



#126

focus

Your gateway to International Standards



WATER

WVLEB

& sanitation

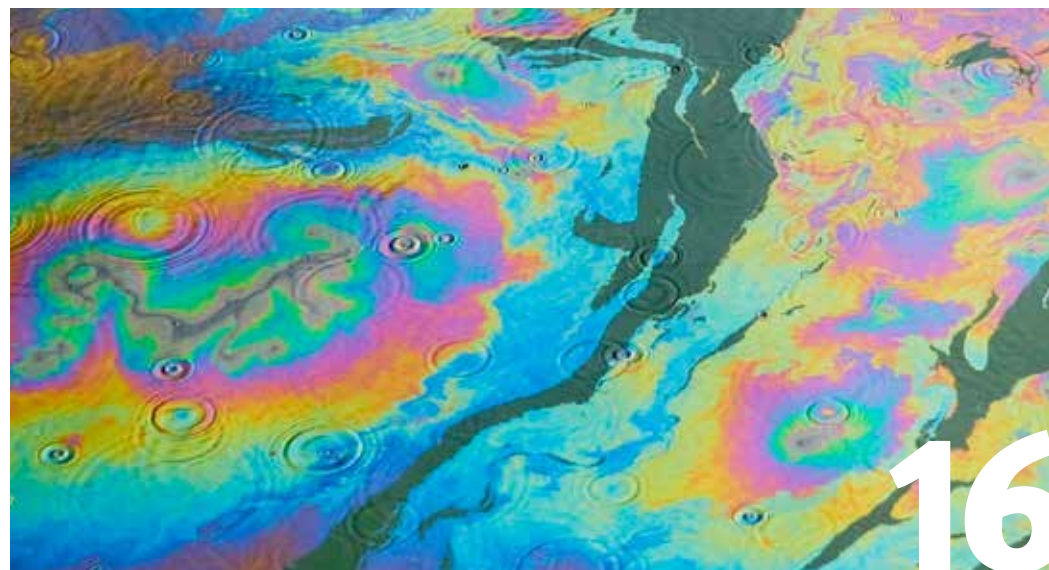


#126



ISOfocus

January-February 2018



ISOfocus January-February 2018 – ISSN 2226-1095

ISOfocus, the magazine of the International Organization for Standardization, is published six times a year. You can discover more content on our Website at iso.org/isofocus, or by staying connected with us on:



Head of Communication | **Katie Bird**

Editor-in-Chief | **Elizabeth Gasiorowski-Denis**

Writer | **Barnaby Lewis**

Contributing writer | **Ann Brady**

Copy editor and Proofreader | **Vivienne Rojas**

Designers | **Xela Damond, Pierre Granier, Alexane Rosa**

Translator | **Alexandra Florent**

Subscriptions and back issues

If you enjoy *ISOfocus*, you can download the pdf for free or subscribe to receive printed issues through our Website iso.org/isofocus. You can also contact our customer service at customerservice@iso.org

Contributions

You can participate in creating this magazine. If you think your contribution can add value to any of our sections, please get in touch at isofocus@iso.org. Views expressed are those of the respective contributors and are not necessarily those of ISO or any of its members.

© ISO 2018

Published in Switzerland. All rights reserved. Articles in this magazine may be reproduced for non-commercial purposes only. These may not be modified and must be properly referenced, with due credit to ISO being given. ISO may revoke this permission at its sole discretion. For enquiries, please contact copyright@iso.org.



42-43 And the award goes to...
ISO Secretary-General meets with members
Smart cities put people first

- 2** Stepping up
Comment by John Walter.
- 4** Taking the smart road
ISO leads the talk on sustainable cities.
- 6** Putting the logic into hydrological
Waste not, want not... the benefits of water reuse.
- 14** Water for development
A panorama of ISO's water standards.
- 16** Managing a precious resource
Is our planet running out of freshwater?
- 20** The troubling talk of toilets
To sewer or not to sewer, that is the question.
- 28** Partners for sustainable sanitation
The time has come to rethink toilets.
- 34** Waste not! How ISO is helping to reinvent sanitation
The new ISO 30500 will help the world "clean up its act".
- 38** Turning waste into profit
When tomorrow's toilets do more than flush waste.
- 44** Fresh changes in the pipeline
Fighting the "fatberg": the problem with clogged sewers.



This magazine is printed on certified FSC® paper.



Stepping up

I look forward
to working
more closely
with you over
my two-year term.

I feel honoured to be able to address here the International Standards community and to share with you a sense of the direction and guidance that I bring to the ISO table. There is much work to be done. We must ensure that ISO's new governance structure is implemented to effectively reflect that we are a member-driven organization. We must also develop and implement our strategy to more effectively focus on the regions. All of which is designed to ensure we continue to evolve and improve as the world's leading developer of International Standards.

This comes at a time when ISO standards are increasingly important and we are entering new and exciting territories of standardization that have the potential to really transform our world. From cookstoves and robots, to the increasing digitalization of everything, and the ever-growing innovative tools for environmental management or self-driving cars, ISO has never been more relevant when it comes to providing solutions to world issues. But standards can only be relevant if they are used widely, which is why the ISO Strategy 2016-2020's ultimate objective to have "ISO standards used everywhere" is so important. Supporting the six directions outlined in the Strategy as much as possible over the next two years will therefore be a high priority for me.

The ISO Strategy is also about ISO's overarching mission, which is to provide global solutions to global challenges. A number of those challenges are also the focus of the United Nations 2030 Agenda for Sustainable Development and its corresponding 17 Sustainable Development Goals (SDGs).

As I embark on my new role as ISO President, I know that International Standards are an integral part of achieving every one of those goals, including Goal 6 ensuring the availability and sustainable management of water and sanitation for all, which we address directly in this issue of *ISOfocus*. Some 40% of the world's population lives in water-stressed areas (defined as the ratio of total freshwater withdrawals to total renewable freshwater resources above a 25% threshold) or is exposed to polluted water sources. What's more, over 80% of the wastewater generated by society flows back into the ecosystem without being treated or reused.

ISO is already leading the way in this field with hundreds of International Standards covering a number of innovations and solutions that contribute to address this question. These include guidelines on service activities relating to drinking water supply systems, wastewater sewerage systems and water reuse, to name a few. We also have a new technical committee on non-sewered sanitation, which is all about providing toilets where there is no access to reliable water and waste systems.

In this first *ISOfocus* issue for 2018, I would like to take the opportunity to thank the entire ISO community for its support and invaluable input into the ISO system. I look forward to working more closely with you over my two-year term. ■



John Walter, ISO President.

As I step into a new year and a new role as ISO President, it is important that I take stock of the impact of ISO standards on our everyday life and on our world. I feel somewhat humbled as I reflect on the numerous issues that International Standards both seek to resolve and actually do resolve.

Over the past three years, in which I served as ISO Vice-President (policy), and, more recently, as ISO President-elect, I have had the privilege and pleasure to witness and be involved in the functioning of one of the world's great international organizations. I have also enjoyed the opportunity of being surrounded by talented and effective people, and I know that following in the impressive footsteps of Dr Zhang Xiaogang will be no easy task. However, I am very comforted to recognize that ISO is made up of a strong team possessed of the ISO spirit of consensus and collaboration. To that end, I have been working closely with Secretary-General Sergio Mujica to ensure that he is successful in his new role. I have been delighted to provide leadership, guidance and advice to him from his first day at the Central Secretariat and will continue to support him throughout my term as ISO President.

TAKING THE SMART ROAD



What makes a smart city? How can standards help? This was the subject of the **#worldsmartcity** campaign organized in the lead up to the Barcelona World Smart City Forum last November.

ISO's four-week-long campaign on how to make cities smarter focused on a different subject every Tuesday. These were energy, connected cities, mobility and resilience. We even tested our audience's knowledge of each topic with weekly quizzes. Featured city experts included Kevin Martin (city representative, Portland) and Ms Abha Joshi-Ghani (Senior Adviser, World Bank) who gave their views on how standards can help. We also had the unique opportunity to hear live from **Andrew Collinge**, the Greater London Authority's lead officer on the Smart City Agenda, to discuss the metropolis' journey towards smartness, its main priorities and the way forward.



Missed the campaign?
See all articles here: www.iso.org/mysmartcity

#WorldSmartCity numbers



350 tweets
by **148** contributors
reaching a total audience
of **342 764** users
generating **2 558 263** impressions*

* number of times all tagged posts were seen

#worldsmartcity

The biggest challenge for smart cities is smart leadership, which leverages resources (especially technology), does more with less, values learning from other cities and ensures inclusion of all citizens.

Standards are important because they allow us to measure the performance of cities in key areas. Cities need to invest more on collecting and sharing standardized and comparable data.

Abha Joshi-Ghani, Senior Adviser, World Bank




The "smartest" Smart City solutions are the ones that are easily scalable, shareable, and replicable in multiple cities. Standard data formats, and standard systems of data collection and access, are the foundation through which we achieve these goals.

Kevin Martin, Tech services/smart cities manager, City of Portland




World SmartCity @WorldSmartCity · Nov 7

#worldsmartcity Standards improve the ability of cities to better manage and ___ for the future.

- 16% Standardize
- 0% Outsource
- 79% Innovate
- 5% Wait

19 votes · Final results

World SmartCity @WorldSmartCity · Nov 7

#worldsmartcity What should a smart city address to improve development and quality of life?

- 4% Energy efficiency
- 10% Clean water
- 10% Citizen's safety
- 76% All of the above

52 votes · Final results



Putting the logic into
hydrological

by Barnaby Lewis

Global mobility, intensive farming and urban developments that have spread into once uninhabitable areas have made water access, use, and reuse, critical areas for International Standards.

It may be hard to imagine, but a vast number of people simply don't have any drop to drink, let alone sufficient water for cooking, washing or growing food. It's an injustice that led to a dedicated United Nations sustainable development goal (SDG 6) on clean water and sanitation.

Prominent inclusion in the SDGs underlines the importance of water to the future of our development, as do the three ISO technical committees that deal with different aspects of water. These are: ISO/TC 147, *Water quality*; ISO/TC 224, *Service activities relating to drinking water supply systems and wastewater systems – Quality criteria of the service and performance indicators*; and ISO/TC 282, *Water reuse*. In common with the SDGs, the work done in these ISO technical committees, and the standards that they are developing (currently, there are more than 80 in the pipeline), go a lot wider than just water, touching on areas from farming and food production to smart cities. Here, we focus on the issue of water reuse: How can International Standards provide guidance that means that water is fit for purpose and used in the right way?

Water should
be treated
as a finite
and precious
resource.

The solution isn't always clear

One might imagine that the “best” solution would be if all water sources could be treated and cleaned to perfect purity, but that's not necessarily the case. *ISOfocus* spoke with water expert Zillay Nawab who explained how needs differ radically according to intended use. With more than 30 years of experience, Zillay makes a valuable contribution to ISO standards, serving on more than five committees and convening the ISO/TC 282 communications task group. The first thing he told me was that “there are basically two phases to reuse: collection and treatment. Both require infrastructure and both incur expense, and the cleaner you want to make water, the more it's going to cost”.

That means forward planning is essential. As Zillay explains, “it's important that water is not contaminated at the collection stage” since domestic water that's been used for showering is relatively “clean” compared to water used in industrial processes or for flushing a toilet. Equally, water that will be used in an industrial setting, for cooling for example, does not need to be treated to the same degree as drinking water; to do so would be a waste of resources. He went on to add that “certain jurisdictions require industries to treat the used water in order to remove harmful elements before discharging it in a water body, ground or drainage system. This is not the case universally, and one sees many examples of pollution and ensuing health problems”.

An advocate for water rights, Zillay sees International Standards as clear guidelines “that help city planners and communities develop solutions that work for them”. ISO standards enable all parties involved, whether municipalities, manufacturers, insurance companies or development organizations, to engage in constructive discussions using a shared vocabulary and a common understanding of what constitutes best practices.

Zillay lives and works in Canada, though he studied engineering in the USA and originally comes from Pakistan. His global perspective on the ISO process, based on consensus, is positive and he highlights the “ongoing need to ensure involvement of developing countries, in order to create solutions that work effectively”. He points out the benefits of arrangements such as twinning, where an experienced and well-resourced ISO member country mentors and supports an underdeveloped member country to jointly create standards. This is part of ISO's work in capacity building. Zillay adds that effective international standardization can be facilitated via “awareness, stakeholder consultation, engagement and collaboration with underdeveloped and developing countries”. It's clear that Zillay's role as convenor of the communication group is an important complement to his technical expertise.



The stuff of life

The technical challenges of water reuse are linked to its role as the basis of all life and most fluids. Chemically speaking, water can dissolve a lot of things. That's convenient for washing clothes or spraying crops, but something of a challenge when all that's needed is a glass of clean water. Water with nothing else in it is actually quite hard to come by.

The fact that two-thirds of the planet are covered by water presents a frustrating conundrum. It looks potable, but you can't drink it or use it for farming, at least not without some help.

The challenge of desalination has intrigued generations of engineers. Technology has moved us closer than ever, but the current state of affairs is that while it can be done, even on a large scale, it comes at a high cost, both financially and ecologically. It usually relies either on energy-intensive distillation or on complex membranes, though a trend towards development of major urban centres in inhospitable environments can mean that there is little other choice.

Historically, most of the world's major cities were founded on rivers. (In fact, in Europe, only one capital isn't on a major river.) The benefits go beyond transport and fishing, or even simply standing on a bridge and letting your thoughts go with the current. Rivers at the heart of a city are testament to the primordial importance of water. And while they carry fewer goods and people than they may have at one time, they're still widely used both to supply water and transport waste. But what about newer cities that have grown in places where water in any form is scarce?



Smart water use, smart cities

It's particularly stark in places that have developed quickly, and few have grown faster than the dazzling cities of the United Arab Emirates (UAE). Attracting millions of tourists both as a destination and a travel hub, the UAE also has, at around 8%, one of the highest population growth rates in the world, partly due to a massive influx of people who are drawn by the promise of lucrative work and luxury living.

In fact, Zillay himself worked in Abu Dhabi for more than 20 years, contributing to one of the largest gravity-fed sewerage and water-recycling systems in the Middle East. At more than 40 km long and 5.5 m in diameter, the tunnel is a modern feat of engineering. In Gulf countries, where water is scarce to begin with and comes mainly from desalination plants, sophisticated water reuse, combined with public awareness on how to use less in the first place, have created some of the world's most water-efficient cities.

Zillay gives some perspective on reducing use: "For example, residents still use about twice as much water as in major Canadian cities, but when it comes to reuse, the region has a good track record." The gold medal goes to Israel's Tel Aviv, where an incredible 90% of water goes on to be reused for everything from agriculture to industrial use, but at around 85%, Abu Dhabi isn't far behind, as a result of strategic, multi-billion-dollar investments.

So many trucks, it looks like a parade

In neighbouring Dubai, there is a lot of catching up to do. Online videos show queues of thousands of tankers driving out to distant sewage treatment plants. In some cases, truck drivers, frustrated by long jams, have illegally dumped hazardous raw sewage into storm drains or on the land, where it can pollute ground water or be carried to the sea. The situation has been addressed urgently, since waterborne pathogens pose a serious risk to health, and currently around 70% of the city's sewage flows into the mains. Safely containing and treating the rest is a priority if the city intends to catch up with neighbouring Abu Dhabi.

The substantial challenge of how to manage water in rapidly growing cities isn't limited to the Gulf. They have simply been forced to deal with it more urgently than others, and have responded with world-class solutions. But more than half of the world's population currently lives in cities, and that's set to increase to 70% within the next 30 years.



Wastewater treatment at a biological station.

Farming, salinity, boreholes, sustainability

That's a good thing because cities are the most efficient, and potentially sustainable, way for populations to coexist. They make the best use of resources, distributing them effectively and benefitting from an economy of scale that makes daily life more convenient and more ecological.

The future is in connectivity. By understanding the habits of citizens, changing distributions and demographics, travel needs and usage patterns of resources, including utilities such as water, people can be served more efficiently than ever before. With smart cities as the theme for 2017's World Standards Day, ISO's role in developing standards that work together to address all aspects of how we will fit seven billion people into cities – comfortably and safely – is more prominent than ever.¹⁾

But it's not just people who aren't able to deal with pollutants in water. Salts are equally unpalatable for most livestock and crops. That's why a significant challenge to sustainable food production is to address over-reliance on mineral-rich water from boreholes. Their use to irrigate arid and semi-arid lands leaves some areas so saline that their continued use for farming is threatened. Far from making marginal areas productive, incorrect water management has turned thousands of hectares of land into man-made salt pans where crops struggle to grow. Sensible planning, accurate irrigation and efficient water reuse are all part of the solution.

1) Visit www.iso.org/sites/worldsmartcity to find out more.

ISO standards
enable all parties
involved to engage
in constructive
discussions.

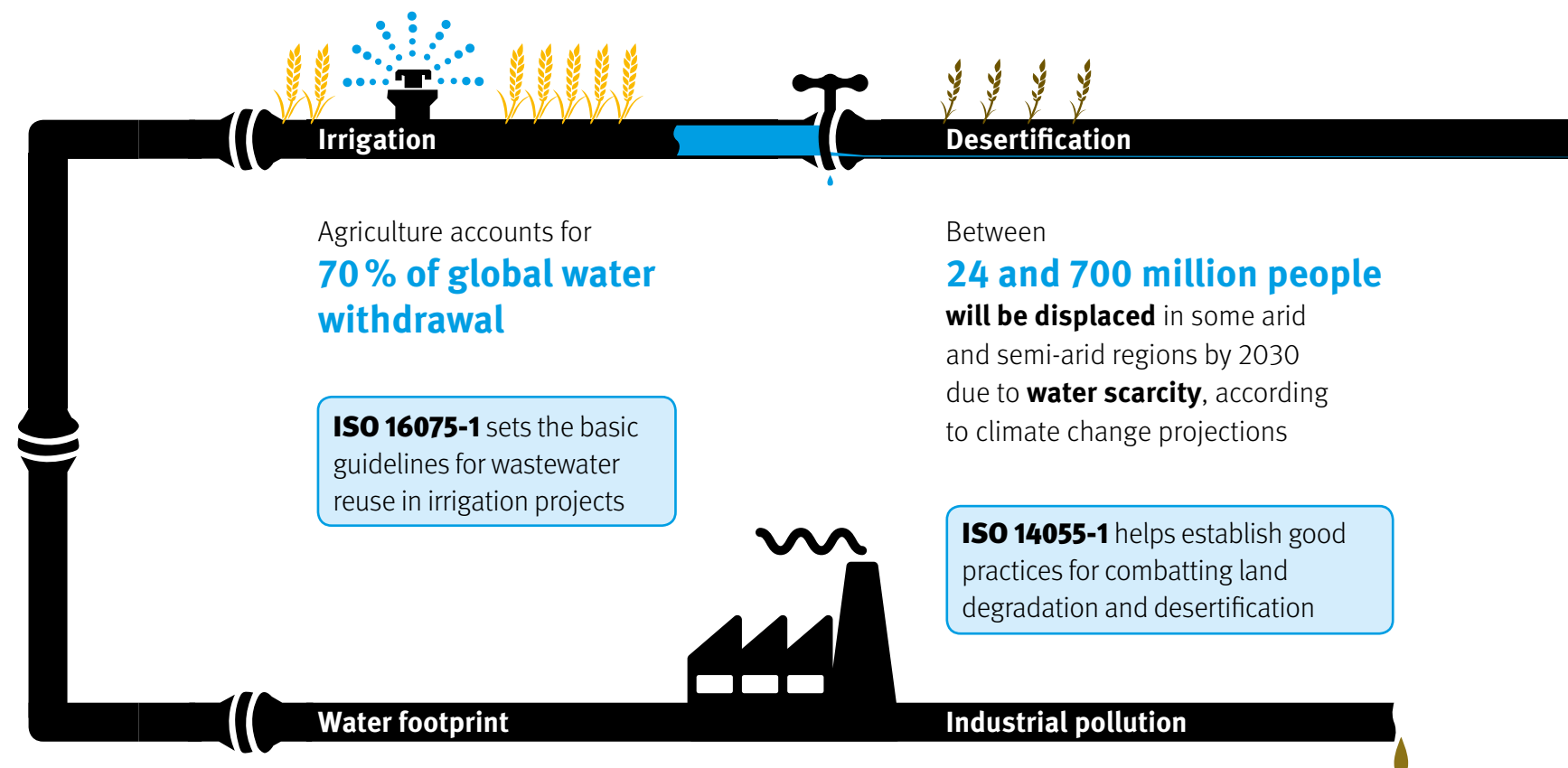
Raising living standards

Unlike energy, water can be created and destroyed. (Probably some of us can remember a simple experiment from our school days where a battery is attached to two electrodes that are plunged into a glass of water. Likewise, burning any hydrocarbon creates water.) But outside of a science lab, water should be treated as a finite and precious resource.

Thanks to ISO experts like Zillay and more than 315 International Standards that set parameters for safe water, efficient use, collection, treatment and reuse can become a global reality, helping to achieve a key sustainable development goal. Equal access will bring immediate benefits to almost two billion people who are forced to drink polluted water every day, and is fundamental to realizing almost all the other goals including “life below water”, “zero hunger” and “sustainable cities and communities”. Now that's something worth raising a glass to. ■

Water for development

The United Nations International Decade for Action – “Water for Sustainable Development” (2018-2028) will focus on the sustainable development and integrated management of water resources for the achievement of social, economic and environmental objectives. ISO develops standards that can be used everywhere to improve water quality, implement good management of water services and reduce pollution.



Global water demand (in terms of water withdrawals) is projected to **increase 55 % by 2050**, mainly due to **manufacturing**

ISO 14046 helps companies monitor their water footprint

Industrial activities greatly impact the availability and **quality of water** that is **discharged** into the environment

Future **ISO 22524** is a pilot plan for industrial wastewater treatment facilities in the objective of water reuse

Wastewater

Globally, **80 % of wastewater** flows **back into the ecosystem** without being treated or reused

ISO 24516-3 on wastewater collection networks helps us better manage our water assets

Sanitation

68 % of the world's population has **access** to at least **basic** sanitation services

ISO 24521 provides guidelines for the management of basic on-site domestic wastewater services

Managing a **precious** resource

Why do we need to manage global water resources?

According to environmental scientist Dr Debbie Chapman, our health and well-being depend on it – and the payback is tremendous. Here, Dr Chapman explains the importance of managing water resources at the global scale.



The greatest global
water challenge
is ensuring that
the limited quantity
of freshwater
we have on earth
is of good quality.

Water is one of the basic necessities of our life. We always hear about how much water we should drink daily, but we don't hear much about the amount of water we are wasting, water scarcity, or how we can reduce usage.

Here's a startling figure. Only 1% of the world's freshwater is easily accessible. To make matters worse, it is not evenly distributed around the globe and is vulnerable to contamination from human activities. Even more disturbing, the long-standing concept that freshwater is a renewable resource is now compromised by the ongoing deterioration in water quality, leading to the degradation of aquatic ecosystems on which human health, livelihoods and development depend.

Freshwater scarcity and quality deterioration rank among the most urgent environmental challenges of this century. According to UN Water, a United Nations inter-agency coordination mechanism for all freshwater and sanitation issues, Earth is facing a 40% shortfall in water supply by 2030, unless we dramatically improve its management. UN Environment and its Global Environment Monitoring System for Water (GEMS/Water), through its partners and work programme, play an important role in helping developing countries meet the United Nations Sustainable Development Goal for Water (SDG 6). GEMS/Water's primary objective is to encourage monitoring and to ensure compatibility and comparability of water quality data for use in national, regional and global assessments.

ISOfocus recently had the opportunity to talk to environmental scientist Dr Debbie Chapman, who has been associated with GEMS/Water for over 30 years and is well known the world over for her role in promoting water quality monitoring and assessment. Dr Chapman established, and is the Director of, the UN Environment GEMS/Water Capacity Development Centre at University College Cork in Ireland, which provides expert advice and training in water quality monitoring and assessment worldwide.

In this *ISOfocus* interview, Dr Chapman depicts the greatest global water challenges the world faces today and explains the practical ways ISO standards can contribute to ensuring resources are used sustainably.

***ISOfocus*: What do you think are the greatest global water challenges?**

Dr Debbie Chapman: As an environmental scientist, I am interested in ensuring that the aquatic environment can deliver, now and into the future, the services on which human populations depend while still maintaining the aquatic ecosystem itself. Some of the services we rely on include drinking water, wastewater assimilation, fisheries for food, water and nutrients for agriculture, and recreation. Many of these services are dependent on a healthy aquatic ecosystem, something that is frequently overlooked.



Photo: Debbie Chapman

Dr Debbie Chapman, Director of the UN Environment GEMS/Water Capacity Development Centre, University College Cork, Ireland.

All living organisms, including ourselves, require water as a basic component of our cells and tissues. Not only do we require sufficient water to keep these cells and tissues hydrated, but it is essential that the water is not contaminated with substances that may be toxic, such as metals, or the thousands of other organic and inorganic chemicals that find their way into the aquatic environment. Contamination of water, even at low levels, can have subtle effects on aquatic organisms, resulting in changes to species and population densities, that ultimately mean the natural ecosystem becomes unbalanced and unhealthy. And an unhealthy ecosystem does not support the services we need.

So, in my opinion, the greatest global water challenge is ensuring that the limited quantity of freshwater we have on earth is of good quality, i.e. a quality that not only provides for the needs of a growing human population, but also for the needs of the aquatic ecosystems. Ensuring a sufficient quantity of water will not support a sustainable future unless that water is also of adequate quality. Monitoring of water quality is essential to determine whether the quality meets the requirements for specific uses, or whether it is deteriorating or improving.

Water resources cannot be managed appropriately without the information produced from water quality monitoring programmes. The UN Environment GEMS/Water

Inadequately managed sanitation is a major contributor worldwide to the deterioration in water quality.

Programme has been encouraging water quality monitoring for over four decades with the aim of sharing the data for assessments, management and policy development. This activity now has new impetus with the introduction of the Sustainable Development Goal indicator for ambient water quality, SDG indicator 6.3.2. The indicator is based on the results of monitoring in rivers, lakes and groundwaters in each country.

How can ISO standards help overcome these challenges?

Water quality monitoring depends on using technical methods and well-run laboratories. Sharing water quality data across regions, and at the global level, requires the data to be comparable. One way of ensuring that water quality data from many laboratories in different countries are comparable is to encourage the laboratories that share data to use standardized methods that have been well tried and tested.

The methods conveyed in ISO standards are reputable and recognized globally, and provide a mechanism for ensuring data from different countries are comparable. There is a wide range of water quality monitoring standards, from field techniques to laboratory testing, so every aspect of the monitoring programme can be standardized and compared, even for monitoring at the global scale.

In what ways can ISO's recent efforts in the sanitation sector bring added value?

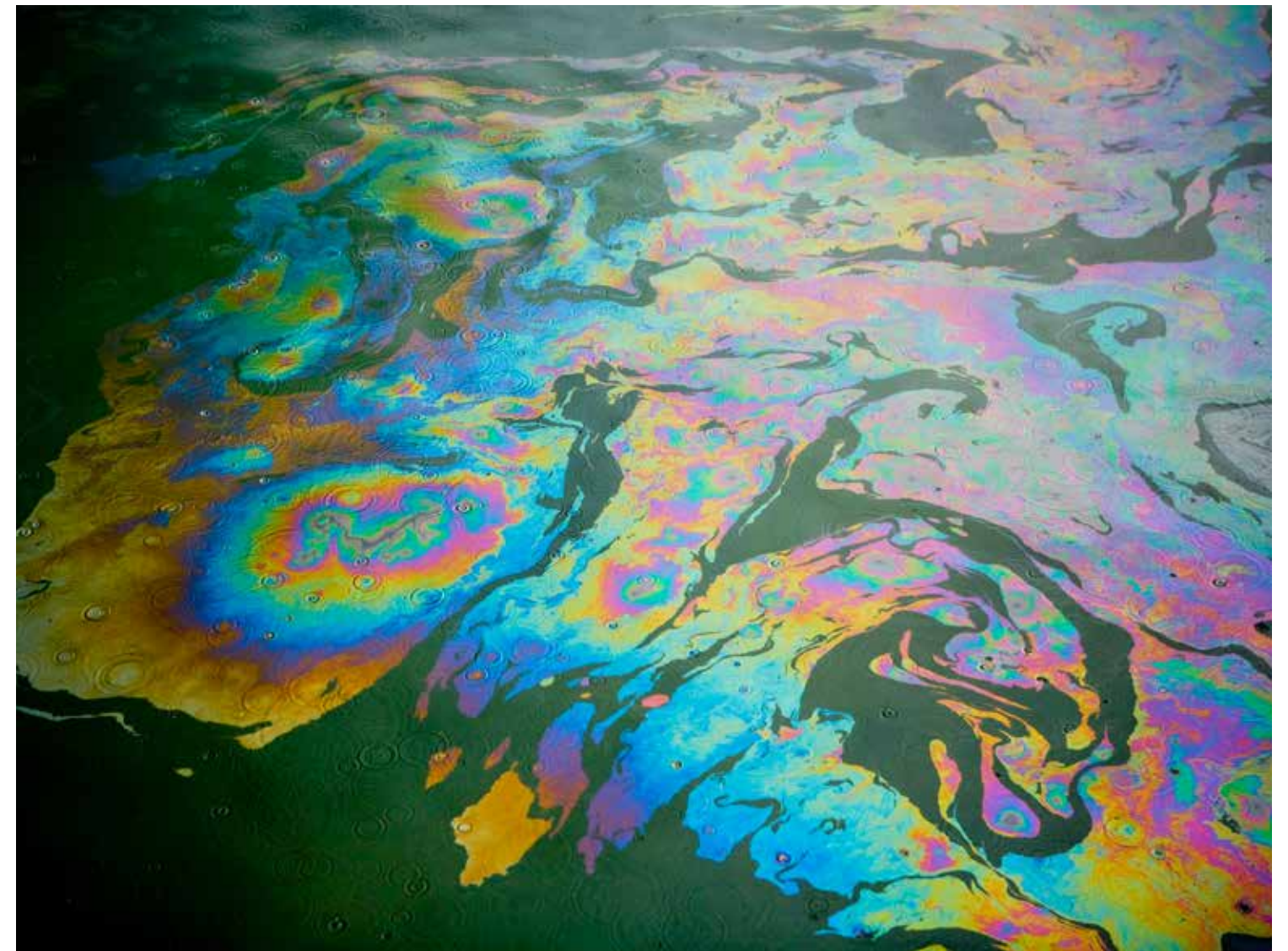
Inadequately managed sanitation is a major contributor worldwide to the deterioration in water quality. Providing guidance and standards for efficient management of sanitation systems will ensure that pollution of aquatic ecosystems with wastewater is reduced, and the water quality of waters receiving effluent will be improved.

If you could look into the future, how are we doing in 2030 in terms of reaching the SDG 6 target for sustainable water management? What more needs to be done?

Unfortunately, 2030 will be here too soon! Although we see evidence of enthusiasm for engaging with the new Sustainable Development Goal for water worldwide, many countries are starting from a low base with respect

to management of pollution sources and monitoring of the impact of those sources on water quality.

There is increasing awareness of the need to preserve water quality, especially for the protection of human health; the crux of the problem is to convince policy makers and resource managers of the importance of monitoring the quality of water bodies and aquatic ecosystems. For countries which currently have very little monitoring activity or no national-scale monitoring programme, it will be difficult to establish a programme and collect sufficient data to guide strategies for improving water quality by 2030. Education, training and awareness raising at all levels, from community to policy makers, will play an important role in driving progress towards achieving SDG 6, and indicator 6.3.2. ■



A tropical river scene with palm trees and a wooden pier. The water is calm and reflects the surrounding greenery. In the foreground, a wooden pier extends into the water, with a white plastic bag and some other debris on it. The background is filled with lush tropical vegetation, including many palm trees. The overall atmosphere is serene but the presence of the pier and debris suggests a lack of proper sanitation infrastructure.

The troubling **TAIK** OF TOILETS

by Elizabeth Gasiorowski-Denis

When we think about the most dire threats to our planet, poor sanitation rarely tops the list. Yet it's a significant (and in some cases immediate) contributor to sickness and pollution in both rural and urban areas. So how can ISO help deliver sustainable sanitation to the 2.3 billion people who lack access to basic services?

Going to the toilet is something we tend to take for granted. And yet for approximately 2.3 billion people around the world who lack any sanitation whatsoever, the only option is “open defecation”. More than two hundred million tonnes of human waste goes untreated every year. In the developing world, 90 % of sewage is discharged directly into lakes, rivers and oceans. All this untreated sewage is estimated to cause more than 500 000 diarrhoeal deaths each year.

The United Nations (UN) has called on countries to “radically” increase investments in water and sanitation infrastructure, not only to protect their populations from deadly diseases but also to ensure that they are able to achieve the Sustainable Development Goals (SDGs). Goal 6 of the SDGs aims to “ensure availability and sustainable management of water and sanitation for all”. It is a comprehensive goal that addresses the entire water cycle, from access to use and efficiency, to the integrated management of water resources and water-related ecosystems.

ISOfocus asked industry experts for their perspective on these issues and what needs to be done to tackle the toilet problem and ensure that going to the toilet is safe and sanitary – with help from the future ISO 30500.



A huge challenge

Eawag is the Swiss Federal Institute of Aquatic Science and Technology and serves as a bridge between the scientific world and the “real world”. Eawag is concerned with concepts and technologies for dealing sustainably with water bodies and with water as a resource. In collaboration with universities, other research institutions, public bodies, industry and non-governmental organizations, Eawag works to harmonize ecological, economic and social interests in respect of water usage. The aim, says Eawag’s Kai Udert, “is to support the development of facilities that can treat the excreta directly on site without the need for a centralized treatment facility”.

He asserts that the choice of sanitation options is still very limited and the high costs of large sewer-based sanitation systems are often prohibitive for a fast implementation. With the current centralized waterborne sanitation systems, “we will not be able to provide public health and environmental protection at many locations in the world, especially in the fast-growing megacities”.

With countries coming under increasing pressure to maintain sanitation systems, it is encouraging to note that new “toilet systems” could help to solve the hygiene problems in a large part of the world and the global problem of nutrient management, Udert says. Furthermore, he adds, new technologies could change the entire sanitation landscape. “The whole sanitation business would become much more flexible and cities would be able to react much faster to new challenges, such as large changes in the population, water scarcity, etc. The new systems would not require any or much flushing water, which would help save water.”

In the developing world,
90 % of sewage
is discharged directly
into lakes, rivers
and oceans.



The sanitation economy

One challenge is the market, says Prof. Chris Buckley from the University of KwaZulu-Natal in South Africa, Pollution Research Group – a market “full of similar seeming products, especially in new, novel or revolutionary items (such as non-sewered sanitation systems)”. Prof. Buckley recognizes that this can cause confusion in the mind of the purchaser and “lead to situations such as analysis paralysis, such that no decision is made”. He acknowledges that in the case of items which can have public health implications, very few bodies in the countries most needing the technology are sufficiently resourced to make value judgements. “So there is no technological advance.”

According to Prof. Buckley, the lack of an International Standard precludes companies from major investments in new and revolutionary products. A number of reasons are responsible for this, including “protecting their product from cheap substandard imitations, the lack of a sufficiently large market to justify investment, and enabling regulatory bodies to set product performance requirements without favouring any specific product or manufacturer,” he says.

The Toilet Board Coalition (TBC), based in Geneva, Switzerland, is catalysing on the new vision of “the sanitation economy” – a new business-led approach that creates an ecosystem of business activity around sanitation. This includes providing toilets, digitizing sanitation as part of smart cities, and creating a circular economy where human waste becomes valued “toilet resources”.

Alexandra Knezovich and Cheryl Hicks from TBC believe sanitation is proving to be one of the most elusive SDGs, with developing countries still lagging behind. “Huge efforts have hardly reduced the 2.3 billion people without sanitation.” But there’s good news, they say. “The sanitation economy is a new model, which can more readily be scaled up, so the standards enabling this, enable a renewed momentum.”

However, the sanitation economy has its share of challenges. According to Knezovich and Hicks, the sanitation economy doesn’t fit in with our preconceived ideas of traditional sewer sanitation. “There are understandable concerns about an alternative system creating infection, odour and pollution,” they explain. “To overcome this, we must achieve consistently high and verifiable standards of design and operation for these new technologies.”





Toilet technology

For the past few years, ISO has worked with partners to develop new sanitation technologies. One of the most promising is a “reinvented toilet” that essentially functions as its own treatment plant. The concept is part of a broader initiative called the “Reinvent the Toilet Challenge” launched by the Bill & Melinda Gates Foundation that aims to deliver sustainable sanitation to the 2.3 billion people who lack access.

Unlike traditional sewer systems, the reinvented toilet (or non-sewered sanitation system) helps remove pathogens and does not require traditional infrastructure such as sewers, water connection or electricity. The reinvented toilet would harvest energy from actual human waste to kill germs in the water itself. The result is sterile water that’s safe enough to wash with, as well as human waste that can be repurposed for healthy, odourless fertilizer.

An active group that supports this effort is ISO project committee ISO/PC 305 on non-sewered sanitation. ISO/PC 305 is currently at work developing an International Standard for non-sewered sanitation systems, sometimes known

as “reinvented toilet technology”. It is expected to help reverse the global sanitation crisis by removing pathogens without requiring traditional infrastructure, providing for cleaner and safer toilets on a global level.

In an effort toward that goal, an International Workshop Agreement – IWA 24, *Non-sewered sanitation systems – General safety and performance requirements for design and testing* – was published in September 2016, serving as the basis for the development of the new International Standard. Interestingly enough, both IWA 24 and the future ISO 30500 have received overwhelming support from the Bill & Melinda Gates Foundation (see our article on p. 28).

The future ISO 30500 will apply to individual and small-scale sanitation systems that serve to safely process human waste and recover valuable resources such as water, energy and/or nutrients in an off-grid and non-sewered environment. The standard will be applicable to individual and community sanitation systems that are self-contained, meet defined discharge requirements and aim for sustainability.

Time for change

The future ISO 30500 that will focus on different aspects of sanitation is clearly an effective tool in tackling a very complex subject. Rémy François, Research and Technologies Director at BFG Environmental Technologies, a start-up in the field of environmental technologies, has been involved with the development of IWA 24 and has contributed as an expert and national delegation leader to the development of ISO 30500. For him, it all comes down to giving access to a basic sanitation service. “Still today, too many children, women and men are facing risks for their health and well-being due to the lack of sanitation solutions, basic water and hygiene,” he says.

François believes the committee’s work is unlike any other, where urgency and collaboration among the various stakeholders are needed most. He says that water quality experts, sanitation experts, developing country representatives, manufacturers and national test laboratories developing the standard had one goal in mind : to describe precisely what shall be done in order to eradicate diseases linked to the lack of sanitation. “I was surprised by the incredible flexibility of these actors to find quickly the best compromise in order that the impacted populations can finally have access to sanitation systems.”

The future standard brings the conceptual toilet to reality through the standardization of its design, installation and use. For example, a poverty-stricken community might not have access to reliable running water, so installing toilets that operate “off the grid” can be a key factor in establishing their ability to function. And these fixtures cost less than five cents per user, providing an opportunity for developing countries to utilize safer, cleaner, cost-efficient toilet alternatives.



It all comes down
to giving access
to a basic
sanitation service.

A clean future

So will the future be any better for the billions of people lacking basic sanitation? Organizations across the world are making serious efforts to improve and provide acceptable toilet solutions globally, and there is a bigger push to achieve SDG 6 than ever before. All of these, plus the “Reinvent the Toilet Challenge” initiated by the Bill & Melinda Gates Foundation and the future ISO 30500, will create the conditions to make this possible.

Bringing toilets to the people still lacking access to safe and affordable sanitation is going to be a huge challenge. However, François believes the future ISO 30500 will be the game changer that will help make it happen.

“ISO 30500 will be the reference document for the future exchanges between users, prescribers, manufacturers and laboratories to guarantee that the proposed solutions address this urgent world health problematic,” he says. “It will permit the creation of a new market with a lot of innovative non-sewered sanitation systems and will reduce drastically the diseases linked with lack of sanitation. ISO 30500 is the first step for the development of a local circular economy with the transformation of human wastes into valuable resources.” ■



SUSTAINABLE DEVELOPMENT GOALS



A World Bank report titled *Reducing Inequalities in Water Supply, Sanitation, and Hygiene in the Era of the Sustainable Development Goals* suggests that a drastic change is required in the way countries manage resources and provide key services, starting with better targeting to ensure they reach those most in need, and tackling inefficiencies to make sure public services are sustainable and effective. The scale of the challenge is huge, and installing more toilets (both connected to sewers and to on-site sanitation systems) is an important contribution to improving the quality of life for billions of people. Martin Gambrill, Lead Water and Sanitation Specialist at the World Bank Group, tells us of the highs and lows of the challenges ahead and how ISO standards can help.

ISOfocus: Why is sanitation so important, and why all the attention now? Why do you think this is a relevant subject to have in the public discourse?

Martin Gambrill: The chronic lack of sanitation represents a public health and environmental disaster – but it is a silent disaster to which too few pay attention. Reversing this situation will be extremely costly: the capital investment to reach the urban sanitation SDG target alone is estimated at USD 46 billion per year. We know, however, that this would represent money well spent as sanitation leads to lower incidence of disease, improved nutrition, reduced stunting, improved quality of life, increased attendance of girls at school, healthier living environments, better environmental stewardship, increased job opportunities and wages, improved competitiveness of cities, and economic and social gains to society more broadly.

Is there a way International Standards could help some of the trends/challenges in sanitation that you are concerned about?

Most definitely. The needs are great in the sanitation sector and the costs of providing universal services are daunting. We need to find appropriate and efficient ways of providing services. Some alternative approaches are “condominal” or simplified sewerage that can be laid in unplanned, informal slums with more efficient overall layouts, at lower depths and with smaller pipe diameters, and at significantly lower cost compared to conventional sewerage. Having an International Standard for simplified sewerage would allow the sector to more easily roll out such solutions as it would serve to counter opposition to such unconventional approaches by more conservative design engineers across the world. Similarly, International Standards for appropriate wastewater treatment technologies, which reduce the operational and maintenance costs and, say, the carbon footprint of the plants, would be similarly welcome. As would standards for on-site sanitation systems, be they for rural areas, such as alternating twin pit latrines, or for urban areas, such as properly designed septic tanks.

How can International Standards become a “game changer” for millions of people around the world?

Business as usual, with the use of conventional sewerage and wastewater treatment solutions for every setting in the developing world, will be far too costly to allow us to attain the goal of universal sanitation coverage. Yet by promoting the adoption of appropriate technologies in the sanitation sector, standards can positively encourage decision makers, including funding agencies, governments, service providers, sector specialists and development professionals, to consider such approaches when planning sanitation interventions.



Partners
for

**sustainable
sanitation**

The Bill & Melinda Gates Foundation is working to reinvent toilets and save the lives of 4.5 billion people who lack, or live without, safely managed sanitation solutions.

In this interview, Doulaye Koné, Deputy Director on Water, Sanitation and Hygiene at the Gates Foundation, explains why they reached out to ISO for help.

“If you want to go fast, go alone. But if you want to go far, go together,” says Doulaye Koné, quoting a popular African proverb. He speaks calmly but confidently about his mission to save people’s lives through engineering. A native of Côte d’Ivoire, Doulaye is the Chair of ISO/PC 305, a project committee that exemplifies like no other why standards and innovation go hand in hand.

The committee is working to establish requirements for the next generation of sustainable sanitation systems. They want to reinvent the toilet. “We have been to the moon, and we carry super computers in our pockets, but we haven’t changed our toilets in two hundred years,” explains Doulaye. This ambitious goal to drive innovation through standards came at the request of the Bill & Melinda Gates Foundation, where Doulaye has his day job. So how did this story begin? And why did the Gates Foundation turn to ISO?

ISOfocus: Why is the Gates Foundation interested in toilets?

Doulaye Koné: The Gates Foundation is a philanthropic organization. Our objective is to reduce poverty in the world and ensure that children have equal opportunities

to thrive. One way to do this is to eradicate deadly diseases.

Many of the people reading this interview will have trouble believing that poor sanitation is still a major source of illness. We take our flush toilets for granted, yet according to the Centers for Disease Control and Prevention (CDC), over 800 000 people, many of them young children, die every year because of inadequate sanitation. This is tragic on its own, but the consequences are far-reaching. The World Bank has estimated that poor sanitation costs billions to some countries, amounting to a significant impact on economic growth. As an example, poor sanitation costs the equivalent of 6.3% of GDP in Bangladesh, 6.4% of GDP in India, 7.2% of GDP in Cambodia, 2.4% of GDP in Niger, and 3.9% of GDP in Pakistan – annually.

What solutions are there?

The traditional flush toilet and sewer system as you know it was invented two hundred years ago. It has helped save lives and increase life expectancy in industrialized countries, as acknowledged by the results of an international poll run by the BMJ (formerly the British Medical Journal) in 2007. However, in the last two hundred years, toilet and

Over 800 000 people
die every year
because of inadequate
sanitation.



Doulaye Koné, Deputy Director on Water, Sanitation and Hygiene, Gates Foundation, and Chair of ISO/PC 305.

sewer technology has not changed. These systems aren’t enough anymore, being impractical and too expensive for many developing regions to use as a long-term sanitation solution. First, because water is scarce. Second, because you need energy to collect and treat water, and send it to people’s homes. Both these resources are expensive: flushing six litres of water every time you go to the toilet is a luxury. And that’s only part of the problem. Processing waste is crucial to protect the environment, but it’s also a tremendous energy cost. It’s time to rethink the system. This is what we are working on at the Gates Foundation. We think there is an opportunity to come up with a new service model, a new industry, that can operate off-grid, outside the sewer system. We are working with partners to develop and test a suite of technologies, business and service models. But these solutions will only work with new entrepreneurship, and the right policies and regulations at the national and local levels.

Why did the Gates Foundation reach out to ISO?

Before we came to ISO, I spent almost five years at the Gates Foundation, working with partners to develop new waste treatment technologies that could work off-grid. We weren’t just looking for an alternative, we wanted something better – a toilet that would be safe, environmentally sound and just as comfortable as existing ones. We even partnered up with one of the largest fragrance manufacturers to investigate the possibility of making them odour-proof.

The result? We have found out that it’s possible to create these next-generation toilets. The response has been positive and now we are working on ways to get these toilets used on a large scale. But we don’t represent the global community and we don’t make the rules that can ensure these new technologies are safe and provide consistent quality for users. That’s why we need to work with ISO.

Public restrooms at the top of Mount Sinai.





Simply put, to take our project further, we need partners that can bring stakeholders together to define the rules for this new industry. With a network and expertise that spans the world, ISO is a well-structured organization and one of the best places to do just that. I really like how the standards development process achieves agreement. It's consensus-driven and democratic, and every opinion counts. We can't achieve our goal alone, we need others to join us, so that we can make a much bigger impact by working together.

You are now the Chair of ISO/PC 305. What is your story? What led you here?

When I was a kid growing up in Côte d'Ivoire, my dream wasn't to work on sanitation. I thought I would become an astronaut, or at the very least an airline pilot. I focused all my energy on maths, physics and chemistry and did great at university. But that's where things changed. Most of my friends were at medical school and, through them, I learned that people in my community were dying of preventable diseases like diarrhoea, malaria and typhoid.

Think of how many bathrooms you have at home. Can you drink the tap water? Our toilets get through five, six... ten litres of water every time we flush. In my country, most people don't have the resources to afford that luxury. It's a tragedy that lives are lost because we can't manage human waste.

NASA became a faraway dream as I decided to shift my focus to sanitary and environmental engineering, so that I could save lives doing something I was good at. Soon, I was leading research teams and started work at the Gates Foundation, which later brought me to ISO.

How is the committee working to address this issue?

On-site/off-grid sanitation is a new industry. In order for it to develop, we need guidelines so that innovators can invest their resources smartly. What are we looking for? The same performance and quality of service as conventional solutions, hopefully at a cheaper price. We want products that can serve anyone – a product that can be used just as well in the USA as it can in Nepal or Burkina Faso.

It's time
to rethink
the system.

Find out more:



The solutions available today are expensive, so we need economies of scale to bring down the costs. That's also where International Standards can help by setting specifications for products that meet the needs of a large population. Once standards are adopted in countries, they allow the industry to flourish and compete for delivering the best innovations and services at the most affordable price. A billion people in industrialized countries use toilets that consume a large amount of water and (indirectly) energy, and I am one of these people. Some cities have already started to question the sustainability of such engineering choices and are looking into alternative and innovative approaches. In developing countries, there is an opportunity to serve a large share of the 4.5 billion people with non-sewered solutions that operate as defined in the standard our committee is currently developing.

Interest is growing fast. Ten years ago, a conference or workshop on this subject would draw barely a hundred people; today, we can convene a thousand plus. We need to build on this will and its momentum. Governments from countries like Bangladesh, Burkina Faso, China, India, Nepal, Senegal or South Africa are coming forward to champion new solutions.

I am lucky to be chairing this committee. Before we joined ISO, we were not sure that we would have the right representation to solve this global challenge. Today, we have 46 countries represented in the committee, whose secretariat is co-led by ANSI, ISO's member for the USA, and ASN, the Senegalese ISO member.



I'm really glad to see the active commitment and energetic participation of African and Asian countries. National standards bodies are contributing a lot. Our experts come from all fields, not just sanitation engineering. There are microbiologists, who can talk about the concentration of pathogens and the different solutions available to ensure safety. Industries and academia are also represented, including manufacturers and universities working on new technologies. Finally, there are networks like the African Water Association, which contributes expertise from water utilities and service providers, or The Toilet Board Coalition, which brings together businesses interested in non-sewered sanitation. As you can see, it's a very diverse group and the conversation is always rich and engaging. We are hoping to have this innovative standard ready in 2018, so that it can help ensure better health for millions – if not billions – of people around the world. ■

Waste not !

How ISO is helping to reinvent sanitation

Though it's hard to imagine, 4.5 billion people still live without a household toilet that safely disposes of their waste, spreading killer diseases that undermine health and productivity.

Barama Sarr, Director General of the Association Sénégalaise de Normalisation (ASN), ISO's member for Senegal, explains how a new standard on non-sewered sanitation will allow many in developing regions to flush and forget.



Barama Sarr, Director General of the Association Sénégalaise de Normalisation (ASN), ISO member for Senegal.

Those who
make the standard
make the market.

Answering nature's call can be a nightmare if you live in parts of the world where the only way of bowel emptying is to squat in the open. Lack of proper sanitation is a reality for 600 million people who share a toilet or latrine with other households, and 892 million people – mostly in rural areas – who are forced to relieve themselves in the wild.

Defecating in the open is as old as humankind. As long as population densities were low and the earth could safely absorb human waste, this caused few problems, but as more people have congregated in urban areas, the correlation between hygiene and health has come to light.

According to the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene 2017¹⁾, 2.1 billion people lack safe drinking water at home, and more than twice as many lack safe sanitation. As a result, each year, over 360 000 children under the age of five die from diarrhoea. Poor sanitation and contaminated water are also linked to a cycle of infection and disease that impose a heavy toll on human, economic and environmental health.

Good hygiene is one of the simplest and most effective ways of curbing the spread of disease, but in many developing countries, the remoteness and rugged terrain mean the installation of sewage systems is all but impossible. Developing hygienic, low-water-using toilets that are not connected to a sewer system is therefore critical to saving lives (and personal dignity) in developing countries.

The end of plumbing?

Senegal is no stranger to this problem. That's why the Association Sénégalaise de Normalisation (ASN), ISO's member for Senegal, is co-leading work on a new International Standard for non-sewered sanitation systems that will help our country "clean up its act".

Next-generation toilets, also referred to as non-sewered sanitation systems, are a practical solution for preventing disease and deaths worldwide. In the future, many toilets won't flush waste away to be treated elsewhere; they will treat it on site. The benefits are huge as these sanitation fixtures remove pathogens, yet they do not require traditional infrastructure such as a sewer, water connection or electricity, providing clean, safe and efficient toilet alternatives at affordable cost. Proper sanitation is essential to human progress, for not only does it reduce loss of productivity caused by poor hygiene practices and illness, estimated to cost poorer countries up to 5% of GDP, it empowers communities to grow and thrive.

1) The Joint Monitoring Programme (JMP) report of the World Health Organization (WHO) and United Nations Children's Fund (UNICEF), *Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and Sustainable Development Goal Baselines*, presents the first global assessment of "safely managed" drinking water and sanitation services.

A standard for toilets

A new International Standard is under development to ensure the safety aspects of these next-generation toilets. By documenting the commonly accepted criteria by which to measure the performance of these new facilities, the forthcoming ISO 30500, *Non-sewered sanitation systems – Prefabricated integrated treatment units – General safety and performance requirements for design and testing*, will enhance efforts to widely manufacture, market and deploy the technology of non-sewered sanitation where it is needed most.

While the standard is obviously designed to address sanitation issues worldwide, it will be deployed to best effect in developing countries where it will provide manufacturers with common requirements for these lavatories of a new kind. This, in turn, will allow purchasers to compare performance criteria from supplier to supplier and verify that minimal health and safety criteria are met. What's more, the future ISO 30500 could be used to secure the market with quality designed toilet products or improve regulations and public policy for sanitation.

ISO 30500 is being developed by ISO/PC 305, the project committee on non-sewered sanitation systems, tasked with developing standards for this emerging industry. Meetings are run under the twinned leadership of ANSI, ISO's member for the United States, and ASN, Senegal's national standards body and member within ISO, with financial support from the Bill & Melinda Gates Foundation, the major fund donor for this programme.

Reinventing toilets

As a developing country, Senegal feels honoured and privileged to be part of the leadership of such an important standardization effort, especially because the topic matches perfectly the strategic orientations of the Senegalese authorities for the water and sanitation sector. Political will has resulted in several programmes in recent years aimed at providing people with access to basic social services, including appropriate sanitation facilities.

Such initiatives, including research programmes on non-sewered sanitation and faecal sludge management, conducted with the technical and financial backing of various partners including the Gates Foundation, have helped drastically reduce the problem of open defecation in many areas of the country. While these are important steps, more needs to be done to tackle the question of sanitation. This means that these new technologies, commonly known as “reinvented toilets”, come at just the right time.



First working group meeting of ISO/PC 305 in Dakar, Senegal.

Next-generation toilets
are a practical solution
for preventing disease
and deaths worldwide.



Calling on Africa

Our first mission has been to get the relevant people on board. The significance of the topic and the level of involvement of ASN in the leadership of ISO/PC 305 have been crucial to arouse interest among national stakeholders. Academics, sanitation companies and consumers, amongst others, are all fully engaged in the process with the support of government authorities.

This commitment was materialized by the presence of Senegal's Minister of Industry and Mines at the opening of the first ISO/PC 305 working group meeting, which took place in Dakar in the early months of 2017. To extend the benefit to other developing countries, particularly in the African region, ASN – with the help of ANSI and the Gates Foundation – used its various networks at the regional and international levels to attract a large number of countries to ISO/PC 305.

Thus, in May last year, the Réseau Normalisation et Francophonie (RNF) hosted an ISO workshop in Dakar on the future ISO 30500, specifically targeted at French-speaking countries in developing regions. The ground-breaking meeting helped spread the word about ISO/PC 305, and the importance of its work for developing countries, and was also an opportunity to bring national standards bodies and technical experts up to speed on the ISO process.

Powers of influence

The Dakar workshop was a resounding success and brought several countries into the fold of ISO/PC 305. In the wake of this achievement, a second workshop was held in Morocco in August 2017 with similarly positive results. Our outreach efforts have since been extended to the Economic Community of West African States (ECOWAS) as well as the African Standardization Organisation (ARSO) and the African Water Association (AfWA), which is also a liaison member of ISO/PC 305.

Currently, a total of 17 out of 31 participating members of ISO/PC 305 come from Africa. Without their participation in the work of ISO 30500, the French-speaking countries of Africa, and elsewhere, would end up being “receivers” rather than “influencers” of the standard. Yet, as we all know, influencing the development of an International Standard in a proactive way ensures that it will deliver the products and services our country needs, as it needs them. After all, those who make the standard make the market. ■

Turning **waste** into **PROFIT**



Photo : Umande Trust

Lack of sanitation is a public health disaster in many African countries and Kenya is no exception. Eight million people who live in informal urban settlements still don't have access to a clean toilet. But things are slowly changing: in Kenya's slums, a revolutionary initiative is turning human waste into clean energy. Ms Aidah Binale-Ebrahim, Executive Director of Umande Trust, explains.

When you walk the streets of Kibera, the Kenyan capital's largest slum, there is one golden rule that must always be observed: don't step on any plastic or paper bag you see on your path. Among the piles of rubbish littering the dusty roads are what are known as "flying toilets" – locals defecating into bags at night, then tossing them by the wayside. The high population density in slums, combined with the lack of infrastructure and resources, means Kenya's eight million slum residents are forced to rely on unsanitary options such as open defecation and pit latrines that release untreated human waste into the environment.

It is thought that some four million tonnes of faecal sludge escape into Kenya's waterways and fields every year. This leads to 1.5 million people dying from diarrhoea, according to World Health Organization (WHO) estimates, with a correspondingly high financial cost, as studies show that Kenya loses USD 324 million each year in missed work hours due to sickness brought on by poor sanitation.

But poverty need not impede sanitation improvement, says Umande Trust, a rights-based agency with a mission to improve water, sanitation and environmental services in the urban centres of Kenya. The organization has pioneered a way to increase the incomes and savings of community members through giving them ownership over community sanitation facilities and now runs nearly 60 bio-centres (public toilets) across Nairobi's informal settlements.

From faeces to fuel

Known across the land for its bio-centres, Umande Trust believes that even modest financial resources can significantly improve access to water and sanitation services if they are strategically invested in community-led plans. Umande, in Swahili, means "dew", a symbol of new beginnings, for the agency has come up with an innovative approach to provide affordable toilets for poorer communities. Bio-sanitation, as it is known, is premised on the need to "close the loop" in the waste management process and thus turn waste into a resource. Using a revolutionary technology, human faeces are fed into a bio-digester to produce biogas for fuel. Without oxygen, the bacteria found naturally in poop thrive, creating methane and carbon dioxide in a mixture known as biogas, which is used as fuel in poorer communities.



Children living in the slums of Kibera in Nairobi, Kenya.

The system varies from ordinary ablution blocks in that it doesn't utilize water to flush away faecal waste, providing solutions to wastewater mismanagement by reducing pollution leached into water bodies. These human waste digesters are based on the Ecosan principle characterized by the safe handling of waste through containment, sanitization and reuse, so that drinking water supplies are not threatened, direct human exposure is not possible, waste is inaccessible to vectors, insects, rodents or other potential carriers, and odour or aesthetic nuisances are eliminated. Umande Trust works closely with partners and the community to make sure all bio-centre employees are properly trained for handling wastewater and wear personal protective equipment. The biogas generated from human waste is used for cooking and lighting in the local community centre,

markets and schools. It is also stored in puxin bags to be used in households away from the centre for a small fee. What's more, the by-product is turned into organic fertilizer to sell to farms for soil enhancement, generating income for the community. So everybody wins.

Designed to standards

In setting up its bio-centres, Umande Trust looked to ISO 24521, which gives practical guidance on the management and maintenance of basic on-site domestic wastewater services. The standard also offers advice on training users and operators, evaluating risks and making use of alternative technologies that can be installed using local resources. Bio-digesters are one of these technologies.

Umande also used ISO 24510 for general management and provision of services, while ISO 24511 and ISO 24512 dedicated to infrastructure and management components of water and wastewater utilities helped the agency develop performance indicators to suit its individual objectives.

All these standards have the backing of the Kenya Bureau of Standards (KEBS), ISO's member for the country, and contribute to giving these bio-centres a framework while generating confidence among users.



Using biogas to cook rice.



Public toilet in Nairobi, Kenya.

How it works

A basic biogas system involves an anaerobic digester (usually underground) with an inlet pipe, an outlet pipe, specially designed burners and a tube for the biogas collection and storage component. Waste falls into a helical, screw-shaped conveyor that is moved every time the toilet seat is lifted. Over the course of 25 days, the waste is slowly dehydrated and gradually moved on to its final destination: a reusable collection bag.

A few figures

One cubic metre of biogas made from human waste generates up to 5 500 kcal/m² of heat energy when burning effectively. That's enough to boil approximately 100 l of water under ambient conditions or light a lamp with a brightness equivalent to 60 W to 100 W for up to five hours. In terms of engine fuel, 30 m³ of biogas are equivalent to approximately 18 l of diesel oil.

Bathrooms and more

By design, the bio-centres are more than just toilets. They are public spaces where people come to watch soccer matches, hold meetings, study for school, lift weights or cook lunch. Beyond these socializing aspects, bio-centres also provide areas for self-employment and income-generating activities, acting as profit centres for local community entrepreneurs.

Each centre runs on a pay-per-use model, often using cashless payment systems for added security, and generates revenues of up to 120 000 Kenya Shillings – approximately USD 1200. With the funds that the toilet operators gain from people using these facilities, they can save and lend the profits to community members, pay for their staff and general upkeep, and pay Umande Trust a small amount so it can expand its services and build toilets in additional communities.

The overall aim of bio-centres is to develop sustainable and scalable models for efficiently delivering safe, accessible and decent sanitation to the poor living in Africa's urban informal settlements. The community lending scheme ensures that the project not only improves the health of the community but also gives people the opportunity to escape poverty through their social business ventures.

Today, just over a decade since opening shop in Africa's largest slum, Umande Trust's bio-centres remain functional, profitable and, above all, used: tens of thousands of people frequent these toilets each day, which are known to be secure, comfortable and safe for all. ■

AND THE AWARD GOES TO...

The US Academy of Television Arts & Sciences has awarded an Emmy for outstanding achievement in engineering to the expert group responsible for “High Efficiency Video Coding (HEVC)”, the video compression standard that has emerged as the primary coding format for Ultra-High Definition TV. The Emmy honours the achievements of the ISO/IEC Moving Pictures Expert Group of ISO/IEC JTC 1’s subcommittee 29 and the Joint Collaborative Team on Video Coding, a team of experts representing the ITU Video Coding Experts Group of ITU-T Study Group 16.

“It is a real pleasure to see the work of our experts recognized in this way,” said Sergio Mujica, Secretary-General of ISO. “This group, which is at the forefront of innovation and technology in video, shows how successful we can be when we work together with a common aim.”

Video accounts for about 75% of all consumer Internet traffic, a figure expected to rise to over 80% by 2020. The majority of this video is coded using international standards developed in collaboration by IEC, ISO and ITU. The collaboration is working towards delivering a new video coding standard to succeed HEVC by 2020, which will again feature double the compression capability of its predecessor.



UN OPEN DAY

In October 2017, some 14 000 people visited the Palais des Nations in Geneva, Switzerland, to discover the city’s long tradition of international cooperation and how it supports the United Nations Sustainable Development Goals (SDGs) for world peace and prosperity.

As one of many organizations representing International Geneva, ISO had the opportunity to showcase several of its standards that help further the achievement of the SDGs – the main thread running through the whole exhibition. ISO was present in two different locations. It shared a stand with other international organizations where visitors could learn about ISO standards through fun activities, including a magnet board on water standards, a colouring book for kids and a snakes and ladders game on smart cities. It also featured on the “SDG cubes”, a set of 17 booths scattered around the Palais des Nations to explain each of the SDG goals and promote a better understanding of the world’s Agenda 2030.

The UN Open Day, which provided unique insights into the work of Geneva-based international organizations, was also the last chance to visit the Palais des Nations before ambitious renovation works, due to happen over the next five years.

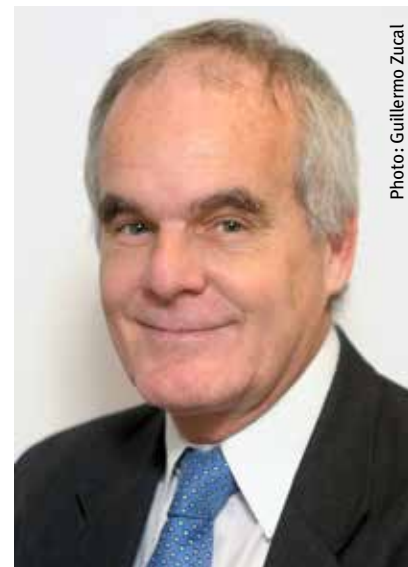


Photo: Guillermo Zucal

NEW CHAIR FOR COPOLCO

ISO’s committee on consumer policy (ISO/COPOLCO) has a new Chair, effective January 2018, in the person of Guillermo Zucal from IRAM, ISO’s member for Argentina. Mr Zucal also serves as the Safety, Health Management and Sustainability Manager at IRAM’s Standardization Division, and is the Coordinator of IRAM’s Consumer Committee.

With long-standing experience in standardization and consumer protection, Mr Zucal is recognized for his work in capacity building and inclusion of consumer representatives in standardization. A former consultant for the Argentina National Consumer Defence Secretary, he has been involved for over 15 years in major consumer organizations in Argentina, such as Acción del Consumidor (ADELCO) and Consumidores Argentinos.

ISO/COPOLCO studies the many ways by which consumers can benefit from standardization, how best to promote the positive role of standards in consumer protection, and how to channel consumers’ views into standards projects in areas of particular interest to them.

Guillermo Zucal succeeds Ratna Devi Nadarajan (DSM – Malaysia), who completed her second consecutive two-year term as Chair in December 2017. At its September meeting, ISO Council expressed its thanks for Ms Nadarajan’s valuable services to the committee.



SMART CITIES PUT PEOPLE FIRST

Developing smart city solutions that are citizen-centric and offer real value will be key to future success, according to experts at the World Smart City Forum held at Fira de Barcelona as part of the Smart City Expo World Congress.

Opening the Forum, Spain’s Secretary of State for the Information Society and Digital Agenda, José María Lassalle Ruiz, highlighted the importance of putting people’s needs at the centre of future urban development. “Some believe that data and algorithms will soon be managing the contemporary world, but they must be used to combat inequality and poverty in our towns and cities. Today, our efforts must be focused on reconciling man and his environment,” he said.

Putting citizens at the centre was also something highlighted by UN-Habitat’s Acting Chief of Office for Europe and European Institutions,

Paulius Kulikauskas, who emphasized this opportunity to ensure that proper and well-organized urbanization is a key driver of sustainable development. The role of standards in supporting collaboration and the sharing of resources was also highlighted by Marijn Fraanje, CIO for the Municipality of The Hague. Fraanje referenced a project in the Netherlands where the five biggest cities focus on different aspects of a smart city and then share findings and resources, with The Hague looking at cyber security.

The World Smart City Forum was organized by the IEC, ISO and ITU, this year under the leadership of ISO, and is part of the World Smart City partnership. It brought together representatives of cities, standards development organizations, industry groups and investors to explore some of the major challenges cities face today and how international standards can help solve them. For the full overview of the Forum: www.iso.org



ISO SECRETARY-GENERAL MEETS WITH MEMBERS

In October 2017, ISO Secretary-General Sergio Mujica embarked on an advocacy tour spanning Africa and the Americas, aimed at supporting the outreach objectives of ISO members in those regions.

Coinciding with World Standards Day, the tour began on a festive note with invitations to celebrate the 60th anniversary of SAZ, ISO’s member for Zimbabwe, and attend the SABS Standards Week, hosted by ISO’s South African member. On both occasions, the festivities combined with interesting debates centred around standards development and competition law in South Africa, and how best to keep serving Zimbabwe to accomplish business excellence through standards.

Meetings with ISO’s Brazilian member (ABNT) were equally successful, not least because the country is such a leading economy in the region. Mr Mujica, who was most impressed by ABNT’s commitment to ISO, met with key ABNT stakeholders from government and industry to discuss the importance of Brazil’s participation in ISO for the national economy and how standards can help local companies be more competitive internationally.

The last leg of the trip took Mr Mujica to Nassau, where he visited ISO’s Bahamian member BBSQ. Addressing private and public-sector entities, he stressed the importance of a national quality infrastructure for The Bahamas and other Caribbean states and highlighted the impacts of international standardization for businesses, policy makers and consumers across key sectors of the Bahamian economy.

WATER FOR SUSTAINABLE DEVELOPMENT

This year marks the start of the International Decade for Action – “Water for Sustainable Development” (2018-2028) to help put a greater focus on water during ten years. This results from deep concerns over the lack of access to safe drinking water, sanitation and hygiene and over water-related disasters and scarcity that are being exacerbated by urbanization, population growth, desertification, drought and climate change.

The new Decade will focus on the sustainable development and integrated management of water resources for the achievement of social, economic and environmental objectives and on the implementation and promotion of related programmes and projects. It will seek to encourage cooperation and partnership at all levels to meet internationally agreed water-related goals and targets, including those contained in the United Nations 2030 Agenda for Sustainable Development.

More than seven hundred ISO standards provide global tools to help us manage our shared water resources equitably and durably. They facilitate sustainable water management and increase water potential, helping to alleviate the scarcity of this precious resource.



Fresh changes *in the pipeline*

by Ann Brady

Ageing wastewater systems are under threat from growing populations, urbanization, pollution and climate change, not to mention human behaviour. However, despite these challenges and fears for health and safety, the new ISO 24516 series is playing a key role in turning what many consider a burden into a valuable resource.



A pipe clogged with fats, oil and grease, nicknamed the “fatberg”, was found blocking a London sewer.

The alarm goes off and, as we roll out of bed, the daily routine kicks in – flush the toilet, take a shower, maybe run a bath, fill the kettle for the vital morning cuppa, perhaps turn on the washing machine and unload the dishwasher from the night before.

Most of us don't give any of this a second thought until a blockage or a faulty part means having to search for the plunger or call in a plumber. We certainly don't spend much time – in fact, probably none first thing in the morning! – thinking about what happens to the water that is flushed into the sewage system or that drains away from the white goods in our kitchens. When we turn on the tap for the kettle, unless the water is a strange colour or smells, we take it for granted that the quality is good and it is safe to drink. But what happens to this wastewater and other “waste” products such as the fat that we poured down the sink after last night's dinner? Last summer, the media reported on a massive block of fat, nicknamed the “fatberg”, that was found blocking a London sewer. *The Guardian* newspaper said it was the size of 11 double-decker buses and stretched the length of two football pitches. As well as fat and grease, it contained nappies and baby wipes that had been flushed down lavatories. This was indeed a monster, but similar fatbergs, although smaller, are found around the world in all wastewater transport systems.

Feeling the strain

The fatberg example is just one of many horror stories emerging that indicate our wastewater systems are coming under increasing strain, not only from human behaviour but also pollution, extreme weather events such as flooding, intense agricultural practices, ageing sewers and the demands of a growing population worldwide. And, of course, plastics, among other non-disintegrating, non-biodegradable materials used in sanitary and other products, are often flushed after use because they tend to be used in bathrooms.

The facts and figures on plastic pollution are stark. According to a report, *Towards the Circular Economy: Accelerating the scale-up across global supply chains*, published by the World Economic Forum (in collaboration with the Ellen MacArthur Foundation and McKinsey & Company), in the United States, “plastic waste sent to landfill tripled to 11.3 million tonnes in 2008 from just 3.4 million tonnes in 1980, whereas total waste shrank by 16% in the same period. Plastics and their applications have proliferated faster than recovery systems have adapted”.

It is little surprise, therefore, that Goal 6 of the UN Sustainable Development Goals, the United Nations' roadmap to create a better world future by 2030, is: “Ensure access to water and sanitation for all”. Guidelines and standards on best practice, quality and safety in this field have never been more important and the ISO 24516 series plays a key role in helping to meet these challenges. There are four parts to ISO 24516, with two standards already published, on drinking water distribution networks and wastewater collection networks; and two under development, on waterworks and wastewater treatment plants.

Need for good governance

Bruno Tisserand, the Chair of ISO/TC 224, the technical committee relating to drinking water supply systems and wastewater systems, applauds the fact that Goal 6 is pushing the problems into the front row. He says: “Innovations are key, but efficient operations are crucial and depend on good governance. I think that ISO can play a role to promote good practices in water services governance.”

He explains that the first three standards, published in 2007, were addressing the overall principles and good practices of water and wastewater service operations. “They were built



for any kind of situation, either an existing high-level service or an area with no service at all.” The last published standards will help to “build an asset management strategy, as well as the necessary tools and decision-making process to keep the infrastructures efficient for the long term at the most affordable cost”.

As Research Program Director for Cities at Veolia, a multinational company that designs and provides water, waste and energy management solutions, Tisserand is keenly aware of the pressures on wastewater systems from growing urbanization. Bigger cities, he says, are more sensitive to the two main impacts of climate change: not enough water (water scarcity and droughts); and too much water (flooding). During 2017’s hurricane season in the United States, for example, wastewater treatment centres in Florida and Texas were overwhelmed. After Hurricane Irma, Bloomberg reported that 500 000 gallons of wastewater flooded St Petersburg and Orlando, with another six million gallons flowing out to the coast of Key Biscayne.

Tisserand points out that more and more people are living close to the sea, often in regions where freshwater is scarce. “This is already an additional challenge in a lot of countries where the rising sea level is becoming a major problem,” he says. “The saltwater intrusion in sewer pipes makes wastewater treatment more complicated.”

Veolia takes an “open-innovation” approach to find solutions for such problems, for instance, by supporting start-ups in areas where water supply is limited. In Mexico, one such start-up is working on a technological solution to recover wasted water, generating benefits for the local municipality as well as Veolia.



Finding a solution

Although advances have been made in many areas, especially in technological progress, many water services are struggling to cope with modern pressures. Duncan Ellison, former Executive Director of the Canadian Water and Wastewater Association, and an active participant in ISO/TC 224, says there are two solutions: “Convincing manufacturers to identify only those products whose physical and chemical properties are similar to toilet paper in respect to the product’s physical disintegration and biodegradation within wastewater transport and treatment systems; and convincing consumers, regardless of product labelling, that the only materials that should be flushed are the three Ps: toilet Paper, Pee and Poop.”

He says that testing done by wastewater utilities has found that many products marked flushable do not disintegrate physically in the hydraulic and mechanical environments of wastewater transport systems and do not biodegrade in wastewater treatment environments. “Hence,” he says, “they tend to accumulate in the transport system or pass through the treatment system to be discharged in the receiving bodies of water into which treated wastewater is discharged.”

There is good news, however. Ellison says that ISO/TC 224’s working group WG 12 is now seeking to establish the hydraulic, mechanical and environmental conditions to help guide manufacturers in designing products that will not contribute to clogging of screens and plugging of pumps, or to discharging non-biodegraded fibres into the aquatic environment. If this is successful, he says, “it will help eliminate, in the future, products being misidentified as being flushable”. He adds that, on a more general basis, “all the ISO/TC 224 standards are tackling issues of water and wastewater services to improve their management and efficiency”.

Africa is one region that has had to deal with the issues of a fast-growing population and rapid urbanization and their impact on wastewater systems. Sylvain Usher, Executive Director of the African Water Association, another active participant in ISO/TC 224, says one big challenge is the adaptation of new innovative technologies related to wastewater treatment that fit Africa’s environment as well as the involvement of new private entrepreneurs in on-site sanitation systems management.



Many water services
are struggling
to cope
with modern
pressures.

Raising awareness

Another challenge, he says, is “raising awareness of financiers to understand that wastewater and faecal sludge can even be a financial resource”. This last point is echoed in the *World Water Development Report*, published by the UN in March 2017, which says that wastewater from homes, industry and agriculture should be seen as a valuable resource to help meet the needs of a growing global population. Richard O’Connor, the report’s Editor-in-Chief, says wastewater contains nutrients such as phosphorous and nitrates that can be turned into fertilizer. Moreover, treated sludge could be turned into biogas that could power wastewater treatment plants.

Perhaps the biggest challenge of all, though, is lifting what Usher calls the “psychological barriers” to wastewater recycling and reuse in Africa. In the meantime, he says, “we need a wider and in-depth development of engineering related to on-site sanitation. And ISO standards are helping in that way”, particularly in guidance to local authorities.

Tisserand, who is also President of EurEau, the organization that is the voice of Europe’s drinking water and wastewater service operators, sums up: “We all know we need to find a solution to provide both water and wastewater services at the same time if we don’t want to face major epidemical diseases like we had two centuries ago in Europe.” However, he is upbeat about the future: “We helped to describe what to do – and how to do it. Now, let’s do it!” ■



