Specialist Group on Water Reuse

Newsletter: April 2016

Editorial Board: Michael Muston, John Anderson, Thomas Wintgens, and Jörg E. Drewes

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EDITORS NOTE

We would like to make this newsletter as relevant to all of you as the members of the IWA Specialist Group on Water Reuse and so it is important that we get a balance of news and technical input from across the continents that are represented by the Specialist Group.

If you have any news item that you think is relevant or wish to make a technical contribution (note this is not a technical journal but we do like to learn from the experience of others) or other feedback that will help to improve the value of the newsletter, please email your information to Michael Muston – qem@1earth.net (Newsletter editor)

Disclaimer: *This is not a journal, but a Newsletter issued by the IWA Specialist Group on Water Reuse. Statements made in this Newsletter do not necessarily represent the views of the Specialist Group or those of the IWA. The use of information supplied in the Newsletter is at the sole risk of the user, as the Specialist Group and the IWA do not accept any responsibility or liability.*

MESSAGE FROM THE GROUP CHAIR

Dear Colleagues, dear Young Water Reuse Professionals,

I am very happy to report that the call for papers for the 11th IWA International Conference on Water Reclamation and Reuse in Long Beach, California has just been released and we are gearing up at several fronts now for our prime event in 14 months from now. I firmly believe that this meeting is going to be a great conference at a location with a very long track record in non-potable and potable water reuse. There is much to learn and see during this event and you don't want to miss it. I very much encourage you to submit a paper to this conference. You will find more information about important dates, conference topics and logistics for this event in this newsletter.

In the last couple of months, we had several exciting developments in water reuse around the globe and this newsletter provides you with some updates on these recent activities. The World Health Organization is finalizing its new document *"Guidelines for Potable Water Reuse"*, which is scheduled to be released in July 2016. With this document, WHO is providing very specific guidance on the practice of drinking water augmentation with recycled water. In Europe, the European Commission is working on the development of minimum requirements for water recycling for agricultural irrigation and indirect potable reuse via groundwater recharge. This is also the first time, these reuse practices are being pro-actively addressed in Europe. A draft document of these requirements has just been released this month for public comments. This is a big step forward to grow water reuse in Europe. In the USA, the feasibility of direct potable reuse (DPR) is currently being investigated as part of a major research program and later this year an expert panel report assessing the feasibility to develop regulations for direct potable reuse in California is expected to be published. These recent developments underscore the fact how much water reuse practices and approaches are becoming core elements of diversifying water resource portfolios worldwide, but also how much water reuse is pushing the boundaries of the water sector.

I am also happy to report a growing momentum to get our new Young Water Reuse Professional (YWRP) group off the ground. Please help me in spreading the word to get our young colleagues involved in the exciting developments and engineering practice of the water reclamation and reuse field.

Later this year, the WRSG is organizing a workshop on potable reuse during the IWA World Congress in Brisbane, Australia. Since several of you are planning to join that event, we are planning to organize a Specialist Group meeting during that event. Please stay tuned regarding meeting location and time.

With that, please enjoy reading about the recent developments in water reuse in another issue of the WRSG Newsletter!

With best regards,

Jörg E. Drewes,
Chair, IWA Water Reuse Specialist Group

THE 11TH IWA WATER REUSE CONFERENCE ON 23-27 JULY 2017 – MARK YOUR CALENDARS!

Reported by Melissa Meeker and Jeff Mosher, USA

Dear Friends and Colleagues,

On behalf of the organizing committee, we would like to invite all colleagues to attend the 11th IWA International Conference on Water Reclamation and Reuse in Long Beach, California on July 23-27, 2017.

We are very pleased to hold this prime event of IWA on water reclamation and reuse for the first time in North America. This international conference is intended to foster a more uniform approach to water reuse providing water qualities that are fit for the specific purpose. This event will provide an opportunity to share knowledge regarding water reuse practices in different countries in order to build trust and further grow water reuse projects. The focus will be to bring together water managers, industry leaders, and cutting edge researches to learn what's working, what's not and what's next in water reuse policy and regulations, technology, operations, financing and public perception.

Around the world, population growth, climate change, drought and other factors are impacting the availability of sustainable sources of clean, safe sources of potable water. As a result, the water industry is experiencing an unprecedented growth in water reuse projects. California is one of those places where the application of water reuse has risen dramatically. The State is entering the fourth year of the worst drought in a century, which has severely strained the traditional supply of water – lakes and rivers fed by rain and melting snow.

The prolonged drought in California has resulted in groundbreaking emergency measures being enacted throughout the state and intense focus on increasing the use of recycled water over the next 10 years. The state is leading the nation in developing statewide regulations to ensure a safe supply of water from water treatment facilities that recycle water directly for human consumption.

California is home to a number of world-class water reuse facilities and projects, as well as some of the most sophisticated fit-for-purpose reuse operations in the world. The situation in California provides a relevant and useful case study for the water supply challenges that communities around the world have and will be facing in the future, and we look forward to welcoming the IWA International Conference on Water Reclamation and Reuse to California.

ABOUT LONG BEACH

Located in the heart of Southern California, the City of Long Beach is the perfect setting for a successful conference. The community blends the urban sophistication of a big city with the relaxed atmosphere of a beach resort. With 345 days of sunshine annually and year-round temperature of 23°C, visitors can enjoy all that the outdoors have to offer, including more than 8 km of breathtaking beachfront along the Pacific Ocean. Long Beach has consistently been chosen as one of the top 10 "most walk-able" cities in the country and is further augmented by transportation systems throughout the downtown area. Long Beach is located within 40 km of two international airports.

CALL FOR ABSTRACTS

This international conference is intended to foster a more uniform approach to water reuse providing water qualities that are fit for the specific purpose. This event will provide an opportunity to share knowledge regarding water reuse practices in different countries in order to build trust and further grow water reuse projects. The focus will be to bring together water managers, industry leaders, and cutting edge researches to learn what is working, what's not and what is next in water reuse policies and regulations, technology, operations, financing and public perception.

We invite you to submit your best case studies and experiences that follow the full life-cycle of recycled water. How do we regulate reuse? How are we expanding the boundaries of how recycled water is applied? How can we better integrate water reuse and energy recovery from waste streams? What are your success stories of planning and implementation? How has technology opened new horizons? How can we enhance water reuse in developing countries?

Do not miss the opportunity to tell your story to the world's leaders in water reuse while attending the 11th Annual IWA International Conference on Water Reclamation and Reuse in Long Beach, CA! Check out the conference website to get all the latest information and submit your abstract at: http://iwareuse2017.org/

CONFERENCE TOPICS

Water Reuse Management
Regulatory policies, water reuse planning
Risk management
Challenges and strategies in setting public health regulations on emerging contaminants
Triple Bottom Line/Life-cycle assessments in water reuse planning
Role of source control and wastewater treatment plant operation in reuse applications
Public perception/education and outreach

Water Reuse Sustainability
Food-Energy-Water Nexus
Integrated resource recovery and reuse water
Water supply resiliency/Integrated water resource management
Environmental impacts and mitigation (Greenhouse Gas Emissions)
Reuse in developing countries
Integrated resources planning

Water Reuse Applications
Agricultural reuse
Groundwater recharge (soil-aquifer treatment and aquifer storage & recovery)
Potable water reuse (indirect and direct) via groundwater recharge and surface water augmentation
Industrial and commercial reuse
Water reuse in the mining sector
Zero waste discharge reuse schemes
Environmental restoration
Non-potable urban settings

Innovations in Water Reuse Technologies
Advances in monitoring and sensors/ real time monitoring
Energy efficiency, energy recovery, and carbon neutral approaches
Treatment technology advances
Water quality control strategies in water reuse (chemicals of emerging concern; antibiotic resistance; emerging pathogens)
Salinity management
Young Water Reuse Professionals Research Session

TECHNICAL PAPERS

Please note that all accepted abstracts will be asked to submit a full paper and selected papers will be peer reviewed for publication in the *Journal of Water Reuse and Desalination* and *Water Science and Technology.*

Would You Be Willing to Provide a 3-5 minute Video of Your Presentation?

Speakers are welcome to present a 3-5 minute video to be shown during the conference. This video will be an abbreviated version of your conference presentation and will be grouped together with other videos in the same subject area and then played on a loop for conference attendees to view in the foyer area.

IMPORTANT DATES

October 1, 2016 – Abstracts Due
December 15, 2016 – Authors Notified
April 15, 2017 – Papers Due
June 30, 2017 – PowerPoint Presentations Due

For more information, please see (the following URL will be active after April 18, 2016):

http://iwareuse2017.org/

Contact person:
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CALL FOR PROPOSALS TO HOST THE 12TH IWA WATER REUSE CONFERENCE IN 2019

Make an impact and host the prime international event in water reclamation and reuse!

With the 11th IWA International Conference on Water Reclamation and Reuse approaching fast, the WRSG Management Committee cordially invites proposals to host the **12th IWA Water Reuse Conference in 2019**. Proposals to host the 2019 event will be presented at the 11th IWA Water Conference in Long Beach, California scheduled for July 23-26, 2017.

Applicants interested in submitting a proposal are encouraged to review the document *"Guidance Notes for Organisers of IWA Conferences"*, which can be found on IWA's website. Proposals consist of a report addressing topics listed in the IWA Guidance Notes and a Powerpoint presentation to the WRSG Management Committee at the 11th IWA Water Reuse Meeting by representatives of the proposing teams. The Management Committee of the WRSG will evaluate these proposals and make recommendation of the winning team to IWA HQ.

Proposals are due by May 31, 2017 in electronic format and should be submitted to the Chair of the WRSG (jdrewes@tum.de) or WRSG Secretary Jiangyong Hu (hujiangyong@nus.edu.sg).

WORLD HEALTH ORGANIZATION IS LAUNCHING POTABLE REUSE GUIDELINES

Reported by Shane Snyder, USA

The World Health Organization (WHO) is currently in process of developing potable water reuse guidelines, which are slated to be released during the Singapore International Water Week (SIWW) meeting in July of this year. The WHO previously addressed the topic of potable reuse in a forward-looking report in 1975, entitled *"Health effects relating to direct and indirect re-use of waste water for human consumption"* [1]. Interestingly, the 1975 WHO document discusses some of the same challenges and opportunities that are currently being considered, such as the use of bioassays for monitoring water quality and the need for on-line sensor systems for process monitoring. The potable water reuse guidelines under development are to augment the more comprehensive Guidelines for Drinking Water Quality (now in the 4th edition) [2]. WHO guidelines are recommended values for the protection of public health, but are not meant to be mandatory limits such as those set by national authorities. Thus, the WHO potable water reuse guidelines seek to identify and address the unique challenges involved with development of an engineered reuse system and corresponding water safety plans.

The reuse guidelines begin with an overview of the drivers for potable reuse and the recognition that unplanned potable reuse is already a reality for vast portions of the world. The reuse guidelines then address health-based targets; of particular interest is the recommended log-removal for pathogens and discussions on emerging chemical contaminants. It is important to specifically note that new guideline values for individual chemical constituents are not developed in the reuse guidelines, but rather, discussion of the topic generally along with current information on monitoring techniques. A chapter on water safety plans discusses the treatment technologies that are often considered for potable water reuse along with corresponding operational monitoring programs. The potable reuse guidelines also provide case studies from Africa, Australia, Singapore, and the USA, which discuss not only the treatment schemes employed, but how public communication strategies were employed.

While several countries have developed their own potable reuse regulations and/or guidelines, the WHO reuse guidelines are highly anticipated as they represent a consensus agreement based on the collective wisdom of experts from around the globe. While the report is still being edited and reviewed, the authors are hopeful that a draft will be available for public dissemination by the SIWW meeting in July of this year.

[1] WHO, *Health effects relating to direct and indirect re-use of waste water for human consumption*, in *Technical Paper Series*. 1975, World Health Organization The Hague, The Netherlands. p. 56.
[2] WHO, *Guidelines for drinking-water quality: fourth edition*. 2011, World Health Organization.

EUROPEAN COMMISSION – PROPOSAL FOR MINIMUM REQUIREMENTS FOR WATER REUSE FOR AGRICULTURAL IRRIGATION AND INDIRECT POTABLE REUSE

Reported by Jörg E. Drewes, Germany

The potential role of water reuse as an alternative source of water supply is now well acknowledged and embedded within European and national strategies. Water reuse has been identified as a top priority area in the Strategic Implementation Plan of the European Innovation Partnership on Water, and maximization of water reuse is a specific objective in the Communication "Blueprint to safeguard Europe's water resources".

In preparation of proposed legislation for 2017, a first draft document entitled ***"Development of minimum quality requirements at EU level for water reuse in agricultural irrigation and aquifer recharge"*** has been developed by the Joint Research Centre (JRC) of the European Commission. The main scope of this document is to propose minimum quality requirements for water reuse in two specific water reuse areas: agricultural irrigation (crop irrigation) and aquifer recharge (direct recharge). The intent of these requirements is to ensure appropriate health and environmental protection and thus provide public confidence in water reuse practices at EU level.

This document refers to water reuse for agricultural irrigation and aquifer recharge. Each of these categories is subdivided in sub-categories as follow:

- **Agricultural irrigation**: (ISO, 2015)
  - Food crops to be eaten raw: crops which are intended for human consumption to be eaten raw or unprocessed.
  - Processed food crops: crops which are intended for human consumption not to be eaten raw but after a treatment process (i.e. cooked, industrially processed).
  - Non-food crops: crops which are not intended for human consumption (e.g. pastures, forage, fiber, ornamental, seed, forest, and turf crops).
- **Aquifer recharge:**
  - Recharge of aquifers which are **not** used as a potable water source: aquifer recharge via surface spreading or direct injection into an aquifer not used for the production of potable water.
  - Recharge of aquifers which are used as a potable water source: aquifer recharge via surface spreading or direct injection into an aquifer used for the production of potable water or as seawater intrusion barrier.

Recommended reclaimed water quality for agricultural irrigation

The recommended reclaimed water qualities for each type of use are divided into different categories according to the level of additional treatment. These categories are named as following:

- Very high quality
- High quality
- Good quality
- Medium quality (secondary effluents, Directive 91/271/EC)

The criteria includes reclaimed water uses, indicative treatment processes, achievable pathogen log reductions (log removal credit for the polishing treatment process), additional preventive measures, exposure reductions and water quality objectives that support the "fit-for-purpose" approach adopted in this document.

Recommended reclaimed water quality for aquifer recharge

The reclaimed water quality recommended for recharging aquifers that are used as a potable water source is the water quality requested for drinking water under the Drinking Water Directive 98/83/EC

(DWD) concerning the quality of water intended for human consumption. For the purposes of the minimum requirements, water intended for human consumption shall be wholesome and clean if is free from any microorganisms and from any substances which, in numbers or concentrations, constitute a potential danger to human health, and meets the minimum requirements set out in Annex I, Parts A and B This recommendation is valid for the two main types of aquifer recharge methods, surface spreading and injection.

The reclaimed water quality recommended for recharging aquifers that are not used as a potable water source has to take into account the Groundwater Directive 2006/118/EC (GWD) on the protection of groundwater against pollution and deterioration. The objective of the GWD is to protect groundwater against pollution and deterioration through the establishment of specific measures to prevent and control groundwater pollution, as provided for in Article 17 of the WFD. These measures include in particular (Article 1) "*criteria for the assessment of good groundwater chemical status; and criteria for the identification and reversal of significant and sustained upward trends and for the definition of starting points of trend reversals"*. "Good groundwater chemical status" is the chemical status of a body of groundwater, which meets all the conditions set out in Table 2.3.2 of Annex V of the WFD.

Contaminants of emerging concern

Besides already regulated pollutants, contaminants of emerging concern (CECs), including biocides, hormones, pharmaceuticals, personal care products, etc. and their transformation products raise increasing attention as they are regularly found both in treated urban wastewater and in the environment. A possibility of these substances having an impact on the environment due to their carcinogenic, teratogenic and/or mutagenic, endocrine disruption and other adverse effects cannot be neglected, since currently there is no comprehensive understanding of their behaviour, fate and biological potency after their discharge or on flora and fauna species present in the environment during reuse applications. Also, the mixture effects of pollutants are not well understood yet. Nevertheless, there is a strong evidence of ever increasing number of CECs in the environment and therefore a selection of performance indicators for CECs and their surrogates such as bulk parameters or indicators of occurrence are required.

In order to improve knowledge about the emerging contaminants that are suspected to present a risk for water reuse purposes and may be relevant for regular monitoring in reclaimed water before its use for potable or non-potable aquifer recharge, a watch list mechanism similar to the one in place for surface water (Article 8b of Directive 2013/39/EU) should be implemented. The mechanism should cover pollutants for which the available monitoring data are either insufficient or of insufficient quality for the purpose of identifying the risk posed to groundwater.

The first watch list shall contain a maximum of 10 substances or groups of substances and shall indicate the possible methods of analysis not entailing excessive costs for each substance. Subject to the availability of methods of analysis not entailing excessive costs, the maximum number of substances or groups of substances that the Commission is allowed to include in the list shall increase by one at each update of the list up to a maximum number of 14. The substances to be included in the watch list shall be selected from amongst those for which the information available indicates that they are:

- Substances relevant to be monitored for drinking water uses, in order to prevent potential exceedance of human health toxicity values;
- Chemicals to be used as "early warning substances", i.e. tracers to anticipate the occurrence of new pollutants and/or significant upward trends in pollutants concentration associated to the artificial recharge of the aquifer. These substances are not necessary highly toxic but they are characteristic of anthropogenic emissions and frequently found in wastewater, being refractory to conventional water treatment processes.
- Substances which pose a significant risk by the use of reclaimed water for potable or non-potable aquifer recharge and for which monitoring data are insufficient.

A minimum list of pollutants and their indicators in reclaimed water used for groundwater aquifer recharge shall be established to be considered by Member States (MS). MS are expected to define threshold values for these pollutants and indicators of pollution on a national, river basin or other appropriate level having regard to regional or local conditions. The minimum list of pollutants and their indicators shall include substances regulated by the GWD (Annex II, Part B). The minimum list shall also include organic pollutants characteristic for reclaimed water which may cause exceedance of human health toxicity values. A harmonised prioritisation scheme to select these organic pollutants shall be established at the EU level.

Bioassays and assessment of risk of mixtures of pollutants

In addition to chemical methods which are intended to detect individual compounds, in vitro bioassays (also called effect-directed bioassays or bioanalytical tools) are now recognized as sensitive monitoring tools to screen for contaminants based on their biological action. As the specific chemical composition of a sample is often unknown, and mixture effects cannot be detected by chemical methods, in vitro bioassays are highly suitable tools to examine the presence of complex mixtures of low concentrations.

Currently, the evaluation of water quality mainly relies on the chemical analysis of a selection of single compounds and related limit values for these substances. At present, the WHO and the US Environmental Protection Agency (US EPA) have derived approximately 125 statutory guideline values for drinking water. The scope of such evaluation is rather limited since many compounds that are present in the aquatic environment are not analysed and for the compounds that are analysed, toxicological information is often lacking or insufficient for risk assessment purposes. As a result, limit values are sometimes based on analytical detection limits rather than a toxicological assessment of the compounds under investigation. In addition, while drinking water sources (including potable ground water aquifers) contain complex mixtures of chemicals, analytical chemistry does not account for combined effects.

Bioanalytical tools hold great promise in being introduced and integrated in current water monitoring strategies. Bioassays are suitable to assess hazards even of complex mixtures of pollutants with limited possibilities of chemical identification and are therefore expected to be highly complementary to modern chemical analytical methods. Smart combinations of chemical- and biological analytics therefore can lead to reduced uncertainty in safety assessments at lower costs.

Bioassays, as tools for analysing and detecting early adverse effects, can be applied relatively fast and cost effectively, integrating the combined potency of all present compounds affecting the pathways in the (panel of) assays. In general, a distinction can be made between bioassays that use living cells/materials (so-called in vitro bioassays) and bioassays that make use of whole organisms such as algae, macrophytes and (in) vertebrates (so-called in vivo bioassays). The latter are often used to study ecosystem health. At present, human health risk assessment mainly relies on testing with rodent animals with a focus on acute toxic effects, carcinogenesis, mutagenesis and reproductive toxicity. In vitro bioassays offer an alternative “non-animal” approach to prevent human health risk since they can address and allow to assess early specific toxic mode of actions of (environmental) compounds and they integrate the combined toxicity of compounds. Cell-based bioassays have been developed to target all steps of the toxicity pathway. Panels of bioassays have been established which are suitable to assess early toxic mode of action respectively for human and ecosystem health effect assessment for e.g. drinking water quality and safety assessment or resource water quality assessment (DEMEAU reports, Escher et al., 2013, Australia, California).

It is increasingly recognised that bioassay thresholds (trigger values) are required to put results of the above scientific progress into regulatory perspective. Although recent work has made progress in in vitro to in vivo extrapolation, it is still difficult to predict in vivo effects with in vitro bioassays. Therefore in vitro bioassays are better suited to be used as quantitative tools for hazard assessment.

A significant progress in the development of bioanalytical tools in the past decade resulted in the selection of a minimal panel of in vitro bioassays for cost effective comprehensive toxicity screening for the evaluation of drinking water quality. After determination of selection criteria for such assays and the most relevant toxicological effects of concern, the appropriate bioassay panel has been identified to detect human health effects of contaminants of emerging concern (CECs). The most relevant toxicological endpoints or modes of action have been identified that can be used as a starting point for the effect-based assessment of water quality, in particular for human health. A set of selection criteria has been defined to assess the effect-based assays whether they are suitable to detect activity towards the selected endpoints. The same panel is proposed to be used for safety assessment of reclaimed water for recharging aquifers that are used as a potable water source. Also, the used selection criteria are proposed to be used as a minimum set for including any other bioassay for assessment of reclaimed water for recharging aquifers.

This trigger values for the selected bioassays for agonistic hormonal activities in the reclaimed water for potable aquifer recharge define a level above which human health risk cannot be waived a priori and additional examination of specific endocrine activity may be warranted. The trigger values are based on
1) acceptable or tolerable daily intake (ADI/TDI) values of specific compounds,
2) pharmacokinetic factors defining their bioavailability,
3) estimations of the bioavailability of unknown compounds with equivalent hormonal activity,
4) relative endocrine potencies, and
5) physiological, and drinking water allocation factors.
The application of trigger values can help to decide whether further examination of specific endocrine activity followed by a subsequent safety evaluation may be warranted, or whether concentrations of such activity are of low priority with respect to health concerns in the human population. As limit values are aimed at the protection of human health in the finally produced drinking water, such limits should be sufficiently conservative to serve as a warning signal. On the other hand, such limits should not be too conservative, to avoid unnecessary and costly additional protection measures.

By using in vitro bioassays, the combined biological activities of the mixture can be quantified, which enables unknown compounds to be detected. The trigger define levels below which health risks are not expected, and above which a more detailed examination of endocrine activities in water sample is required. As a result, the following trigger values (equivalents (eq)/L) for 17β-estradiol (E2), dihydrotestosterone (DHT), dexamethasone (DEX) and Org2058 are proposed. In deriving the trigger values, as point of departure were chosen recognised (i.e. defined by the FAO/WHO Joint Expert Committee on Food Additives (JECFA)) ADI values of specific reference compounds.

Chemical (compound-directed) analysis provides a method of absolute quantification of certain compounds in water samples, but the toxicological properties of these compounds are not always known. Bioassays do not discriminate between different specific compounds but detect the total specific endocrine activity, and so the concentration of endocrine activity is expressed as an equivalent (eq) to a potent reference compound, e.g. 17β-estradiol (E2) for ERα-, dihydrotestosterone (DHT) for AR-, dexamethasone (DEX) for GR-, and Org2058 for PR-mediated activity. By using in vitro bioassays, the combined biological activities of the mixture can be quantified and expressed as ng eq of a reference compound per L. This enables unknown compounds to be detected by their activity and provides toxicological relevance (i.e. specific endocrine activity) of this mixture. Together with the sensitivity and robustness, these properties make the use of in vitro bioassays suitable as a screening tool for endocrine activity in water samples. It is expected that the relative potency (Benchmark Quotient) will be determined for a large number of new substances identified as relevant in the reclaimed water allowing for risk assessment of mixtures of substances. In a first tier it has been attempted to focus on a selection of human health related endpoints that are considered relevant for water quality assessment.

A draft document is expected to be published by midyear.

EXPERT PANEL REPORT ON FEASIBILITY OF DIRECT POTABLE REUSE IN CALIFORNIA

Reported by Adam Olivieri, USA and Jörg E. Drewes, Germany

Water supplies in California, as well as other parts of the world, are derived from a variety of sources, including local and imported surface water, groundwater, desalinated brackish water and seawater, and recycled water. As a result of population growth, urbanization (especially along coastal areas), cyclical droughts, and climate change, public water supplies in some regions are becoming stressed, and the opportunity to develop new groundwater or surface water sources is becoming more difficult, if not impossible. Although conservation can reduce per capita demand in these regions, the remaining supplies may and will most likely be insufficient to meet overall water needs. As a consequence, new strategies are needed to help meet future water demand and develop more sustainable water supplies.

One such strategy is planned potable reuse, in which treated wastewater is used to augment public water supplies. Potable reuse can occur indirectly through the recharge of unconfined or confined aquifers, via surface spreading or direct injection, or by surface water augmentation into a stream or reservoir that serves as a source for drinking water. Beside this practice of indirect potable reuse (IPR), potable reuse can also occur direct (DPR), where highly treated wastewater is introduced either directly into a public water system or into the raw water supply immediately upstream of a conventional drinking water plant. Drinking water augmentation with recycled water has been practiced in the form of IPR for more than 50 years in California.

As interest in potable reuse has grown, so has the need for providing guidelines for potable reuse, specifically DPR. The purpose of this Expert Panel Feasibility Report is to address the legislative mandate in the State of California that, in summary, requires the Expert Panel to:

- Advise the Division of Drinking Water of the State of California on public health issues and scientific and technical matters regarding the feasibility of developing uniform water recycling criteria for DPR, and to
- Assess what, if any, additional areas of research are needed to be able to establish uniform regulatory criteria for DPR, and recommend an approach for accomplishing the additional needed research in a timely manner.

The Expert Panel selected the following seven key topics to further investigate as part of addressing the legislative mandate:

1. Bioanalytical Tools – Issues related to the use of *in vitro* bioassays for advanced treated wastewater (ATW) and drinking water.

2. Quantifying Treatment Facility Reliability – Multiple barriers (e.g., redundancy, inherent performance, and mechanical reliability); online monitoring tools (e.g., sensors, surrogates and indicators); and performance objectives (e.g., process and overall facility compliance).

3. Analytical Methods and Tools – Approaches for assessing chemical water quality in ATW and drinking water (with an emphasis on indicators and surrogates).

4. Molecular and Other Pathogen Monitoring Methods – Monitoring indicators, surrogates, and pathogens in ATW and drinking water.

5. Antibiotic Resistant Bacteria and Antibiotic Resistant Genes – State-of-the-science, relative sources, potential exposure pathways, and relative significance of concern.

6. Comparative Health Risks – Associated with existing potable water supplies as compared to possible potable reuse configurations.

7. Public Health Surveillance – Example programs, ongoing national and state programs, health endpoints, sensitivity and interpretation of data, non-health based data, and feasibility of a DPR surveillance program.

A key element of an IPR system is its reliance on an "environmental buffer" (e.g., a groundwater aquifer or reservoir). While some environmental buffers might offer opportunities for further treatment, the core functions of the environmental buffer are to provide – through storage – some level of water quality equalization and time to respond to any process failures or out-of-compliance water quality monitoring results. In contrast, with DPR, the environmental buffer would be eliminated and recycled water would be directly piped into the raw water supply of a drinking water treatment facility or into the drinking water distribution system; therefore, the core functions of the environmental buffer would need to be replaced to ensure an equivalent level of public health protection.

As such, the Panel has considered reductions in environmental buffer criteria as currently written in the proposed Surface Water Augmentation criteria for the State of California and groundwater replenishment regulation, and will provide some guidance in this Panel Feasibility Report that the Division of Drinking Water could use to evaluate the feasibility of proposed projects consistent with the overall objective to protect public health.

This report will provide more details for each of the above key topics, including the Panel's assumptions, conclusions, and recommendations to address these topics, as well as the feasibility of developing uniform DPR criteria for the State of California. Although DPR is the subject of this report, many of the key aspects presented and discussed herein can also be applied to IPR. The report is scheduled to be published in September 2016.

IWA WORLD WATER CONGRESS – WRSG WORKSHOP ON POTABLE REUSE

Reported by Jörg E. Drewes, Germany

For the upcoming IWA World Water Congress in Brisbane, Australia (Oct 9-15, 2016), the WRSG has proposed to conduct a workshop entitled *"Potable Water Reuse – Are we ready to go from indirect to direct?"*, which has been accepted to be included in the main technical program of the World Congress.

During a moderated 40-min panel discussion following presentations, a panel of experts will debate the opportunity to shift the paradigm from indirect (IPR) to direct potable reuse (DPR), including the following aspects:

- Are DPR chemical and microbial risks fundamentally different from IPR?
- Can multiple barrier treatment and redundancy including an engineered storage option and online monitoring provide adequate protection for microbial risk and against unknown chemicals?
- What would be considered the minimum standards for DPR?
- How to improve public perception of DPR?

The desired outcome of the workshop would be the definition of best management practices regarding direct potable reuse applications to augment drinking water supplies in cities of the future. Particularly, the following aspects will be addressed:

- What are considered adequate monitoring strategies?
- Key lessons learned from demonstration- and full-scale DPR installations?
- Challenges to implement DPR?
- Public acceptance of direct potable water reuse

This workshop will be moderated by **Shane Snyder** (University of Arizona, USA) with the following panelists providing keynote presentations:

1. **Jörg Drewes** (Technical University of Munich, Germany)
   – Expert panel recommendations regarding the feasibility of direct potable reuse in the State of California, USA
2. **Shane Trussell** (Trussell Tech, USA)
   – Lessons learned by operating a direct potable reuse treatment scheme demonstration project, San Diego, CA, USA
3. **Fred Leusch** (Griffith University, Australia)
   – The role bioassays can and cannot play in assuring safety?
4. **David Cunliffe**, (SA Dept. of Health, Australia)
   – Are we ready to entertain direct potable reuse as a global option for drinking water augmentation? The WHO perspective

The workshop will be followed by an additional 90-min Panel Discussion with Q&A from the audience with the focus on the question: *"Is Reverse Osmosis needed in Direct Potable Reuse Treatment Schemes?"*. Within this theme, this panel discussion will address the controversial issue what treatment requirements should be fulfilled to practice direct potable reuse and in particular whether reverse osmosis treatment is a process that cannot or shouldn't be substituted?

The panel discussion will be moderated by **Olivier Lefevbre**, National University of Singapore, Singapore with the following panelists:

1. **Shane Snyder**, The University of Arizona, USA
2. **Josef Lahnsteiner**, WABAG, Austria
3. **Stuart Khan**, The University of New South Wales, Australia
4. **Shane Trussell**, Trussell Tech, USA
5. **Jörg E. Drewes**, Technical University of Munich, Germany

YOUNG WATER PROFESSIONALS

Conference Report
Building the next generation of water leaders

Report by Shona Fitzgerald

On 18-19th February, 2016 the University of NSW (UNSW) in Sydney hosted the 4th IWA/AWA Australian Young Water Professionals Conference. The conference gave delegates an opportunity to showcase their work and discuss their vision for the future of the water industry. The theme of the conference, *Connect. Collaborate. Create*, provided a platform for delegates to discuss the need for collaboration and cross-disciplinary solutions in creating a sustainable future for the water industry. Moreover, the theme inspired discussion on how research, private and public sectors can work together to improve efficiencies and to see more innovative solutions implemented in the water industry.

Throughout the conference the delegates were asked to reflect on what key challenges we face, what the future of the water industry could look like and what capabilities and opportunities are required for young professionals to lead a sustainable future.

Among the key challenges identified by the delegates were:

- a risk averse industry;
- lack of funding for innovative technologies;
- difficulties in implementing research in industry;
- impacts of climate change including water scarcity;
- the need for more proactive leadership in government; and
- equal access to water across Australia and around the world.

Resource recovery was high on the agenda in the vision for a sustainable future. Presentations on resource recovery included recovering nitrogen fertiliser from urine and water recycling in abattoirs. However, opportunities for recovering resources, in particular opportunities for water reuse, were recognised as severely under-utilised in Australia. The delegates articulated a need for increased water recycling in Australia, with focus on reusing both wastewater and stormwater. A lack of education of the community to shift public perceptions and a lack of proactive leadership in government were identified as two of the key limitations for change. Stuart Khan from the IWA WRSG sat on a panel of industry leaders at the conference to discuss what the key challenges are in the water industry. He also spoke about the need for proactive leadership so that we are solving tomorrow's problems rather than reacting to yesterday's issues.

The message the delegates articulated throughout the conference was a desire to be involved in influencing and having their voice heard in regard to key decisions in the water industry. They recognised to lead well in the future they would need to have a workforce with diversity; diversity in skills, in gender, in culture, and in experience. Diversity would also need to stretch to the solutions we seek, which may include decentralised systems and will require cross-disciplinary input. In order for young professionals to up-skill in a way that will give them the diversity and the capacity to respond to change, more experienced professionals were encouraged to mentor young professionals to build industry capability. The IWA WRSG has an

opportunity to mentor young water reuse professionals and I encourage you to join with us in building the next generation of water leaders.

To all YWRPs, please contact us, talk to us and join us!

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PhD STUDENT PROFILE

Editors note: *We have introduced this regular feature for this Newsletter where we will ask students currently undertaking PhD projects on water reuse related topics to provide an overview of their project. We hope that this will stimulate interest in the important work being undertaken by some of young professionals in the field. All PhD students and/or their supervisors are invited to contact the newsletter editors or any of the following YWRP contacts register your interest in providing a PhD student profile for future newsletter issues.*

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Stevo Lavrnic (stevo_lavrnic@yahoo.com); *Olivier Lefebvre (ceelop@nus.edu.sg) .*

Lauren Weinrich PhD

Affiliation: Drexel University (Philadelphia, PA, USA), American Water (Voorhees, NJ, USA).

Questions and answers
February 22, 2016

What is your motivation in undertaking a PhD in the field of Water Reuse?

I work for a company that serves customers all over the United States including many regions with water shortages. One of my first projects in my job involved travelling to Florida and California where "purple pipe" supports non-potable water needs in many communities. I studied the storage and distribution of this resource and how water quality was affected; the project expanded my knowledge outside of the drinking water sector. Since then, I have seen a rapid increase and a shift in the water industry towards a commitment to expanding indirect and direct potable reuse. The development of the science, technology, policy, and public perception of IPR and DPR has come a long way in a few short years with a lot more to come. It is an exciting time to be in the water reuse industry. My PhD project topic focussed on seawater desalination, and I feed that both desalination and water reuse are increasingly important for cities that strive to maintain safe and reliable water resources.

Can you tell us a bit more about your research group and your project?

I am part of the research group in the Innovation and Environmental Stewardship department at American Water. American Water is the largest publicly traded U.S. water and wastewater utility company. Being part of a large company provides opportunities to help our customers within the company at the different drinking water, waste water, and reuse water plants. My research supports our business directly and we have successfully been a part of numerous research grants from the leading research foundations in the United States, including the WateReuse Research Foundation (WRRF). Thanks to WRRF, American Water, and Drexel University I was able to secure funding for my PhD research in seawater desalination. Research using reverse osmosis membranes has been a strong foundation for me in the reuse field for indirect and direct potable reuse, since these membranes can treat waste water effluents to a very high quality. My current research is investigating the impact of adsorption and biological filtration on organic matter in secondary effluents and nonpotable distribution systems. For the past 11 years I have studied the behaviour and reduction of biodegradable organic matter throughout pretreatment processes including biological filtration. Considering the impacts of easily assimilable organic carbon (AOC) I have measured in treatment plant and in distribution systems, I was motivated to more deeply investigate the problematic

biological fouling that occurs on reverse osmosis membranes. I developed a luminescence-based bioassay based to measure the AOC fraction in the RO feed.

How do you envision the future of water reuse and what role do you see yourself playing as a water professional?

I think the future of water reuse will provide numerous jobs and opportunities for water professionals. With the pressures of community growth and climate change, there is an ever growing need for expertise in numerous fields related to water reuse. Not only the engineering and science aspects of designing, building and operating treatment plants, but other aspects related to public health, policy, communications etc. provides numerous opportunities and will require a talented workforce. I see the future with increasingly unified and connected affiliations and perhaps more decentralized approaches to water resource management, treatment, and resource recovery. We need to use water wisely, and conserve resources and energy as much as possible. I think there are so many exciting opportunities for this now, and many more to come.

How interesting do you think that water reuse sector is for YWPs today and how could it be promoted?

The water reuse sector is a great area for involvement of YWPs because their energy and new ways of thinking is crucial to the future of this industry. The solutions that are being implemented today will be carried on and developed by YWPs. I think working in the water industry is extremely rewarding. People that put energy into their work want not only financial compensation, but to know that their work means something. I want to go to work, continue and expand projects, find solutions that all ultimately relate to water, our precious resource. If working with talented professionals, managing our resources and overcoming challenges is a compelling career, then this is a great industry for you! The water industry is unique because of the necessity for expertise needed for all technical backgrounds not limited to engineering, microbiology, and chemistry, and also areas of public health, public perception and government and regulatory oversight. The future of water treatment and management is changing every day, and we need the talent and expertise of YWPs to be a part of that now and in the future.

Do you think that the universities and academic institutions in general give enough attention to water reuse as a scientific field?

In my studies I have always been fortunate to work with industry leaders concerned about how bench scale would be practically applied in full scale applications. I think it is important for academia to prepare the student with the technical expertise while involving us in broader themes. Water reuse should be an area of increasing attention in academic fields, so that focus on industrial and residential reuse can be approached holistically, and experts can have knowledge of drinking water, waste water and water reuse for proper understanding of the issues that can assist in other areas like biosolids recycling and resource recovery. I think the industry and universities need to continue to find opportunities to work together and drive these results. I am concerned that there is not enough funding to support critical research at various levels in private or public companies, government, and universities. This challenge will hopefully be overcome with partnerships and investments to secure talented academics and industrial professionals to find solutions. I was working full time when I chose to go back for my PhD. To secure funding, I leveraged the resources from my American Water and

Drexel University to increase the value of the research dollars from the funding agency, the Water Reuse Research Foundation. I consider this a non-traditional approach to attaining an advanced degree, and I think students and professionals alike all need to begin thinking of ways to further research dollars, not only in the water reuse field, but in the water industry and other research areas in total.

The following article is posted on the Water Wiki site by Lauren Weinrich:

PERSPECTIVE ON RO MEMBRANE BIOFOULING REDUCTION

PhD Thesis: The Impact of Assimilable Organic Carbon on Biological Fouling of Reverse Osmosis Membranes in Seawater Desalination

Name: Lauren Weinrich, PhD

Advisor: Charles N. Haas, PhD. LD Betz Professor of Environmental Engineering. Head - Dept. of Civil, Architectural & Environmental Engineering at Drexel University.

Affiliation: Drexel University (Philadelphia, PA, USA), American Water (Voorhees, NJ, USA).

Synopsis

Seawater desalination using reverse osmosis is an important part of a community's water portfolio in coastal areas experiencing water scarcity. However, desalination using RO is expensive in part because of the costly challenges that arise from fouling on the RO membranes. Specifically, biological fouling has emerged as the most poorly managed among the different types of fouling. My literature review and discussion with industry leaders helped identify the niche in which an Assimilable Organic Carbon (AOC) test could be used for measuring the potential for microbial growth in the RO feed water. If we could identify treatment conditions that increased the amount of AOC, or "food" for the bacteria colonizing the biofilm on the RO membranes then we could take steps to control and mitigate this adverse outcome, ultimately increasing seawater RO efficiency. I'd like to share an overview of my research.

Overview

My research in the water industry has largely focused on organic matter in reclaimed water, drinking water, and seawater desalination. The subject of my doctoral project was to investigate easily assimilable organic carbon (AOC) and water quality of treated seawater in reverse osmosis desalination plants. At the beginning of my PhD program, I had recently completed a project in which one of the deliverables was to create a method for measuring AOC in seawater. Prior to that, AOC bioassays used freshwater organisms that could not survive in seawater because of the difference in the salinity between fresh and seawater. Furthermore, previous assays were labor intensive but our group at American Water developed an application for AOC using luminescence instead of traditional serial dilutions and plate counts for tracking the growth of AOC organisms. The luminescence AOC method has since been used for practical management of water quality in the treatment plant and in the distribution systems in numerous research projects, and as a tool for minimizing health risks and adverse water quality conditions that result from unwanted microbial regrowth.

I secured the funding for my PhD research project through an unsolicited research project proposed to the Water Reuse Research Foundation (Alexandria, VA, US) with support from Drexel University and American Water. This project focused on investigating biological fouling potential in full scale, pilot and bench scale applications. The final report for the project (WRRF 11-07) was published in 2015. The major findings and recommendations include:

- Total organic carbon removal at full scale treatment plants in the study was not effective (generally <10%) or inconsistent;
- Chemicals used for other treatment applications in seawater RO (such as cleaning, dechlorinating and antiscaling agents) increased AOC in the RO feed;
- Common oxidants such as chlorine, chlorine dioxide, and ozone were investigated for byproduct formation from humic matter in which AOC was formed.
- Dechlorinating the RO feed water before adding antiscalant is an effective way to reduce reactions between chlorine and antiscalants which can result in AOC.

Since the end of the project, I have continued looking for opportunities to collaborate with leaders in the industry and other research groups or treatment plants, and assist with water quality challenges related to harmful algal blooms and challenges in the desalination and reuse industries. Currently, my research projects are investigating organic matter removal in secondary effluents and nonpotable distribution systems. In addition to the AOC method, other fluorescence and online monitoring tools are promising for investigating the impact of adsorption and biological filtration on organic matter. My work in the water industry has largely focused in one way or another, on easily biodegradable organic matter present after treatment and the impact of its presence in drinking water treatment, and drinking water and reclaimed water distribution systems.

I was fortunate to be able to conduct my PhD research as a student while working full time at American Water. I have been with American Water since 2005 in their Innovation and Environmental Stewardship group. I have enjoyed the support of my supervisors Dr Mark LeChevallier and Dr Orren Schenider and other colleagues when I proposed the idea of expanding my research into a doctoral dissertation. It was extremely meaningful to me to be able to maintain my role at the company and pursue my goal of going back to school for my PhD.

References

Weinrich, Lauren, Charles N. Haas, and Mark W. LeChevallier. "Recent advances in measuring and modeling reverse osmosis membrane fouling in seawater desalination: a review." Journal of Water Reuse and Desalination3.2 (2013): 85-101.

Weinrich, Lauren A., Orren D. Schneider, and Mark W. LeChevallier. "Bioluminescence-based method for measuring assimilable organic carbon in pretreatment water for reverse osmosis membrane desalination." Applied and environmental microbiology 77.3 (2011): 1148-1150.

Weinrich, Lauren A., Eugenio Giraldo, and Mark W. LeChevallier. "Development and application of a bioluminescence-based test for assimilable organic carbon in reclaimed waters." Applied and environmental microbiology 75.23 (2009): 7385-7390.

Links

https://watereuse.org/watereuse-research/application-of-the-bioluminescent-saltwater-assimilable-organic-carbon-test-as-a-tool-for-identifying-and-reducing-reverse-osmosis-membrane-fouling-in-desalination/

http://jwrd.iwaponline.com/content/3/2/85

NB. We would like to encourage you to look at the Water Wiki site on a regular basis and to add your own articles. The link to the site is: **http://www.iwawaterwiki.org/xwiki/bin/view/Main/WebHome** Olivier Lefebvre is the moderator for the site from the WRSG and he can be contacted at**:** **ceelop@nus.edu.sg**

CONFERENCES

INTERNATIONAL WATER REUSE & DESALINATION SYMPOSIUM

4 - 5 November, 2015
Brisbane QLD Australia

Report by Maria Ceresa

A two day International Water Reuse & Desalination Symposium focused on climate resilient water solutions will be held in Brisbane, Australia on the 4th and 5th of November. Brought to you by the Water Services Association of Australia, WateReuse, Australian Water Recycling Centre of Excellence and the National Centre of Excellence in Desalination Australia.

Caption: CEO AWRCE, Dr Mark O'Donohue, Executive Director of WSSA, Adam Lovell, Executive Director Water Reuse, Melissa Meeker, and CEO NCEDA, Neil Palmer

Coming together to achieve water security - Symposium success

The Latest research outcomes in water recycling and desalination from Australia and the US were examined with a view to advancing climate resilient water options at an international water reuse and desalination symposium in Brisbane, Australia from 4-5 November, 2015.

Co-hosted by four organisations, US-based WateReuse Association, the Water Services Association of Australia, the National Centre for Excellence in Desalination and the Australian Water Recycling Centre of Excellence, the Symposium attracted a strong line-up of senior presenters and 140 delegates.

The Symposium was noteworthy for the research networks strengthened between the US and Australia and its interactive approach to talking about climate resilient water, which considers recycling and desalination of water as complementary solutions to traditional water supply options.

"Water recycling and desalination is being pursued all over the world as options to augmenting water supplies and the two-day dialogue among water researchers, utilities and government representatives at the Symposium, included numerous examples where research over the past five years has responded to the needs of industry and is enhancing the adoption of climate resilient water options," Dr O'Donohue said.

A real strength of the symposium was the open dialogue resulting from panel facilitated sessions which enabled a fresh approach to talking about challenging water issues and how research can play a more effective role in providing practical assistance to the water industry for the next five years.

KEYNOTE 1

Richard Nagel, USA
The Millennium Droughts for Australia and California: Lessons Learned or Not?
Rich Nagel, General Manager of the Californian-based Water Basin Municipal Water District, presented dramatic pictures of the impact drought and the diminishing snow packs were having on the state's waterways. He also used a racing car analogy to compare desalination (a popular solution in Australia with water reuse, proving more popular in California and concluded that both supply options had integral roles to play.

KEYNOTE 2

Kaylene Maywald, Australia

Water Reform: The road to resilience

Karlene Maywald, the former Water Commissioner and now strategic water adviser with the South Australian government outlined Australia's path to water reform highlighting the joint challenges faced by Australia and the US over the past five years

KEYNOTE 3

Sue Murphy, Australia

Water Forever – Whatever the weather

Sue Murphy CEO of the Water Corporation, based in Perth, Australia provided a thought provoking and entertaining overview of how the water utility has built a diverse portfolio of water supply options that included water recycling and desalination - all underscored with an intensive community engagement program.

ASSOCIATED HIGHLIGHTS

Launch of potable reuse website

An interactive website which brings together international learning on potable reuse throughout the world and provides stakeholder engagement and educational materials to those on the "potable reuse journey" was launched at the Symposium. Water organisations can find out about being part of the Water360 – resources for reuse initiative at www.water360.com.au.

Potable reuse issue of science journal launched

A recent edition of the Environmental Science Water Research and Technology journal, published by the Royal Society of Chemistry, demonstrates the importance of sharing research across international borders and places Australia in the world context potable water reuse. Launched at the Symposium the special issue was guest edited by the University of New South Wales Associate Professor Stuart Khan.

Latest in Australian research at your fingertips

A powerful search engine that returns credible information relating to themes of national importance to the water industry is now available at www.waterportal.com.au. The site The Water Research Access Portal (WRAP) targets leading Australian water research, government and industry websites.

SOCIAL PROGRAM

A social program that included a Women in Water breakfast and Symposium gala dinner provided delegates with the opportunity to build and consolidate networks.









World Water Congress & Exhibition 2016

SHAPING OUR WATER FUTURE

9-14 October 2016 / Brisbane / Queensland / Australia

THE CONGRESS AND EXHIBITION

The IWA World Water Congress & Exhibition is the global event for water professionals. It offers new insights into how pioneering science, technological innovation and leading practices shape the major transformation in water management that is underway. It draws over 5,500 of the top water, environment and related professionals from more than 100 countries from across the water sector, including thought leaders from within and beyond the water sector.

At this conference, the WRSG is responsible to hold two workshops including panel discussions on issues related to potable water reuse.

KEY DATES

01 December 2015	Exhibition Stand Space Bookings Open
15 December 2015	Registration Opens
01 April 2016	Presenters notified of acceptance/rejection
01 July 2016	Deadline for accepted presenters
29 July 2016	Deadline for early bird registration

Details available here

See also separate article on the workshop entitled *"Potable Water Reuse – Are we ready to go from indirect to direct*?" to be held at the IWA World Water Congress & Exhibition.

IDA International Conference on Water Reuse and Recycling: Turning Vision into Reality

Announcing IDA's inaugural conference focused on Water Reuse to be held September 25-27, 2016 at the Hyatt Regency Nice Palais de la Méditeranée in Nice, France.

This international conference on Water Reuse and Recycling covers leading edge strategies and technology for advanced municipal and industrial water reuse programs.
Submission Deadline: March 31, 2016

ABOUT THE EVENT
The two-day international water reuse technical conference will consist of technical paper sessions, panel discussions and plenary sessions focusing on advanced technologies.

IDA is seeking original work on a wide variety of topics related to Water Reuse and Recycling in the following subject areas:

- Cutting Edge Technologies for Water Reuse
- Direct and Indirect Potable Reuse (DPR,IPR)
- Non-Potable and Agricultural Water Reuse; Challenges and Successes
- Industrial Water Reuse and Recycling
- Water Quality Monitoring and Control
- Advanced Technologies for Joint Desalination and Water Reuse

Plenary and Panel presentations and discussions are as follows:

- DAY 1
  - Plenary: Global Water Reuse Advances and Success Stories
  - Panel: Regulation, Funding and Public acceptance of Water
- DAY 2
  - Plenary: Key to Success of Water Reuse and Vision for the Future
  - Panel: Role of Water Reuse in Solving the Water-Energy and Food Nexus

WHERE IS THE EVENT
Hyatt Regency Nice Palais de la Meditreranee
Nice, France.

Click here to learn more about the conference.

Reported by Michael Muston and Thomas Wintgens

Victorian population boom spurs recycled water boost

The Sunbury Recycled Water Plant in Victoria is set to receive a $53 million upgrade, undertaking to increase treatment capacity in service of the growing region. Contracted to Downer, the upgrade will increase the capacity for treatment of wastewater at the plant from 5.9 to 9.2ML per day, with the potential to increase to 19.2ML per day subject to further works.

Western Water Managing Director Neil Brennan says the upgraded treatment features will be incorporated into the existing plant. "Downer has offered an innovative solution that includes new treatment process units as well as utilisation and upgrade of some of the existing treatment plant," Brennan says. "Downer will operate the existing plant until the upgrade is constructed and commissioned in late 2018, then continue to manage and operate the upgraded plant until 2026."

The renewed plant will include multi-stage biological nutrient removal and membrane filtration processes, as well as UV and chlorine disinfection, and sludge treatment and dewatering, with design features ensuring the increased treatment capacity still remains within the current footprint of the plant.

Upgrades also include new inlet structures, odour management and new site facilities, including buildings, roads and visitor spaces. Recycled water currently produced by the plant is already used for agriculture, but improvements to the treatment process will result in higher quality water, widening its potential use.

Source: Australian Water Association

Australian Guidelines for Water Recycling Under Review

A review of the Australian Guidelines for Water Recycling (2006) is now underway with a working group expected to deliver its recommendations to the steering committee midway through 2016. The 2006 guidelines are one of the foundation documents of Australia's successful approach to the safe and effective management and delivery of recycled water, and the review, supported by the Australian Water Recycling Centre of Excellence, recognises that continuing advances in technology and management of risks over the past 10 years warrants a re-examination of the various health components in the guidelines.

Chaired by Principle Water Quality Adviser at SA Health, Dr David Cunliffe, the review working group comprises members of the National Recycled Water Regulators' Forum, a senior research scientist with expertise in human health risk elements, nominees from the Water Services Association of Australia and the Australian Water Association, and a representative from the Environmental Health Standing Committee (enHealth).

The review will draw on the rapid advances and implementation of water recycling schemes over the last 10 years, and areas of focus will include:

- new knowledge around topics such as appropriate reference pathogens, burdens of disease,

alignment with health-based performance targets, indicative log removals of pathogens and indicator organisms
- incorporation of guidance on validation of treatment technologies being developed by the jurisdictions as part of the Centre's National Validation (NatVal) research project
- calculations of microbial health based performance targets.

For further information about the review contact the Australian Water Recycling Centre of Excellence's Manager, Research and Commercial Development, Dr Simon Cashion.

Source : Australian Water Recycling Centre of Excellence

Foodprint Melbourne

Foodprint Melbourne is a research project that investigates Melbourne's foodbowl. The project is investigating where the city's food comes from currently and the potential for Melbourne to source more of its food from within the state of Victoria in future.

Project outputs so far
The project has released a new infographic about how much water it takes to feed Melbourne, and how recycled water could present some solutions.

- Infographic on urban sprawl's impact on city-fringe farmland
- Report on Melbourne's Foodbowl: Now and at seven million
- Briefing paper on The role of cities in climate resilient food systems.

About the project
Foodprint Melbourne is a collaborative project between VEIL (University of Melbourne), Deakin University and Sustain: The Australian Food Network (formerly the Food Alliance). The project is funded by the Lord Mayor's Charitable Foundation.
The Foodprint Melbourne project aims to:

- Identify the potential economic, health, social and environmental benefits of meeting more of Melbourne's food supply needs from within the state of Victoria
- Generate data that can be used to build a sound case for investment in Melbourne's regional food economy
- Identify vulnerabilities in Melbourne's food supply and approaches to address them

How much water is needed to grow Melbourne's food?
New research from the Foodprint Melbourne project has found that it takes over 475 litres of water per person per day to grow our food. This is the amount of irrigation water (e.g. from rivers) used – it doesn't include rainwater used to grow our food or water used in processing or manufacturing our food.

Around 758 gigalitres of water is needed to grow enough food to feed Greater Melbourne for a year. This is around double the amount of water used in homes, which is approximately 376 gigalitres per year.

South-East Australia is experiencing increasing drought and extreme heat events, and there is likely to be less water available to grow food in future.

Melbourne's water treatment plants produce recycled water that can be used to grow food once it is treated to a high standard. Only a small amount of this water is currently used for agriculture, but recycled water is likely to have a bigger role in growing food in a drying climate.

Using recycled water in Melbourne's Foodbowl
Melbourne's two water treatment plants (the Eastern and Western Treatment Plants) produce just over 300 gigalitres of recycled water each year. Just 6% of this water is currently used for agriculture, 10% for other uses and the remaining 84% is released out to sea.

Foodprint Melbourne research shows that just 10% of the recycled water produced by the two water treatment plants could grow around half of the vegetables needed to feed Melbourne each year.
Melbourne's two main water treatment plants are located close to key vegetable growing areas in Melbourne's West (Werribee) and South-East (Casey, Cardinia and the Mornington Peninsula), presenting a unique opportunity to 'drought proof' some areas of Melbourne's foodbowl.

Recycled water from both plants is already used to grow vegetables, but there is a significant amount of unused Class A recycled water (suitable for food production) available from the Eastern Treatment Plant after an upgrade of the plant was completed in 2012. Recycled water is also available from smaller water treatment plants around the fringe of Melbourne.

Not all of the unused recycled water produced by the water treatment plants can currently be used for agriculture, because agricultural demand is highly seasonal, and because of a lack of the necessary infrastructure to produce recycled water of the appropriate quality, store recycled water and to pipe this water to farmers in some areas.

To deliver recycled water to more farmers requires investment in the necessary infrastructure. This investment has the potential to effectively 'drought proof' some parts of Melbourne's foodbowl, securing local vegetable production in these areas.

Contact
For more information about the project contact Dr. Rachel Carey
Email – rachel.carey@unimelb.edu.au

Source : Victoria Eco Innovation Lab

Tackling the barriers of water reuse: Two years of DEMOWARE project

Innovation-demonstration for a competitive and innovative European water reuse sector (DEMOWARE) is a research project funded by the European Union's Seventh Framework Programme for research, technological development and demonstration. The project was born with the mission to overcome the main barriers which constrain the widespread implementation of water reuse around Europe and worldwide. The project started January 2014 and now it is entering in its final stage as it is planned to end by December 2016. During these two project years a lot of activities have been done in research and innovation related to water reuse.

Regarding innovative technologies and schemes, it worth to mention the Tarragona demonstration site where up to 40% of fresh water for cooling purposes in a petrochemical plant has been replaced by reclaimed wastewater from an urban origin. At the same time, at the Torreele in Belgium site, will have demonstrated their capacity to remove more that 35% of nitrogen and phosphorous present in membrane concentrates from an urban wastewater reclamation plant producing water for indirect potable reuse.

At the Shafdan demonstration site in Israel, it has been demonstrated how ozone pre-treatment helps in improving trace organic degradation in soil-aquifer treatment while preventing the dissolution of undesirable compounds from the upper layers of the aquifer. In this same site, an innovative flow reversal technology is expected to prevent fouling in reverse osmosis systems and increase the performance of membrane-based reclamation schemes.

DEMOWARE is also studying the benefits of monitoring and control technologies for water reuse schemes. Flow cytometry and an innovative molecular biological detection method for relevant microorganisms proved to be interesting techniques to evaluate the effectiveness of different disinfection technologies and the presence of biological contamination in reclaimed water networks. First results from chemical fingerprinting and effect-based assays also demonstrated how these techniques could serve to identify a large range of micropollutants and provide a rapid and online detection of chemical contaminants, respectively.

Life-cycle and risk assessments are being applied in several demonstration sites to quantify the environmental benefits and the impact to the human health of several water reuse schemes. Focus has been put on developing a common approach for assessing and the potential chemical or microbial risk associated to water reuse in the different sites.

In order to help companies overcome market-related barriers, business models for selected water reuse schemes and technologies have also been developed. On the other side, governance related challenges and stakeholder collaboration as well as public engagement activities in water reuse schemes all over the world have been studied in order to identify possible governance issues that the demonstration sites within DEMOWARE face and develop strategies to overcome them.

Finally, Water Reuse Europe (WRE), an association of companies and professionals involved in the European water reuse sector has been established (see separate news item below). WRE was born to outlive DEMOWARE and its mission is to create a collective identity for the European water reuse sector and promote an innovative and dynamic water reuse industry.

For more information regarding the activities within DEMOWARE you can visit www.demoware.eu or follow its Twitter profile @DemowareFP7.

Launch of Water Reuse Europe

The European water reuse sector received a significant boost in February 2016 with the launch of Water Reuse Europe (WRE). The new industry association offers a range of services for both commercial companies and public organisations involved in water reuse scheme design, operation, and regulation.

Water reuse is playing an increasingly important role in the pursuit of sustainable water management. Recent years have seen significant growth in the number of industrial, agricultural, and municipal reuse schemes across Europe. However, the sector has lacked a single unifying body through which it can share best practice and develop a single voice on important issues. WRE provides the collective space within which these ambitions can be achieved. Its mission is to create a collective identity for the European water reuse sector and promote an innovative and dynamic industry.

Being a member of WRE will enable companies, public bodies, trade associations and research institutions to take advantage of stimulating opportunities for knowledge exchange, advocacy, and education. It will provide organisations with access to news and information about the latest developments in the reuse market and enable them to take advantage of specialist conferences, seminars, and workshops.

Other advantages of being a member of WRE include access to the members directory, the publications library with more than 3000 entries, up to date news from the European and global water reuse sectors, technical reports and a database of water reuse schemes.

More information about how to become a member of WRE can be found on:
http://www.water-reuse.eu/

Update on JPI Water Project FRAME "A novel Framework to Assess and Manage Chemicals of Emerging Concern in Indirect Potable Reuse"

Reported by Stefano Polesello, Italy and Jörg E. Drewes, Germany

The third meeting of the EU-funded JPI water project FRAME "*A novel Framework to Assess and Manage Chemicals of Emerging Concern in Indirect Potable Reuse*" was hosted by BRGM in Orléans, France from 8th to 10th of March, with the active participation of more than 20 scientists from the partner institutions and stakeholders. The meeting was preceded by a half-day meeting for stakeholders where the project concepts and technologies related to indirect potable reuse (IPR) were presented and regulatory framework and impacts of FRAME were discussed. Discussion with stakeholders highlighted that the implementation of IPR projects in Europe are still hindered by a misperception regarding the true risks of this reuse practice and regulatory constraints which in some cases require that drinking water limits are met in reclaimed water prior to recharging groundwater. It is necessary to communicate that the infiltration of reclaimed water can already be today an inevitable part of the water cycle. Natural attenuation of contaminants and pathogens is an effective process which can be added to conventional treatment trains to produce water with a potable quality. During the following General Assembly of FRAME, partners shared preliminary results on initial pilot- and full-scale studies. The efficacy of the different applied treatment trains was verified by measuring a wide set of regulated und unregulated compounds using target, suspect and non-target screening to enable the control of chemicals of emerging concern (CECs). Risks from chemical and microbiological contaminants were evaluated by applying a set of bioassays and measuring pathogens and antibiotic resistant genes. The possibility to extract integrated indices for chemical, toxicological and microbiological risks and to integrate them in the developing Decision Support Framework (DSF) was discussed. The DSF structure will include the treatment processes, transport modeling as well as the overall process evaluation and will support stakeholders in conducting feasibility studies for the application of IPR considering their specific field site conditions.

More information on the FRAME project can be found at:
http://www.frame-project.eu/project/index.html

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Contributions from WaterWiki Advisory Board Member and Valentina Lazarova and Nikolay Voutchkov:

During the past decade, water scarcity, climate change and urban growth have led to a great shift in the paradigm of water resource management. Low-cost surface and/or groundwater sources are practically depleted in many urbanized regions of the world. Therefore, the water supply planning paradigm is evolving from reliance on traditional fresh water resources towards building an environmentally sustainable diversified water portfolio where low-cost conventional water sources are balanced with more costly but also more reliable and sustainable water supply alternatives such as water reuse and desalination. The dramatic advance in membrane technologies enables to significantly improve the reliability of the production of such high-quality alternative water resources, as well to reduce their cost and carbon footprint. The evaluation of the feasibility of water reuse and desalination projects has to be completed applying the triple-bottom line approach which considers economic, environmental and social impacts equally.

Therefore, forward looking water utilities should consider desalination and water reuse as two integral components of sustainable management of the water cycle, with a number of synergies and mutual benefits in terms of costs, water production capacity, product water quality and energy use.

- Valentina Lazarova and Nikolay Voutchkov

http://www.water-g.com/

As always, please feel free to contact me (cparker@iwap.co.uk) with any questions.

Chloe Parker
IWA WaterWiki Community Manager
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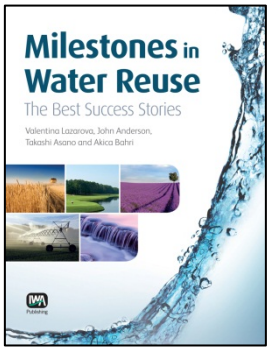
New and Forthcoming Publications on Water Reuse

Milestones in Water Reuse
The Best Success Stories



Valentina Lazarova, Takashi Asano, Akica Bahri, and John Anderson

ISBN: 9781780400075
January 2013 • 408 pages • Paperback
IWA Members price: £ 74.25 / US$ 133.65 / € 100.24

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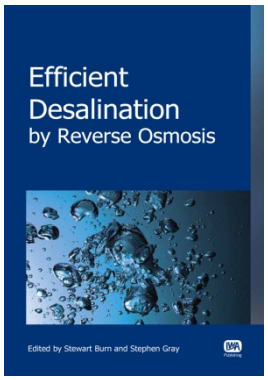
Milestones in Water Reuse: The Best Success Stories illustrates the benefits of water reuse in integrated water resources management and its role for water cycle management, climate change adaptation and water in the cities of the future. Selected case studies are used to illustrate the different types of water reuse, i.e. agricultural irrigation, golf course and landscape irrigation, urban and industrial uses, environmental enhancement, as well as indirect and direct potable reuse. The various aspects related to water reuse are covered, including treatment technologies, water quality, economics, public acceptance, benefits, keys for success and main constraints.

Efficient Desalination by Reverse Osmosis
A best practice guide to RO



Stewart Burn and Stephen Gray

ISBN: 9781780405056 • May 2015 • 256 pages • Paperback
IWA members price: £ 66.75 / US$ 120.15 / € 90.11

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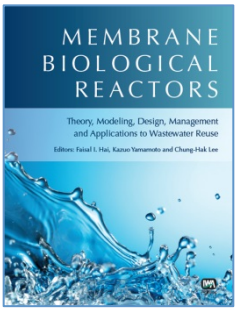
Efficient Desalination by Reverse Osmosis provides a complete guide to best practice from pre-treatment through to project delivery. It is written for utility managers & professionals.

Membrane Biological Reactors

Theory, Modeling, Design, Management and Applications to Wastewater Reuse



Faisal I. Hai, Kazuo Yamamoto and Chung-Hak Lee

ISBN: 9781780400655 • November 2013 • 504 pages • Hardback
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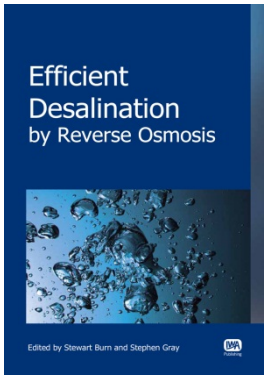
In recent years the MBR market has experienced unprecedented growth. The best practice in the field is constantly changing and unique quality requirements and management issues are regularly emerging.

Membrane Biological Reactors: Theory, Modelling, Design, Management and Applications to Wastewater Reuse comprehensively covers the salient features and emerging issues associated with the MBR technology. The book provides thorough coverage starting from biological aspects and fundamentals of membranes, via modelling and design concepts, to practitioners' perspective and good application examples.

Alternative Water Supply Systems

A best practice guide to RO



Fayyaz Ali Memon and Sarah Ward

ISBN: 9781780405506 • October 2014 • 496 pages • Hardback
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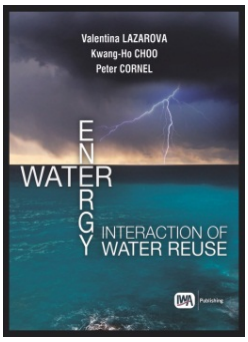
Alternative Water Supply Systems covers technical, social, financial and institutional aspects associated with decentralized alternative water supply systems. These include systems for greywater recycling, rainwater harvesting, recovery of water through condensation and sewer mining. A number of case studies from the UK, the USA, Australia and the developing world are presented to discuss associated environmental and health implications.

The book provides insights into a range of aspects associated with alternative water supply systems and an evidence base (through case studies) on potential water savings and trade-offs. The information organized in the book is aimed at facilitating wider uptake of context specific alternatives at a decentralized scale mainly in urban areas.

Water-Energy Interactions in Water Reuse

Valentina Lazarova , Kwang-Ho Choo, and Peter Cornel



ISBN: 9781843395416 • May 2012 • 360 pages • Paperback
IWA members price: £ 74.25 / US$ 133.65 / € 100.24

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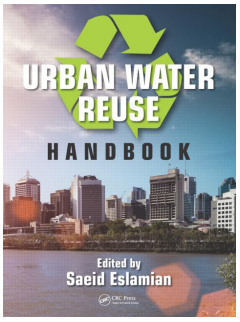
Water-Energy Interactions of Water Reuse covers the use of energy in conventional and advanced wastewater treatment for various water reuse applications, including carbon footprint, energy efficiency, energy self-sufficient facilities and novel technologies, such as microbial fuel cells and biogas valorisation. It is of real value to water utility managers; policy makers for water and wastewater treatment; water resources planners, and researchers and students in environmental engineering and science.

Urban Water Reuse Handbook

Saied Eslamian



February 2016 • ISBN: 9781780407364 1184 pages • Hardback
Full Price: £ 140.00 / US$ 252.00 / € 189.00 Member Price: £ 105.00 / US$ 189.00 / € 141.75

http://iwapublishing.com/books/9781780407364/urban-water-reuse-handbook?utm_source=IWA+Publishing+Mailing+List&utm_campaign=9ec6f458ce-Wastewater_100915&utm_medium=email&utm_term=0_49a7734030-9ec6f458ce-90011889

Urban Water Reuse Handbook recognises that rapid population growth, along with drought, water-intensive energy development, climate change conditions, and a number of other factors all place stress on world water supplies. In many countries throughout the world, water reuse has proved to be an effective and safe means to help satisfy growing water demands and offset scarcity. This book provides the latest information on water reuse applications with a focus on urban areas. It examines numerous new and alternative methods for sustainable water supplies.
This title is co-published with CRC Press

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