water. Many scientific studies have been performed proving the potential use of moderately saline water for irrigation. The use of saline drainage water in Egypt is well known and has been applied for millennia.

In California, USA, moderately saline drainage water is commonly used for crop production. One example can be found in the Broadview Water District of California, where saline sub-surface drainage water since 1956 has been blended with Delta-Mendota Canal water to form irrigation water of a salinity equivalent to 3.2 dS/m. It has since been used to irrigate a variety of crops, changing with the salt content of the irrigation water. Cotton, barley and alfalfa are the most common crops grown at present. In other countries, like China, Tunisia, India and Israel, the use of brackish ground-water for irrigation is known, to grow sugar beet, citrus or maize, for instance. The importance of brackish water irrigation has increased with the development of deep wells. After irrigation, the salinity of the drainage water increases and this can be used to keep a careful balance of the supply of salt to the soil and removal of salt from the soil with the use of excess drainage water.





Depending on water quality, overall salinity but also the composition of minerals in the water, accumulation of soil salinity can be avoided and minerals prone for precipitation, such as gypsum, calcium sulphate, must be kept dissolved in the water.

Among agricultural scientists, great efforts have been made to develop crops that can withstand higher salinities in soil and water. When the plant is tolerant of saline conditions, it must apply methods of

balancing the toxic and osmotic effects of the increased salt concentrations, which can be reached through the use of stress proteins and compatible cytoplasm osmotic solutes, such as sequestration of salt and storage of it within the vacuole to protect more vulnerable areas of the cell. Salt tolerant plants can build up higher concentrations of sugars, amino acids and quaternary ammonium bases to balance the osmotic effect of salt. These properties can be found in many salt tolerant plants and can further on be transferred to other species in plant breeding activities, as reported in scientific literature the last two decades.

Soil salinization is however a serious, worldwide ecological problem. Based on the FAO and UNESCO

Soil Map of the world, various saline soils occupy about 1000 million hectares of surface, accounting for about 10 per cent of the global land area, and are widely distributed in more than 100 countries and

regions. Moreover, the area of soil salinization is continuously increasing. According to statistics from FAO more than 50 per cent of the world's irrigated soils are affected by secondary salinization and/or alkalization. Each year, about 10 million hectares of land are abandoned, mainly due to secondary salinization. An UNEP investigation shows that soil degradation by salinization is larger than one million km² in the dry-lands of the world—it has become the third largest cause and manifestation of desertification after wind and water erosion.

How can salinization of soil be managed? The short answer is to avoid accumulation of salts during irrigation. Salt tolerant plants can also be used for soil remediation. Ameliorating saline soil by biological methods means simply planting salt-tolerant plant species in the saline environment. These plants take up salts, which results in the amelioration of the soil's physical and chemical conditions. This is an interesting method to gradually refresh a saline soil and has been tested in full scale in the arid regions of north-western China and other places. An accumulation of salt in the soil after many years of saline water irrigation needs to be addressed by using a proper irrigation schedule in order to ensure the sustainability of saline water irrigation. Not all irrigation needs to be done with freshwater. ●

About the authors

Kenneth M Persson and Linus Zhang are researchers in Water Resources Engineering at Lund University, Sweden



DON'T BLAME THE DROUGHT!

TEXT | ANDERS JÄGERSKOG PHOTO | ISTOCK

THAT THERE HAS BEEN A DROUGHT IN SYRIA IS A FACT. BUT THAT DROUGHT CAUSED THE CONFLICT IS NOT. WE MUST AVOID OVERSIMPLIFICATIONS AND DIG DEEPER TO PROPERLY UNDERSTAND THE ROOT CAUSES, WRITES ANDERS JÄGERSKOG.

In the wake of the migration resulting from primarily the Syrian crisis into neighbouring countries and in increasing numbers also to Europe during the fall of 2015, part of the popular and academic debates have increasingly tried to understand the linkages between climate change, droughts and migration. According to UNHCR more than one million people, refugees and migrants, entered Europe by boat alone in 2015, fleeing conflict and hardship in the Middle East and Africa. This is the largest refugee crisis since World War II. According to the UN the Syrian crisis has resulted in more than 4.3 million people having fled Syria and 6.6 million are internally displaced. Understanding the reasons behind are imperative. A key question that has emerged in academic debates as well as in media reporting is if climate change and drought (and increased variability in primarily water) has resulted in migratory flows and thereby contributed to (or even was one of the primary causes of) the Syrian crisis. This article tries to point to some of the underlying factors that often has not been highlighted in most analysis and reporting.

The Middle East and North Africa (MENA) is in many ways particularly sensitive to climate change. Climatic variability is high and droughts are recurring events. IPCC reported as early as 2007 that “annual rainfall is likely to decrease in much of Mediterranean Africa and Northern Sahara, with the likelihood of a decrease in rainfall increasing as the Mediterranean coast is approached”. In the 2014 IPCC Fifth Assessment Report it was concluded that the MENA region is especially vulnerable and by the end of the 21st century it is estimated that the Arab region will face a temperature increase of 0.9 to 4.1 degrees Celsius. While the range is wide the trend seems clear, there will be an increase in temperature. An increase in temperature, which is accompanied by a decrease in rainfall and increases in evaporation will affect the available water resources of the region and thereby the potential

for food production. The Arab Fund for Environment and Development (AFED) has noted that most of the agricultural systems in the region are rainfed and therefore any changes (or variations) in rain are bound to affect the agricultural output.

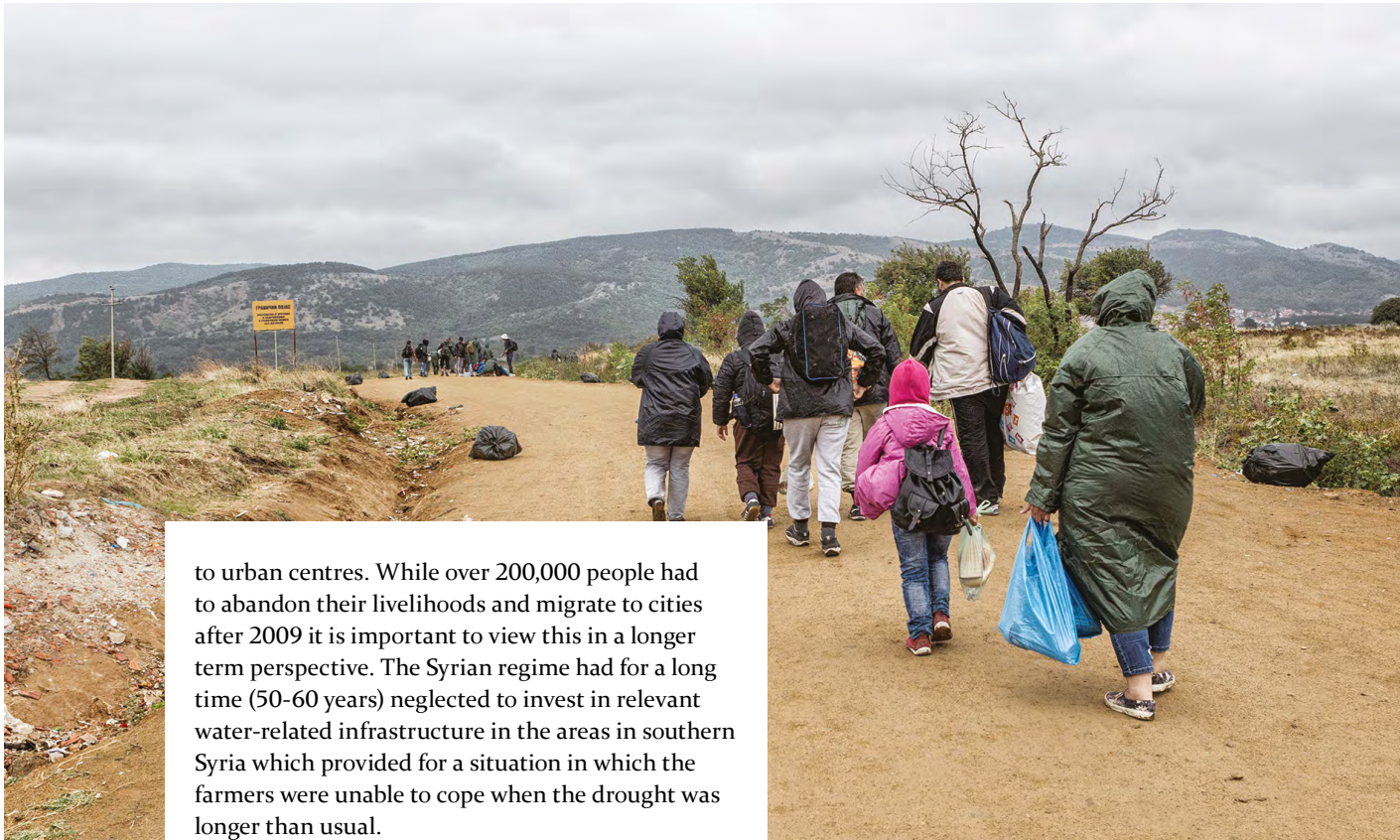
In the years preceding the Syrian uprising and civil war the region suffered a prolonged drought, which led to migration from the rural areas to the urban centers, not least in the city of Daraa in southern Syria where the protests started in 2011. While media as well as the Syrian regime has focused on the long drought as reasons for crop failures as well as loss of livelihoods in Syria, such an explanation underestimates other key features.

“A lack of proper governance and preparedness for the effects of climate variability and change emerge as the key explanation rather than the drought in itself.”

The key reason that emerges when looking closer, rather than the drought in itself, is the Syrian regime’s long standing unwillingness to put in to place proper governance systems to address challenges related to drought management. Francesca de Chatel, in an article from 2015 – The Role of Drought and Climate Change in the Syrian Uprising: Untangling the Triggers of Revolution –, is very clear in her analysis of the relationship between the drought and the Syrian uprising and notes that the “... possible role of climate change in this chain of events is not only irrelevant; it is also an unhelpful distraction. In the context of the future of water management in Syria, it distracts from much more tangible and real problems; in the context of the uprising, it strengthens the narrative of the Assad regime that seizes every opportunity to blame external factors for its own failings and inability to reform”.

While it is important to try to understand the root causes behind the uprising and their possible links to climate change, drought and water, it is important not to read too much into the drought in itself and the ensuing move of people from rural

– THE DANGERS OF OVER-SIMPLIFYING THE CASE OF SYRIA



to urban centres. While over 200,000 people had to abandon their livelihoods and migrate to cities after 2009 it is important to view this in a longer term perspective. The Syrian regime had for a long time (50-60 years) neglected to invest in relevant water-related infrastructure in the areas in southern Syria which provided for a situation in which the farmers were unable to cope when the drought was longer than usual.

When deconstructing the complex reasons behind the uprising and the role of drought and climate change in it, a more nuanced and complex picture emerges. The combination of a range of factors are important in this regard. In particular lack of proper governance and preparedness for the effects of climate variability and change (manifested through a prolonged drought in the case of Syria) emerge as the key explanation rather than the drought in itself. In their 2013 article *Did Drought trigger the Syria Crisis?*, Sowers, Woertz and Waterbury analyzed the relations between the drought and the civil war in Syria, and put it pointedly when they noted that: “Rather than demonstrating that drought caused the conflict, the Syrian tragedy highlights the capacity of political systems and economic policies to exacerbate vulnerability to environmental events”.

To conclude; water scarcity is one driver of migration and while there is an indirect correlation between climate change, drought and migration it has been overestimated and oversimplified. Still, it can intensify existing social tensions and political

instability and will likely add additional pressures on the states and regions that are already fragile and conflict-prone as noted above in the Syria case. Thus, there is rarely a single cause to challenges such as the migration crisis. When trying to work towards solutions to the nexus of migration, water and climate change the international community needs to work with actors across sectors to develop innovative, collaborative solutions that tackle the root causes of global challenges – water scarcity and variability included. ●

Associate Professor **Anders Jägerskog** is counsellor for regional water issues in the Middle East and North Africa for the Embassy of Sweden in Amman, Jordan. The views expressed here do not necessarily reflect the views of the Swedish International Development Co-operation Agency or the Swedish Government. For more on this subject, see the upcoming book: <https://rowman.com/ISBN/9781442247635/Emerging-Security-Threats-in-the-Middle-East-The-Impact-of-Climate-Change-and-Globalization#>

“We are in a new place. This is what climate change looks like”

TEXT | KARL MATHIESEN PHOTO THE GUARDIAN

When my parents and their friends fought their government on Tasmania’s Franklin dam protest in 1982 they were harassed, intimidated, arrested, released and finally victorious. It was the greatest environmental movement in Australian history and led to the creation of a global treasure - the vast Unesco Tasmanian Wilderness World Heritage Area.

Like all of their fellow protestors - doctors, bus drivers, teachers, farmers - my parents thought they had won a victory that would ensure the continuation of this ecosystem of wild rivers and ancient Gondwanan forests for me and my children to walk in and enjoy.

My mum cried last week when I told her that those forests were on fire.

Australian forests are uniquely adapted to burn, but not these ones. The alpine conifers of the central plateau contain species that have little resistance to fire. Over millions of years, they have retreated in the face of the fire-evolved eucalyptus. Now, just a remnant of the great Gondwanan woods that once stretched from Australia, across Antarctica to South America, clings to the high, remote bogs of Tasmania where it is too wet to burn. Until this year.

Natural climate cycles of El Niño and the Indian Ocean dipole combined with the ever-warmer climate to cause the failure of last year’s spring rains. This was followed by the hottest summer on record. By January 13, even the mountain bogs were tinder dry. Then, highly unusual but in line with climate change predictions, a huge, dry lightning storm flashed across the state, setting off over 100 fires.

In the world heritage area, thousands-year-old trees have burned. The ancient peat beneath them remains on fire and may remain so for months. The wondrous, delicate cushion plants, built like coral reefs by generations of tiny plants, look like over-toasted marshmallows.

But the fires of this summer are just the beginning. David Bowman, a professor of environmental change biology at the University of Tasmania, tells me that as the dry summers keep coming this mag-



nificent landscape will burn again and again. Until only ash remains of the forests of Gondwana.

“It’s a bit like knowing someone you love’s got cancer,” he says. “You have to get your mind around the inevitability, I suppose. You grieve. It’s a sadness. It’s going to be pretty hard for this stuff to survive, certainly in the 100-year time frame. It stretches my mind to believe that there’ll be much of this stuff left in 50 years.”

“We are in a new place,” he adds. “We just have to accept that we’ve crossed a threshold, I suspect. This is what climate change looks like.”

The news has hit Tasmanians hard. We thought these special forests would be safe. If we are honest, we thought we would be safe. That climate change would happen “over there”. But climate change disregards the boundaries of national parks and countries alike. Now, we truly begin to understand what we’ve done. ●

Karl Mathiesen is an environmental journalist. He writes the Guardian’s Eco Audit.

19-20 APRIL
JUMEIRAH ETIHAD TOWERS,
ABU DHABI (UAE)
Global Water Summit 2016

The Global Water Summit 2016 in Abu Dhabi is going to break new ground for the sustainability of water as a source of business and economic growth. We will bring together our distinct community: the people who lead the businesses that supply and use water and the stakeholders whose decisions influence the way those businesses are run.

Utility leaders, government ministers, CEOs of corporations and their customers need to come to terms with this basic fact of life: that the state of water in 2050 is going to depend on what we do to make the world of water better - now.

<http://watermeetsmoney.com/>

26-28 APRIL
ASWAN CITY (EGYPT)
4th African Regional
Conference on Irrigation and
Drainage (ARCID)

The conference shall be hosted by ENCID, including three days technical sessions, exhibition and book fair, an exciting program for accompanying persons, and a one-day post-conference study tour under the main theme "Agricultural Land and Water Management for Sustainability under Climate Variability."

<http://encid.org.eg/arcid/>

22 MARCH
WORLDWIDE
World Water Day

World Water Day is an annual event celebrated on March 22. The day focuses attention on the importance of freshwater and advocates for the sustainable management of freshwater resources.

This day was first formally proposed in Agenda 21 of the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, each year focuses on a different issue.

A number of non-governmental organizations promoting clean water and sustainable aquatic habitats have used World Water Day as a time to focus attention on the critical issues of our era.

SIWI uses this day to announce the Stockholm Water Prize laureate.

<http://unwater.org/worldwaterday>



10-12 MAY
MELBOURNE CONVEN-
TION AND EXHIBITION
CENTER
OZWATER'16 - Australia's
International Water
Conference & Exhibition

Ozwater is Australia's international water conference and trade exhibition, and is run annually by the Australian Water Association. This highly regarded event has built a strong reputation for being the leading event on the calendar for water industry professionals and those with a commercial interest in water.

<http://ozwater.org/>

15-20 MAY
JOHANNESBOURG, SOUTH
AFRICA
ICOLD 2016 84th Annual
Meeting

The Organising Committee of the South African National Committee (SANCOLD) has been hard at work at ensuring a high technical content for the meeting by way of one-day technical tours, symposium and workshops, exhibition and study tours. A social and accompanying person's programme has been devised to give you a taste of Africa.

<http://eiseverywhere.com/ehome/icold2016/>

WATERFRONT

NEXT ISSUE OUT IN MAY!

HOW DO YOU LIKE YOUR WATER FRONT?

The screenshot displays the digital version of the Water Front magazine. At the top, the title "HOW DO YOU LIKE YOUR WATER FRONT?" is prominently featured. Below it, the magazine's masthead includes the SIWI logo and the issue information: "NO. 3 • AUGUST 2015".

The main content area is divided into several sections:

- EDITORIAL: OUR SHARED PASSION**: An article by Malin Falkenberg discussing the importance of managing resources in sub-Saharan Africa.
- BRIEFING: WATER RE-USE ADVOCATE WINS STOCKHOLM INDUSTRY WATER AWARD**: A feature on CH2M, a Colorado-based global service and engineering company.
- TEXTILE AND WATER PROJECT SHORTLISTED FOR GLOBAL SUSTAINABILITY AWARD**: A story about the Sustainable Water Resources (SWR) project in India.
- WHILE THE INITIATIVE EXPANDS TO MORE COUNTRIES**: A report on the expansion of the SWR initiative to Bangladesh, China, Ethiopia, India, and Turkey.

A **CONTENT** sidebar on the left lists various sections with their respective authors and page numbers:

- 03 BRIEFING: Water news roundup
- 05 COVER STORY: Our shared thirst
- 09 ANALYSIS: Shining down, clean up
- 11 OPINION: Blind spots delay sub-Saharan struggle for water security
- 22 THE WORLD'S BEST WATER IDEAS
- 34 LAST WORD: Jan Lundqvist
- 35 CALENDAR: Coming up in the water world

At the bottom of the page, there is a navigation bar with a search icon, a page number "3 of 36", and a "WATER FRONT # 3 | AUGUST 2015" label. Below the main content, a row of smaller magazine covers is visible.

DEAR WATER FRONT READER,

We hope you like the magazine. We hope it informs and inspires you.

In the Water Front editorial team, we have thought about how to make the magazine more environmentally sustainable – limiting paper usage and long transports - while keeping all our highly valued readers, as well as attracting new ones!

As a first step, in 2015 we introduced an e-reading tool on siwi.org, in which you can access and read both Water Front and other publications. Perhaps you have tried it out already, and recognize the example above. In addition to the e-reading tool, the magazine can be read in a PDF format.

As a second step, we would like to ask you to note in which format you prefer to receive the magazine. Whether you prefer a print subscription, electronic, or both, please follow the link below to mark your preferences!

We hope you enjoy this issue!
/The Water Front editorial team

<http://webforms.siwi.org/waterfront>

WATER FRONT