

SCIENTIFIC PROGRAMME

OF THE 11TH IWA SYMPOSIUM ON

MODELLING AND INTEGRATED ASSESSMENT

23 - 27 SEPTEMBER 2023
QUEBEC CITY, CANADA



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Centre de recherche sur l'eau



ORGANIZERS



OFFICAL EVENT OF



PROGRAMME OVERVIEW

SATURDAY, 23 SEPTEMBER		
08:00-10:00	Registration	
<div>Young Water Professionals Workshop</div> <div>Location: Room A</div> <div>How Do Availability And Quality Of The Data Impact The Way We Model Water Systems? Challenges And Good Practice</div> <div>YWP Steering Committee: Saba Daneshgar (Ghent University, Belgium), Hanna Molin (Lund University, Sweden), Fanlin Meng (Tsinghua University, China), Helieh Abasi (INRS, Canada), Kester McCullough (Cornell University, USA)</div>		
Time	Topic	Presenter/Moderator
09:00-09:45	Welcome & Ice breaker activity Introduction to MIA Specialist Group	S. Daneshgar
09:45-10:15	Keynote: “Setting the scene”	J.D. Therrien
10:15-10:45	Coffee break	
10:45-11:30	Part I: What is “good” data and what can you do with it? Mechanistic modelling perspective Data-driven modelling perspective Hybrid modelling perspective	H. Molin B. Elduayen-Echave M. Khalil M. Schneider
11:30-12:00	Q&A and Discussion	
12:00-13:30	Lunch break	
13:30-14:45	Part II: Group works on the case studies Participants work together in groups to find solutions to one of the case studies Group 1: Case study 1 - Wastewater application Group 2: Case study 2 - Drinking water application Group 3: Case study 3 - Stormwater application	K. McCullough
14:45-15:15	Wrap-up	
15:15-15:45	Coffee break	
15:45-16:45	Reports on case studies & General discussion	Organisers
16:45-17:00	Wrap-up and closing	S. Daneshgar
17:00-19:00	YWP Social Activity	

PROGRAMME OVERVIEW

SUNDAY, 24 SEPTEMBER	
08:00-10:00	Registration
09:00-12:00	Workshop 1 Location: Room A How Can Hybrid Modelling Be Used For Model Complexity Reduction? Chair/Co-Chair: E. Torfs, D. Fernandes del Pozo Contributors: A. Froemelt, S. Borzooei, S. Daneshgar, C.C. Gómez Cortéz, R. Saagi, J. Sparks, X. Zou, K. Villez, M.Y. Schneider
09:00-17:00	Workshop 2 Location: Room B Shedding Light – How Can We Improve Mathematical Models To Promote And Optimize Phototrophic Systems For Water Remediation And Resource Recovery? Chair/Co-Chair: B. Valverde-Pérez, F. Casagli Contributors: B.G. Plósz, O. Bernard, J.-P. Steyer, G. Capson-Tojo, J. Laurent, S. Rossi, A. Turolla, E. Ficara, T. Lorenz, U. Theilen, J. García, E. González Flo, D. Batstone
13:30-17:00	Workshop 3 Location: Room C How Can Mathematical Modelling Integrate With Wastewater-Based Epidemiology To Enhance Public Health Protection? Chair/Co-Chair: S. Tik, Ll. Corominas Contributors: C. Huot, D. McCarthy, J.-D. Therrien, P.A. Vanrolleghem, S. Dorner, S. Nourbakhsh, S.C. Aydin, T. Maere, W. Yusuf
13:30-17:00	Workshop 4 Location: Room A From Integrated Modelling To Holistic Decision Frameworks For The Water Sector, What Are The Needs And Challenges For Interoperability? Chair/Co-Chair: S. Daneshgar, E. Torfs Contributors: P. Bach, C. Vaneeckhaute, J. Alferes Castano, P. Seuntjens, I. Nopens
17:00-18:00	Registration Location: Musée National des Beaux-Arts du Québec (179 Grande Allée Ouest, Québec)
17:30	Opening Reception and Keynote Location: Musée National des Beaux-Arts du Québec (179 Grande Allée Ouest, Québec) Climate Change Drives Market For Urine-Separating Toilets Bruce Beck (FASresearch and International Institute for Applied Systems Analysis, Austria)

PROGRAMME OVERVIEW

MONDAY, 25 SEPTEMBER			
08:00-10:00	Registration		
08:30-10:00	Opening Session and Plenary Keynote Location: Plenary Room Community Engagement For Water Management Under Uncertainty Elmira Hassanzadeh (Polytechnique Montréal, Canada) Modelling “Palettes” - A New Dawn Of Integrated Assessment To Support Water Management's Role Towards Climate-Adaptive Cities Peter Marcus Bach (Eastern Switzerland University of Applied Sciences, Switzerland)		
10:00-10:30	Coffee break		
	Room A	Room B	Room C
	SESSION 1 SMART MONITORING AND DATA PROCESSING Moderator: K. Newhart, J.D. Therrien	SESSION 2 FLOCCULATION AND SETTLING Moderators: B. Valverde-Pérez, D.F. del Pozo	SESSION 3 DIGITAL TWIN CASE STUDIES Moderator: S. Daneshgar, K. McCullough
10:30-12:00	1.1. Multivariate Monitoring For Surveillance Networks Of SARS-CoV-2 In Sewage <i>L.I. Bosch, J. Pueyo, L.I. Corominas</i>	2.1. Simulating Floc Size Distribution In Coagulation-Flocculation Processes Through Mass-Based Population Balance Models For Integral Modelling of Drinking Water Treatment Plants B. Elduayen-Echave, E. Ayesa	3.1. Full Scale Digital Twin With Integrated Hybrid Model Predictive Controller For Ammonia Based Aeration Control J.A. Sparks, P.A. Vanrolleghem, C.B. Bott
	1.2. Water Quality Sensor Data Processing In Applications For Water Management N. Desmet, F. Van Bauwel, L. Brosens, R. Vandeputte, J. Dehaspe, P. Seuntjens	2.2. Application Of Computer Vision For Microscopy Images: A Revolutionary Approach In Predicting Activated Sludge Settling Characteristics <i>S. Borzooei, L. Scabini, G. Miranda, S. Daneshgar, L. Deblieck, R. Cornelissen, E. Van Den Broeck, P. De Langhe, O. Bruno, B. De Baets, I. Nopens, E. Torfs</i>	3.2. MSD's Data Driven Digital Transformation Journey Over 20 Years <i>D. Tao, O. Fradet, S. Shishegar, W. Miller, S. Laughlin</i>
	1.3. Wastewater Generation Model To Predict Impacts Of Urine Separation On Wastewater Treatment Plants J. Kleckers, A. Abadi, K. Brandherm, J. Haberkamp	2.3. Impact Of Sludge Settling On Oxygen And N ₂ O Gas Mass Transfer <i>Y. Qiu, V. Bakos, N. Stewart-Campbell, B.G. Plósz</i>	3.3. Full-Scale Soft-Sensor Implementations Enable WRRF Hybrid Digital-Twins B.R. Johnson, C. Yang, K. Lesnik, J. Registe, T. Johnson, A. Menniti, J. Kenyon
12:00-13:30	Lunch		

PROGRAMME OVERVIEW

	SESSION 4 PLANT-WIDE MODELS Moderators: E. Belia, S. George	SESSION 5 COMPARTMENTAL MODELS Moderators: J. Laurent, H. Molin	SESSION 6 SYSTEM APPROACH TO SURFACE WATER Moderators: P. Bach, J. Schmidt
	4.1. Re-thinking Industrial Wastewater Treatment Using Advanced Mathematical Modelling X. Flores-Alsina , V. Monje, E. Ramin, P. Ramin, J. Abildskov, K.V. Gernaey, A. Mitic, L. Lardon, L. Wolmarans, I. Coremans	5.1. A Dynamic Compartmental Model Of A Sequencing Batch Reactor (SBR) For Biological Phosphorus Removal S. Daneshgar , S. Borzooei, L. Debliek, E. Van Den Broeck, R. Cornelissen, P. de Langhe, C. Piacuzzi, M. Daza, S. Duchi, U. Rehman, I. Nopens, E. Torfs	6.1. Poster presentations Model Development For Cooling Towers And Optimization Of Their Fan And Pump Operation Strategy C.D. Jayaweera , J. Wauman, A. Verliefde, I. Nopens, I. Hitsov A Flexible Mesh Model For Simulation Of Coastal Hydrodynamics And Water Quality In Hong Kong K.T.M. Wong , Q. Ye, S.N. Chan, H.S. Lee, A.Y.W. Chiu
	4.2. A Comprehensive Modelling Framework For Integral Simulation Of Drinking Water Treatment Plants B. Elduayen-Echave , E. Ayesa	5.2. Development And Validation Of A New Combined Hydraulic And Biological Model For Trickling Filters In A Real WWTP K. Olaciregui-Arizmendi , S. Jaray-Valdehiero, T. Fernández-Arévalo, A. López, J. Gómez, B. Elduayen-Echave, E. Ayesa	6.2. How To Evaluate WRRF Pollutant Discharge Regulations For Protecting The Quality Of Receiving Waters: A Mechanistic And Artificial Intelligence Model-Based Methodology D.A. Mendoza Grubert , T. Maere, F. Li, C. Boisvert, P.A. Vanrolleghem
	4.3. Plant-wide Modelling Of Digestate Up-Cycling: The Case Of Microalgae Cultivation D. Carecci , S. Rossi, A. Catenacci, G. Ferretti, E. Ficara	5.3. A Compartmental Model Approach For Dynamic Combined Simulation Of Hydraulics And Biochemistry In WRRFs A. Romay-Gainza, B. Elduayen-Echave, B. Hernández , R. Arnau, J. Climent, E. Ayesa	6.3. The Influence Of Discharge Permits On Economic And Emission Performance Of Industrial Enterprises: An Agent-Based Perspective Z. Wei , M. Gong, F. Meng, Y. Liu
	4.4. Evaluating Monitoring Strategies In Wastewater Treatment Plants Using Benchmark Simulation Model No. 2-M P. Ramin , E. Ramin, S.O.N. Topalian, U. Jeppsson, K.V. Gernaey, X. Flores-Alsina	5.4. Compartmental Model Study Of A Pilot-Scale Activated Sludge Reactor D. Fernandes del Pozo , S. Daneshgar, I. Nopens	6.4. Water-Smart Strategies To Support Decision Making For Water Resource Management In The Industrial Context J. Alferes, N. Desmet , S. Kempeneers, S. Latte, I. Hitsov, C. Jayaweera, K. De Neve, J. Wauman, R. Bosch, S. Van Ermen, P. Seuntjens, I. Genné
13:30-15:30			
15:30-17:30	Poster Cocktail Session		

PROGRAMME OVERVIEW

15:30-17:30	Poster Cocktail Session – List of Posters
	<ol style="list-style-type: none"> 1 Optimal Placement Of Sensors For Networkwide Calibration Using Pressure Dependent Modelling A.G. Seyoum, S. Tait, J. Boxall, A.N.A. Schellart 2 Life Cycle Analysis Of Water Resource Recovery Facilities Based On Algae-Bacteria Processes D. Penaranda, F. Casagli, F. Beline, O. Bernard 3 Effect Of System Nonlinearity On The Resilience Of Water Resource Recovery Facilities A.S. Laino, O. Wani, S. Soudjani, R.J. Davenport 4 An Energy Use Accounting Method For WWTPs Based On A Process Unit Balance And Its Application L. Yao, C. Wang, Y. Liu 5 Estimation And Analysis Of Embodied Energy Conversion In Community Septic Tank Y. Yan, C. Wang, Y. Liu, X. Dong, Y. Liu, L. Yao 6 Exploring The Effects Of Faults And Disturbances On The Performance Of A Biological Wastewater Treatment Process H.L. Ivan, V. Zaccaria 7 Model Predictive Control For The Elimination Of Contaminants Of Emerging Concern By UV Based Advanced Oxidation Process T.-M. Hwang, J. Lee, S.-H. Nam, E. Kim 8 Model Predictive Control For The Elimination Of Micropollutant During Bromide-Rich Wastewater Ozonation E. Kim, H. Kye, S.-H. Nam, T.-M. Hwang 9 State Estimation In Water Distribution Networks Using The Saint-Venant Equations With Extended Kalman Filtering M. Bartos, M. Thomas, M. Frankel, M.-G. Kim, L. Sela 10 Application Of Pre-Processing And Noise Reduction Methods To Improve Generalization Performance Of The Leakage Detection Model M.A. Caronge, Y. Arai, K. Ito, T. Kunizane, A. Koizumi, B. Bakri 11 Smart Management Of Wastewater Treatment Based On Total Nitrogen Prediction Applying Long Short -Term Memory (LSTM) neural network Y. Lee, H.-W. Kim 12 Deterioration Assessment Model Of Urban Drinking Water Distribution Pipes Using A Machine Learning Algorithm And Geographic Information System J. Lee, S.-H. Nam, E. Kim, T.-M. Hwang 13 Fluorescence Excitation-Emission Matrix Spectroscopy Coupled With PARAFAC Modeling To Determine Of Chlorine Decay Constants In Metropolitan Water-Distribution Systems J. Lee, S.-H. Nam, E. Kim, T.-M. Hwang 14 Residential Water And Energy Consumption Prediction At Hourly Resolution Based On A Hybrid Machine Learning Approach C. Wang, X. Ni, Z. Li, W. Shi, J. Zhang, J. Bian, Y. Liu 15 Enhancing The Explanation of Household Water Consumption Through The Water-Energy Nexus Concept: A Case In Beijing, China Z. Li, C. Wang, Y. Liu, J. Wang

PROGRAMME OVERVIEW

15:30-17:30	Poster Cocktail Session – List of Posters
	<p>16 A Flexible Mesh Model For Simulation Of Coastal Hydrodynamics And Water Quality In Hong Kong K.T.M. Wong, Q. Ye, S.N. Chan, H.S. Lee, A.Y.W. Chiu</p> <p>17 Model Development For Cooling Towers And Optimization Of Their Fan And Pump Operation Strategy C.D. Jayaweera, J. Wauman, A. Verliefde, I. Nopens, I. Hitsov</p> <p>18 Myths And Reality Of The Advantages And Drawbacks Of Algae-Bacteria Processes F. Casagli, O. Bernard</p> <p>19 Modelling Heterotrophic Microalgae Cultivation For Nutrient Recovery From Industrial By-Products And Wastewaters S. Rossi, D. Carecci, E. Ficara</p> <p>20 Why Knowledge Management Systems Need To Overcome Organisational Inertia To Manage Uncertainty: A Case Study Analysis K. Sritharan, B.S. McIntosh, P.A. Vanrolleghem</p> <p>21 An Interactive Real-Time Control Tool To Support Urban Drainage Operators J. Schmidt, A. Roy, B. Kerkez</p> <p>22 Mechanistic Modelling Framework To Develop Digital Twins For Water And Wastewater Technologies G. Bellandi, R. Muoio, E. Guerrero, W. Audenaert, U. Rehman</p> <p>23 Optimal Design Module For Watershed Water Quality Monitoring Network As A GIS Toolbox W. Meng, M. Luo, Q. Liang, J. Jiang</p> <p>24 Sludge Age Predictive Modeling In Full Scale Wastewater Treatment Plant Using Recurrent Neural Network M. Djeddou, P. Wongburi, A. Bachiri, J.K. Park</p> <p>25 A Dynamic Model For Ion Exchange And Resin Regeneration: Model Calibration And Global Sensitivity Analysis D.I. González, I.P. Hitsov, B. Claessens, J.P. Gallo Molina, I. Nopens, E. Torfs</p>

PROGRAMME OVERVIEW

TUESDAY, 26 SEPTEMBER			
08:00-08:30	Registration		
08:30-10:00	Plenary Panel Discussion Location: Plenary Room <i>Plenty Of Modelling Methodologies, Which Ones Really Support Systems Thinking?</i> Panelists: Branko Kerkez (University of Michigan, USA), Kate Newhart (West Point, USA), Simon Duchi (AM-Team, Belgium)		
10:00-10:30	Coffee break		
	Room A	Room B	Room C
	<u>SESSION 7</u> HYBRID MODELS	<u>SESSION 8</u> URBAN HYDRAULICS	<u>SESSION 9</u> DIGITAL TWIN DEVELOPMENTS
	Moderators: M. Schneider, M. Khalil	Moderators: W. Rauch, J. Li	Moderators: P. Ramin, B. Hernández Blázquez
10:30-12:00	7.1. Hybrid Machine Learning-Mechanistic Modeling Of Algae-Bacteria Processes Under Various Climatologies F. Casagli , M. Scalabrino, J.I.F. Ulloa, O. Bernard	8.1. Capacity Of 2D Shallow Water Models To Represent Unsteady Flow Characteristics In Urban Area L. Guiot , G. Dellinger, F. Lawnicak	9.1. A Novel Contaminant Transport Model For Natural And Urban Drainage Networks With Real-Time Data Assimilation M.-G. Kim , M. Bartos
	7.2. Balancing Calibration Efforts In Parallel Hybrid Modelling Of Wastewater Treatment Processes L. Verhaeghe , P.A. Vanrolleghem, S. Daneshgar, G. Kirim, E. Torfs	8.2. Flood4CastRTF: A Novel Flood Modelling Tool M. Craninx , K. Hilgersom, G. Vaes, T. Danckaert, J. Bronders	9.2. Forecasting Influent Water Quality Parameters And Flow Of WRRFs Using Weather Data A. Hykkerud , A. Nair, H. Ratnaweera
	7.3. Automatically Generating Hydrologic Process Models From Sensor Data T.A. Dantzer , B. Kerkez	8.3. Integrated Modeling Of Urban Mobility, Flood Inundation, And Sewer Hydrodynamic Processes For Resilience Assessment Of Urban Drainage Systems L. Wang , X. Dong, R. Li	9.3. Automatic (Re)Calibration Of Water Resource Recovery Facility Models To Ensure Continuous Model Performance C. Gómez , S. Daneshgar, K. Solon, S. Borzooei, I. Nopens, E. Torfs
12:00-13:30	Lunch		

PROGRAMME OVERVIEW

	SESSION 10 SOFT SENSORS I Moderator: B. Kerkez, K. Olaciregui-Arizmendi	SESSION 11 SEWER AND CATCHMENT Moderators: S. Tik, B. Elduayen-Echave	SESSION 12 N₂O MODELLING AND MITIGATION Moderators: X. Flores-Alsina, N. Uri Carreno
13:30-15:00	10.1. Transforming Biosolids: Linear Multimodal Modelling For Improved Fourier Transform Infrared Based Soft Sensors S.O.N. Topalian , P.C. Keymer, X. Flores-Alsina, K.V. Gernaey, D.J. Batstone	11.1. A Model-Based Assessment Of In-Sewer Heat Recovery Potentials D. Muschalla , W. Sprung, S. Reinstaller, F. Kretschmer	12.1. Pattern Recognition Of Operational States Leading To N ₂ O Emissions In Full-Scale Biological Wastewater Treatment A. Froemelt , L. Zueger, W. Gruber
	10.2. Soft Sensor For Substrate Characterization Through The Reverse Application Of The ADM1 Model For Anaerobic Digestion Plant Operations A. Donoso-Bravo, M.C. Sadino-Riquelme, F. Zorrilla , E. Valdebenito-Rolack, D. Gómez, F. Hansen	11.2. Swift Physics-Informed Model For Hydraulic Characteristics In Sewer Networks J. Li , K. Sharma, Z. Yuan	12.2. Using Artificial Intelligence For Online Prediction Of N ₂ O Emissions In WRRFs M. Khalil , A. AlSayed, P.A. Vanrolleghem, Y. Liu
	10.3. Using Machine Learning To Predict The Total Solids Concentration In Thickened Primary Sludge At Henriksdal WRRF H. Molin , E. Bröndum, S. Nilsson, R. Saagi, E. Lindblom, B. Carlsson, U. Jeppsson	11.3. Rainfall Driven E.coli Dynamics In Inland Rivers V. Suslovaite , V. Speight, J.D. Shucksmith	12.3. General Framework For Effective Assessment, Mitigation, And Reporting Of N ₂ O Emissions G. Bellandi, S. Duchi , T. Weijtmans , R. Muoio, W. Audenaert, U. Rehman
15:00-15:30	Coffee break		
15:30-16:30	Problems, Ideas and Challenges Session Location: Plenary Room		
16:30-17:30	MIA Specialist Group Open Group Meeting Location: Plenary Room		
18:30	Surprise Conference Dinner		

PROGRAMME OVERVIEW

WEDNESDAY, 27 SEPTEMBER			
08:00-08:30	Registration		
08:30-10:00	Poster Breakfast	Hybrid Modelling Challenge Organized by the Hybrid Modelling Working Group Location: Room C	
	Room A	Room B	Room C
	SESSION 13 PROCESS CONTROL Moderator: J. Sparks, T. Dantzer	SESSION 14 PROCESS MODELS Moderator: C. Vaneckhaute, P. Carrera	SESSION 15 DECISION SUPPORT SYSTEM FOR DESIGN Moderators: L. Corominas, R. Ktori
10:00-12:00	13.1. Long-Term Assessment Of Multi-Objective Model Predictive Control Of WRRFs <i>P.A. Stenftoft, C.L. Holmboe, B. Valverde-Pérez, L. Vezzaro</i>	14.1. A Quantified Nitrogen Metabolic Network Based On Reaction Kinetics And Mathematical Model In Treating Low COD/TN Wastewater <i>J. Meng, Z. Sun, J. Li</i>	15.1. Poster presentations Why Knowledge Management Systems Need To Overcome Organisational Inertia To Manage Uncertainty: A Case Study Analysis <i>K. Sritharan, B.S. McIntosh, P.A. Vanrolleghem</i> Life Cycle Analysis Of Water Resource Recovery Facilities Based On Algae-Bacteria Processes <i>D. Penaranda, F. Casagli, F. Beline, O. Bernard</i> Effect Of System Nonlinearity On The Resilience Of Water Resource Recovery Facilities <i>A.S. Laino, O. Wani, S. Soudjani, R.J. Davenport</i>
	13.2. Hybridization Of A First-Principles Biofilter Model With A Data-Driven Model To Improve Performance Of A Hybrid MPC Controller Of Methanol Dosing For N-Removal In A Denitrifying Biofilter <i>M. Serrao, V. Jauzein, S. Daneshgar, S. Azimi, V. Rocher, B. Tassin, P.A. Vanrolleghem</i>	14.2. Model Based Analysis Of Trace Metal Speciation Effects In An Anaerobic Digestion System Under Different Modes Of Operation <i>S. George, M.R. Mattei, L. Fruzo, G. Esposito, E.D. van Hullebusch, F.G. Feroso</i>	15.2. Sustainability Assessment Framework Of Integrated Desalination And Resource Recovery: A Participatory Approach <i>R. Ktori, M.P. Parada, M. Rodriguez-Pascual, M.C.M. van Loosdrecht, D. Xevgenos</i>
	13.3. Integrated Real-Time Control Of Urban Drainage Systems For Water Quality Using Reinforcement Learning <i>Y. Wang, X. Dong, Z. Huang</i>	14.3. Detailed Modelling Of Radiation Transfer In Photobioreactors For Purple Phototrophic Bacteria Mixed Cultures And Integration With Biokinetics <i>A. Amini, E. Porciatti, M. Greco, S. Rossi, E. Ficara, A. Turolla</i>	15.3. Adaptation Pathways Modelling Of Urban Wastewater Systems Under Deep Uncertainty And Urban Expansion <i>D. Zhang, X. Dong, S. Zeng</i>
	13.4. Poster presentation An Interactive Real-Time Control Tool To Support Urban Drainage Operators <i>J. Schmidt, A. Roy, B. Kerkez</i>	14.4. Development Of A New Combined Hydraulic And Biological Model For Aerobic Granular Sludge Reactors <i>K. Olaciregui-Arizmendi, S. Jaray-Valdehiero, T. Fernández-Arévalo, B. Elduayen-Echave, E. Ayesa</i>	15.4. Development Of An Agile Benchmarking Framework For The Evaluation Of Emerging Wastewater Treatment And Resource Recovery Technologies In QSDsan <i>X. Zhang, S. Rai, Y. Li, B.D. Shoener, P.A. Vanrolleghem, R.D. Cusick, J.S. Guest</i>
12:00-13:30	Lunch		

PROGRAMME OVERVIEW

	SESSION 16 CALIBRATION AND OPTIMAL EXPERIMENTAL DESIGN Moderators: U. Jeppsson, S. Rossi	SESSION 17 SOFT SENSORS II Moderators: A. Froemelt, H. Ivan	SESSION 18 GREEN/GREY INFRASTRUCTURE Moderators: S. Duchesne, V. Suslovaite
13:30-15:00	16.1. Moving Sensor Deployment For Network-Wide Pipe Roughness Calibration A.G. Seyoum , S. Tait, J. Boxall, A.N.A. Schellart, W. Shepherd	17.1. Modeling Phosphorus Recovery Within MagPrex: Lessons From A Statistical And Machine Learning-Based Analysis J. Lybik , N.G. Love, R. Maltos, B. Wisdom, K. Newhart	18.1. A Flood Impact Matrix To Support Sustainable, Targeted Blue-Green-Grey Stormwater Management Solutions S. Li, J.P. Leitao, Z. Wang, P.M. Bach
	16.2. Model Parameter Estimation With Imprecise Information W. Rauch	17.2. Adaptive Sampling For The Calibration Of Soft Sensors M. Tobias , B. Kerkez	18.2. Applying MCDA For NBS Planning: A Comparison Between A Canadian, French, And Australian Case Studies M. Bousquet , R. Lavoie, F. Bichai, P.A. Vanrolleghem
	16.3. Mass-Balance-Based Approach In Planning A Measurement Campaign For Energy Factory Tilburg D. Ysebaert, Q. Le, P. Carrera , R. Schemen, S. Weijers, E.I.P. Volcke	17.3. Predicting Total Solids Using Non-Contact Acoustic Sensors: Systematic Feature Reduction For Robust Model Performance G. Kittleson , B. Bhattacharai, K.N. Ngo, H. Nguyen, T. Nguyen, H. De Clippeleir, N. Love, B. Kerkez	18.3. Operation Strategy Of A Sewer System And Green Infrastructure Layout Based On Vulnerable Facilities C. Shen , X. Dong, X. Wang
15:00-15:30	Coffee break		
15:30-17:00	Closing Session and Closing Keynote Location: Plenary Room An Integrated Computer Control System (IC2S) for Wastewater Treatment Plant Operation – A Digital Twin “Avant la lettre!” Gilles Patry (University of Ottawa, Canada)		