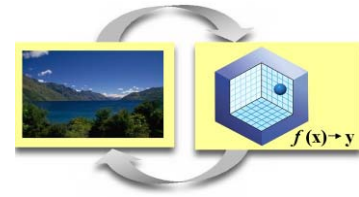




Specialist Group on SYSTEMS ANALYSIS AND INTEGRATED ASSESSMENT



Newsletter: *Volume 6, Number 1, April 2011*

Watermatex 2011

*8th IWA Symposium on Systems
Analysis and Integrated Assessment*



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Disclaimer: *This is not a journal, but a Newsletter issued by the IWA Specialist Group on Systems Analysis and Integrated Assessment. 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.*

Note: To prevent misuse, all e-mail addresses in this newsletter include the @ sign in graphic rather than text format.

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SAIA SPECIALIST GROUP DESCRIPTION

Systems Analysis is directed at providing guidance when choosing between alternative courses of action, i.e., decision-making. The Group addresses all aspects of the formal methods of applying systems analysis to managing the aquatic environment. This includes, for example, the development and use of mathematical models, optimisation algorithms, time-series analysis and forecasting, computational procedures for decision analysis and support, and so on. The Group is also responsible for maintaining a forum for the discussion of inter-disciplinary issues within the IWA. Its subject area is not confined therefore merely to wastewater treatment, or water supply, or to surface water, or groundwater systems. Increasingly, managing the water environment will present challenges in which the engineering and economic elements of problem-solving will need to be augmented with those having human, institutional, and cultural dimensions to them. The Group is also directed, therefore, at developing and promoting the application of systematic procedures of Integrated Assessment.

HOW TO JOIN THE SPECIALIST GROUP ON SYSTEMS ANALYSIS AND INTEGRATED ASSESSMENT

All members of IWA are welcome to join the Specialist Group. With the IWA registration, you can indicate which Specialist Group you wish to join. Please contact the Chairman or Vice Chairman if you wish to become member of the Specialist Group on Systems Analysis and Integrated Assessment and you did not indicate it on your IWA registration form. You may also directly contact Frances Lucraft at IWA (frances.lucraft@iwahq.org).

SPECIALIST GROUP WEBSITE

News on the IWA Specialist Group on Systems Analysis and Integrated Assessment is available on our website, which is maintained by Marie-Noëlle Pons of the Laboratoire des Sciences du Génie Chimique, CNRS, Nancy cedex, France. The web site's address is: <http://www.ensic.inpl-nancy.fr/iwa-saia/>

CHAIRMAN'S MESSAGE

Well, this is it—my last message to you, friends, SAIA members. Indeed, at the end of our forthcoming Watermatex symposium I will pass on the chairman stick to Eduardo Ayesa who will have just shown his ability to organise a magnificent Watermatex2011 (just putting pressure, Eduardo ;-). You will not lose my enthusiasm for SAIA though as I will remain on the Management Committee to help out for a while and support the new leadership. Indeed, the constitution of our Specialist Group states that the four-yearly Watermatex symposium is the place where the management committee is rejuvenated. Typically some members retire from the committee and are replaced by new, active Specialist Group members who want to contribute in the coming years to the group's activities. May I therefore call upon those who feel motivated to put time into our Specialist Group (SG) to send me a one-page description of who they are and how they think they can bring their energy into the SG's management committee? We are particularly keen to get applications from female members and Young Water Professionals.

To show that your contribution as a Management Committee member can really be meaningful, let me take a moment (after 8 years as SAIA chair) to look back to the future. Together with the ICA SG with which we have quite some affinity, we established the Virtual Programme at World Water Congress in which we helped attendees find the SAIA-relevant papers within the huge program of such a conference. We established a new WWTmod seminar series, and in doing so were the first to confirm the potential of collaboration between two huge organizations in the water sector: IWA and the Water Environment Federation, each with their strengths. Within WWTmod, we put Young Water Professionals in the spotlight, allowing them to organize a YWP workshop and, especially, allowing over 20 of them to learn about Scientific Committee work by linking each of them with an established researcher with whom they reviewed submitted papers. So, SAIA provides you with a platform to try out some new things that are subsequently spreading around within IWA.

And I'm not done! Do you realize that the SAIA SG is hosting the majority of IWA's Task Groups? Most of you know that the Scientific and Technical Reports written by these task groups are outstanding contributions to water science, technology, and practice—all done on a voluntary basis. Let me name these task groups in chronological order with their acronym and short description: RWQM1 (River Water Quality Model No 1), GMP (Good Modelling Practice), BSM (Benchmarking of control systems for WWTPs), DOUT (wastewater treatment Design and Operations Uncertainty Task group), GHG (Model-based minimization of greenhouse gas emissions from wastewater utilities), and just approved by IWA, the Task Group on a Generalised Physico-chemical framework for modelling processes such as acid-base reactions, gas-liquid transfer, and solid-liquid precipitation in water systems. Let me share my appreciation for the inspiring work these extremely good ambassadors of our SG have been and currently are doing, by thanking their chairs: Thank you László Somlyódy, Leiv Rieger, Ulf Jeppsson, Lina Belia, José Porro, and Damien Batstone.

I want to announce four more organizational topics that will be discussed during the Management Committee and Open Specialist Group meeting during Watermatex2011. First, as we already discussed at Watermatex2007 in Washington DC and again at WWTmod2010 in Québec, should we change the name of the Specialist Group? Does the current name reflect what we stand for and is it a good branding? Personally I think we can do better. I don't think we need to change the scope of what we cover by our SG, but I'm afraid that a lot of our IWA colleagues have difficulties in grasping what "Systems Analysis and Integrated Assessment" really means. Shouldn't we try somehow to get the word "model" into the name of our SG? Think about it and share your ideas with me and we'll bring it forward in San Sebastian.

A second discussion topic that is surfacing regularly is our relation to two other SGs that are close to our interests: the Hydroinformatics SG and the Statistics and Economics SG. I don't think we should merge, but we could certainly coordinate our activities better. Any ideas on this (and perhaps on relations with other SGs) would be very much appreciated. Please note that IWA's Strategic Council has a SG subcommittee that is moving forward in establishing a matrix of interrelationships between SGs. This may be a very useful exercise in strengthening the coverage of IWA SGs over the whole water discipline and reducing overlaps.

Third, some of you may be aware of an IWA organizational structure called Working Groups. In contrast to Task Groups that have a limited lifetime (three years), Working Groups are standing committees within a SG that have a reduced scope within the larger scope of the SG. For instance, within the Urban Drainage SG five Working Groups have been in place for a long time. Two examples are Real-Time Control within Urban Drainage, and Sewer Processes and Networks. This organizational structure within IWA may be a good way to ensure that active people within a SG can channel their energy into topics that truly interest them and get some visibility within the larger technical community (one of the best benefits IWA can provide). Working Groups organize workshops and even conferences, write white papers, leaflets, update IWA's waterwiki, and have their own webpages. The discussions I've had with some of the "energy bombs" in our SG have convinced me that we should take this route and set up Working Groups on, for instance, Good Modelling Practice, Benchmarking Control Strategies, and Computational Fluid Dynamics. What I would like to get at my last Management Committee meeting is proposals for Working Groups that include the scope of what the group will cover, the management team that will follow through, the intended activities, etc. Please contact me if you want to know more about Working Groups and the procedures linked to them. They have only recently been established.

Finally, but very importantly, at the end of Watermatex2011 we want to announce where the next Watermatex will be held, in 2015. We invite candidates for the organization of the next Watermatex to send me a two-page teaser in which you convince us of your organizational talents and experience, the goodies of the venue, ideas you have at making Watermatex even more attractive than it already is, and anything you think will convince the management committee to pick your proposal. We hope as well that you can give a short presentation at Watermatex to the management committee and if selected, invite all participants to make their travel plans for 2015. Please note that the SAIA SG has an established rule that the chairman of the elected Watermatex committee becomes the next secretary of the SAIA Specialist Group.

Let me finish my last chairman's message with something I have been advocating for the last five years and that has finally come true. At WWTmod2010 history was finally corrected: a request by Imre Takács in a little textbox in the February 2005 issue of Water21 was finally made official: the "Petersen matrix" concept for compact model representation is now dead and will henceforth be known as the "Gujer matrix." Indeed, it was Willi Gujer who basically put this compact model presentation approach together in the early 1980s. He should get the credit for this very valuable contribution to the modelling field as it made communication among modellers so much more efficient and clear. I am happy to say that we were just in time to correct this before Willi Gujer retired this year as a paid contributor to the water profession. I am sure though that we can still look forward to many interesting contributions to come!



As Stefano Marsili-Libelli taught me with the classic finishing slide of his presentations: "That's all folks!" See you in San Sebastian two months from now.

Peter A. Vanrolleghem, SAIA Chairman

WATERMATEX 2011

Plan to attend Watermatex2011!

20-22 June 2011, San Sebastian, Spain

<http://www.watermatex2011.org/>



Conference chairmen's letter

On behalf of the Scientific and Organising Committees we would like to invite you to attend the 8th IWA Symposium on System Analysis and Integrated Assessment (WATERMATEX 2011) to be held in San Sebastian (Spain). This event is the last of a long series of IWA Specialist conferences that started in London (1987) and continued in Durham, USA (1991), Budapest (1994), Quebec (1997), Gent (2000), Beijing (2004) and Washington (2007).

Since the beginning, WATERMATEX symposiums have been focused on promoting the application of a wide range of mathematical methods for solving water-related problems. Methodological approaches presented and discussed in WATERMATEX conferences are very diverse, including, for example, mathematical modelling and identification, optimisation, process monitoring and control, time-series analysis and forecasting, uncertainty analysis, decision support systems, soft computing, and so on, all of them oriented to better analyse water systems in a very broad sense, including drinking and wastewater, surface and groundwater and technical and natural systems.

Nowadays, mathematical modelling and computing tools are being applied more and more by an increasing range of water professionals. Consistent with this trend, the WATERMATEX 2011 Symposium targets people from research, consulting companies, institutions and operations involved in the practical and rigorous use of models and computing tools to support the understanding, management and optimisation of water systems. We anticipate that a significant representation of the state-of-the-art will be presented next summer in the Symposium.

Finally, we would like to remark that San Sebastian is a historic, scenic coastal town which offers an exceptional array of entertainment and culinary possibilities. Please plan on attending WATERMATEX 2011. Here at CEIT and LEQUIA, we all look forward to meeting you personally in San Sebastian in June 2011!

Yours sincerely,
Eduardo Ayesa, Chair of WATERMATEX 2011
Ignasi Rodríguez-Roda, Vice-chair of WATERMATEX 2011

Technical Programme

A robust technical programme is planned around the conference themes and application field shown below.

Conference themes	Application Fields
<ul style="list-style-type: none"> - Mathematical modelling - System identification - Systems analysis and optimisation - Uncertainty analysis and risk assessment - Time series analysis and forecasting - Automatic control - Data management and assimilation - Signal processing - Decision support systems - Software engineering - Numerical methods and Solvers - Monte Carlo simulations - Integrated assessment - Environmental Impact and LCA - Model-based benchmarking (BSM) - Good Modelling Practise (GMP) - Water Resources Management of River Basin 	<ul style="list-style-type: none"> - Water treatment - Wastewater treatment - Sewer networks - Water supply and distribution - Industrial process waters - Water reuse - Surface waters - Groundwater - Coastal waters - Sludge treatment and disposal - Water and Energy - Water economics - Integrated water systems - Urban water cycle

The conference will also include the following workshops and special sessions:

Sunday 19th June – The Use of Water Quality and Process Models for Minimising Wastewater Utility Greenhouse Gas Footprints. Organised by the IWA Task Group on Greenhouse Gases.

Monday 20th June – The Role of Calibration and Validation in Wastewater Modelling. Organised by the IWA Task Group on Good Modelling Practice – Guidelines for Use of Activated Sludge Models (GMP).

Tuesday 21th June – Modelling Issues for Integrated Assessment and Water Resources Management of River Basins. Organised by Geoff Podger, Stefano Marsili-Libelli, Suzanne Pierce and Tony Jakeman.

Venue

The conference will be held in the School of Engineers of the University of Navarra (TECNUN), situated in the Ibaeta Campus in San Sebastian, Spain. The city is one of the most attractive places in Spain. Situated on the Bay of Biscay, the city is surrounded by beaches and mountains, and offers some of the best fine cuisine in Europe. Delight in famous restaurants or try ‘pintxos’, appetizer-sized dishes delicately prepared in the city’s many bars and pubs. With its welcoming atmosphere, the city attracts plenty of visitors every summer.

You can also visit many traditional and lovely villages near to San Sebastian including Hondarribia or Getaria, whose green hills, beaches and historic buildings will provide you with unforgettable memories! For art lovers, art in open spaces, accessible to all, is another of the representative characteristics of San Sebastian. At the end of Ondarreta Beach (west end of San Sebastian) el Peine del Viento made by the sculptor Eduardo Chillida and architect Luis Peña Ganchegui offers a delightful view of the merger between art and landscape. In the Paseo Nuevo, challenging the power of the tides stands the sculpture Construcción Vacía by artist Jorge Oteiza. The play, which was awarded at the Biennale of Sao Paulo half a century ago, is nowadays a landmark in the contemporary art world, a real treasure handy to everyone.



Important Dates for Watermatex2011

Final programme announcement: 31 March 2011

Early bird registration closes: 30 April 2011

You can register for Watermatex2011 at http://www.watermatex2011.org/?page_id=116. Register before 30 April to take advantage of discounted Early Build registration fees.

NEWS FROM THE SAIA SPECIALIST GROUP – WWTMOD REPORT

2nd IWA/WEF Wastewater Treatment Modelling Seminar

Mont-Sainte-Anne, Québec, Canada, March 28-30, 2010

www.modeleau.org/WWTmod2010



We are proud to say that the 2nd IWA/WEF Wastewater Treatment Modelling Seminar (WWTmod2010) was able to repeat the success of the first seminar (in March 2008). Modelling experts from around the globe met in Mont-Sainte-Anne, Quebec, Canada to discuss the state-of-the-art and trends in wastewater treatment modelling. A good mixture of participants from academia and practice, as well as geographically from Europe, North America, Asia, Oceania and South America, led to remarkable debates analyzing topics from different perspectives. Total attendance was 125.



In contrast to a standard conference setup, all sessions were prepared upfront, which resulted in 80% of the attendees being involved in the program. This year's seminar covered seven parallel workshops on Sunday with small groups of up to 25 participants. In the main track, held on Monday and Tuesday, six sessions were arranged with only 13 platform presentations. Every session had two 20-minute presentations plus another 50 minutes of moderated discussion per session. The scene was set by an opening lecture given by Glen Daigger (IWA's president elect) providing his personal perspective on the future of wastewater treatment modelling.

Topics included workshops on: 1) data collection and reconciliation which discussed procedures and methods to check data quality, 2) micropollutant modelling which identified knowledge gaps, 3) modelling green house gas (GHG) emissions which defined the current state of knowledge, 4) computational fluid dynamics (CFD) which highlighted problems in current clarifier design standards and showed application of CFD models in bioreactor design, 5) biofilm models which outlined current practice and future needs, 6) the development of a generalized framework for modelling of physicochemical processes, and finally, 7) biokinetic model concepts which discussed new microbiological findings and how to include them into engineering models.

The single track setup on Monday and Tuesday covered sessions on: A) model synthesis and communication which introduced a new notation framework for wastewater treatment modelling, B) new modelling approaches for nitrogen modelling which discussed organic nitrogen conversions and multiple ammonia oxidizing biomass (AOB) populations, C) new model concepts which analysed the impact of particle-size distribution in granular sludge reactors and studied heterogeneities within microbial populations by using agent-based modelling of wastewater treatment systems, D) modelling in practice which showed the benefits of using models in operation support, design of process control strategies, and the importance of data quality, E) uncertainties which focused on methods for sensitivity analysis and examples of how to include uncertainties in wastewater treatment modelling, and F) whole-plant modelling which stated the need for models that cover standard processes and their interactions and which work under varying conditions. Ten posters were displayed in the coffee area and stimulated a more personal exchange of ideas.



The closing session was moderated by Gustaf Olsson and started with statements by Willi Gujer and Sudhir Murthy about model limitations and the role of modelling in speeding up knowledge capture and management. A very passionate discussion followed on the role of modelling in engineering practice and science. All discussions were extremely intense, sometimes controversial, but always fruitful. The stimulating atmosphere can be best described with Monday night's Break-out Sessions: These special sessions provided time and space for ongoing discussions on topics emerged during the seminar. Some of these groups only stopped close to midnight.

It is difficult to give a highlight out of all these excellent contributions, but one of the topics getting the most attention was modelling green house gases (GHG). A very interesting statement was made that at the moment our industry is below the radar in terms of GHG emissions but that this could easily change if recent findings on significant GHG emissions from wastewater treatment are proven correct. A new IWA task group has been started recently to further analyze this (see IWA Task Group GHG below in this newsletter).

Several meetings took place outside the official seminar program (e.g. IWA Specialist Groups on Instrumentation Control and Automation and Systems Analysis and Integrated Assessment, IWA Task Groups on Benchmarking Control Strategies, Good Modelling Practice, Uncertainty in Design and Operation of WWTP and The use of water quality and process models for minimizing wastewater utility greenhouse gas footprints, a workshop on Uncertainties, and many more. All these activities once again confirmed that WWTmod is THE platform to discuss wastewater treatment modelling issues, to share perspectives, and to develop ideas to meet the current and future needs of the wastewater modelling world. Selected papers from WWTmod2010 will be published in *Water Science and Technology*.

WWTmod2010 introduced what is probably the most extensive program for young water professionals (YWP) including: 1) A dedicated mentoring program for the scientific committee (a team of a senior and a YWP had to come up with decisions for all questions related to reviews and program development), 2) A formal YWP committee making sure that YWP interests were taken care of, and 3) A special YWP workshop on Saturday before the seminar that was the first combined IWA/WEF YWP event. The YWPs also took care of the Break-out Sessions.

As an example of how WWTmod provides real opportunities for YWPs a little success story: Ingmar Nopens and Josh Boltz started as YWPs in 2008 and were promoted to senior scientific committee members and subsequently chaired the YWP committee in 2010. As part of the restructuring of the organizing team, Bruce Johnson will take over the chair of the SC in 2012 with Josh and Ingmar being the formal incoming chairs. This means that two YWPs from WWTmod2008 will chair the seminar in 2014. The WWTmod2012 organizing team will consist of the outgoing chair of the Scientific Committee (Leiv Rieger), the actual SC chair (Bruce Johnson), the incoming SC chairs (Ingmar Nopens/Josh Boltz), and the chair of the Organizing Committee (Peter Vanrolleghem). A special Thank You goes to Imre Takács, who came up with the idea of restarting a specific conference on wastewater treatment modelling and who is now retiring from the organizing team.

The organizers would like to thank all our sponsors who made this event affordable:

Platinum Sponsors: CH2M-HILL, Envirosim Associates Ltd., Veolia Water, Hydromantis Inc., CDM
Gold Sponsors: Carollo, MOSTforWATER

Leiv Rieger (outgoing chair Scientific Committee) and Peter Vanrolleghem (chair Organizing Committee)

Preliminary Announcement: WWTmod2012

In response to the success of the first two modelling seminars, a third seminar is planned. Watch for the official announcement of the 3rd IWA/WEF Wastewater Treatment Modelling Seminar (WWTmod2012), to be held March 25-27, 2012, in Mont-Sainte-Anne, Quebec, Canada.

WWTmod2012 will be the third seminar in the wastewater treatment plant modelling seminar series started in 2008. WWTmod promotes dialog between experts by providing a regular discussion platform on all aspects of wastewater treatment modelling, especially “within fence” (whole-plant modelling). Emerging contaminants, stricter effluent limits, and climate change are driving forces for model development and application. As well, a number of new model concepts/extensions and calibration approaches have been developed in the last decades by different research groups and companies. The main objective of the conference is to present recent findings and successful case studies with the aim of bringing together different “schools” and approaches with the aim of consensus building and clarification of differences on topics where discussion has matured. The process of consensus building is supported by inviting targeted people from research, consulting companies, equipment suppliers and wastewater treatment plants.

NEWS FROM THE SAIA TASK GROUPS AND OTHER SPECIALIST GROUPS

IWA Task Group on Good Modelling Practice

The GMP Task Group has been very active in the last few months finishing the Scientific Technical Report and promoting Good Modelling Practice around the world. Some of these activities are listed below.

Seminar and Conference Activities

The **IWA World Water Congress** in Montreal, Canada hosted several GMP Task Group activities:

- A GMP Modelling Course was held by the task group with kind support of Yves Comeau from École Polytechnique de Montréal. The course evaluation once again showed the appreciation for the effort the GMP group is putting into these activities.
- A GMP Workshop was part of the conference program and led the audience through the different steps of the GMP Unified Protocol for activated sludge modelling.
- Together with the BSM, DOUT and GHG task groups, the GMP group presented their activities at the **IWA Specialist Group and Task Group Leader Meeting**. The following table shows the impressive records of SAIA-related task groups.

	BSM	GMP	DOUT	GHG
	since 2005	since 2005	since 2008	since 2010
Workshops	5	7	4	0
Conference organization	2	3	0	0
Courses	1	5	0	0
Publications	50+	11	2	1
Questionnaires	0	2	0	0
TG meetings	15	13	6	3
Conference presentations	50+	-	0	2
Specialised web site	yes	yes	yes	yes
Recurring updates in IWA et al newsletters	yes	yes	yes	yes
No of PhD theses based partly on TG's work	16	1	1	1
Post doctoral work based partly on TG's work	10+	-	1	-

- GMP task group members were also present at **WEFTEC.10** in New Orleans. An update on our activities was given at a meeting of the MEGA group, a WEF sub-committee and one of the expert groups connected to the GMP group. The New Notation for Wastewater Treatment Modelling (Corominas *et al*, 2010) is fully supported by MEGA.
- **Watermatex 2011**: A GMP Workshop on *The Role of Calibration and Validation in Wastewater Modelling* will take place on Monday June 20th. More information can be found on the conference website: http://www.watermatex2011.org/?page_id=364
- **WWTmod2012**: The next Wastewater Treatment Modelling Seminar will be held in March 2012 in Mont-Sainte-Anne QC, Canada.
- We are also planning a GMP modelling course at the **LWWTP 2011** in Budapest.

For details on modelling courses, workshops or other events please contact Guenter Langergraber (Guenter.Langergraber@boku.ac.at).

GMP Website (<https://iwa-gmp-tg.cemagref.fr/>)

Our new website is continuously updated and now contains plenty of material for downloading. For instance it includes error-checked and corrected Gujer Matrices for 7 published models.

The GMP group's biggest helper defended her PhD thesis
Hélène Hauduc, a PhD student at Cemagref, France and Université Laval, Canada defended her thesis on November 2nd 2010 in Quebec, Canada. The GMP Task Group would like to thank her for the amazing work she performed with the Task Group and wishes her all the best for her future.

Recent publications of the GMP group

For a list of recent publications with GMP contributions please visit our website (<https://iwa-gmp-tg.cemagref.fr/literature-and-downloads>).

Scientific and Technical Report (STR)

The Good Modelling Practice Task Group continues to work toward the completion of the STR on Good Modelling Practice. The STR is currently undergoing an extensive external review process (deadline May 1st). Details of the STR are available via the following link:

<http://www.iwapublishing.com/template.cfm?name=isbn9781843391746>

More information

For more information see our website: <https://iwa-gmp-tg.cemagref.fr/> (**new address!**) or contact the Task Group Chair, Leiv Rieger, rieger@envirosim.com.

The IWA Task Group on Benchmarking of control strategies for wastewater treatment plants

The goal of the Task Group is to promote the use of the benchmark simulation protocols (BSM1, BSM1_LT and BSM2) and produce a Scientific and Technical Report (as part of IWA Publishing's series). In the mid 90s, the IWA Task Group on Respirometry began to work on the development of a simulation-based protocol (a 'simulation benchmark') that would be used for the objective comparison and evaluation of wastewater treatment plant control strategies. The main reason for initiating this work was that it was discovered that over the years numerous WWTP control strategies had been proposed in the literature, however, the literature did not provide a clear basis for comparison of these strategies because of the many confounding influences that have an impact on the system.

The 'benchmark protocol', as it is currently, is defined in terms of a comprehensive description of a standardized simulation and evaluation procedure including plant layout, simulations models and model parameters, a detailed description of disturbances to be applied during testing and evaluation criteria for testing the relative effectiveness of simulated strategies. The success of the BSM's in terms of publications (already more than 300 when counted two years ago) and research groups world-wide requesting access to the tool are strong indications of the need for this research.

The Task Group maintains a website for publication of on-going activities (www.benchmarkwwtp.org) and the

Scientific and Technical Report is to be published this year — see the IWA Publishing website for pre-publication information and to reserve a copy: <http://www.iwapublishing.com/template.cfm?name=isbn9781843391463>. Several papers and posters related to the work of the BSM Task Group will be presented at WaterMatex 2011.

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The IWA Task Group on Uncertainty Evaluation in Model Based WWTP Design and Operation (DOUT Group)

Following the success of the workshop on uncertainty and model prediction accuracy held during the WWTmod2008 international seminar in Mont-Sainte-Anne, a new IWA Task Group was formed in September 2008. The goals of the group can be summarised as follows:

1. Propose a common language for communicating on the subject of uncertainty.
2. Propose a comprehensive list of the sources of uncertainty.
3. Document and evaluate existing methods for assessing and evaluating uncertainty (quantitative and qualitative).
4. Incorporate knowledge from other fields (water resources, atmospheric science, nuclear industry, etc.) on applications of uncertainty evaluation methodologies.
5. Identify gaps in current knowledge. Define the developments required to provide adequate tools to implement uncertainty evaluations in projects for design and operation of WWTPs.

The task group has as its goal the preparation of a Scientific and Technical Report. The report will provide an overview of the topic of uncertainty in the field of wastewater treatment and will summarize current knowledge on the available methods for assessing and evaluating uncertainty. The Task Group has full support from the IWA Specialist Group on Systems Analysis and Integrated Assessment, by the Task Group on Good Modelling Practice (GMP), and by the Modeling Expert Group of the Americas (MEGA), a Water Environment Federation (WEF) subcommittee. Core members of the TG are Evangelina Belia (Canada), Peter Vanrolleghem (Canada), Lorenzo Benedetti (Italy), Marc Neumann (Canada), Sudhir Murthy (USA), Bruce Johnson (USA), and Stefan Weijers (Netherlands).

During the two years that the TG has been active, the group has held eight core group meetings and organised three workshops. They have also assembled a working team of 26 volunteers that are compiling the material for each of the chapters of the STR. The TG has also put together a team of 33 expert reviewers from across four continents. In order to present the work of the Task Group in a more official forum, the group organised three workshops in 2010.

- During WWTmod2010: Interdisciplinary Meeting on Uncertainty, Mont-Sainte-Anne, Québec, March 31st, 2010.
- During IWA WWC 2010: Explicitly dealing with uncertainty in WWTP design and operation, IWA World Congress, Montreal, September 20th.
- During WEFTEC 2010: How will your Wastewater Plant Really Run? Evaluating Risk in Design and Operation, Workshop 203, New Orleans, October 3rd.

For more information, contact the Task Group Chair, Evangelina Belia, belia@primodal.com, or visit the Task Group website: http://www.iwahq.org/Home/Networks/Task_groups/Task_Group_on_Uncertainty/

IWA Task Group GHG

The SAIA supported Task Group GHG (formally The Task Group on The use of water quality and process models for minimizing wastewater utility greenhouse gas footprints) has been very active in the last year. Focused on modelling N₂O and CH₄ greenhouse gas emissions from wastewater systems, the Task Group has held open meetings, presented technical papers, and contributed in workshops and seminars at the following events: WWTmod 2010, WWC 2010, Novedar_Consolider Seminar, Water and Energy Conference, and the Nutrient Recovery and Management Conference. The TG has created a global network of researchers and practitioners and has begun engaging them for demonstrating cases, performing modelling experiments, collecting and sharing data, and, most importantly, for building consensus on models, tools, and methodologies. Ultimately the work will be compiled in a Scientific and Technical Report due in early 2013 and will include consensus-based and peer-reviewed

models, similarly to efforts from other task groups for the development of models such as the IWA Activated Sludge and Anaerobic Digestion Models. The TG has also formed a collaboration with the Water Environment Research Foundation (WERF) and will begin calibrating N₂O models using full-scale WWTP data. The TG is also currently working on a plant-wide modelling and GHG benchmarking case. The TG GHG will be organizing an N₂O and CH₄ modelling workshop at the upcoming Watermatex Conference in San Sebastian.

More information

More on the TG GHG can be found on their website <http://www.iwataskgroupghg.com/> or by contacting the chair, Jose C. Porro, Malcolm Pirnie, Inc., Long Island City, NY, USA, jose.porro@arcadis-us.com. Please do not hesitate to contact the TG for more information or for collaboration opportunities.

The IWA Task Group on a Generalised Physicochemical Framework for Water System Models

A new Task Group has been established under the SAIA umbrella to enhance our understanding and representation of physicochemical processes. These reactions occur naturally in aquatic environments, without the need for a microbial mediator. They are commonly used across the water industry cycle. Important examples include the use of alum for coagulation and phosphorous removal, unintentional scaling, gas transfer, and acid-base reactions. While an enormous amount of effort has been expended in developing and applying biological process models, models of physicochemical reactions are generally rudimentary and empirical. This greatly limits our ability to effectively manipulate and utilize these processes. In fact, the fundamentals are reasonably well known, but have not been systematically assessed in the water and wastewater area. The Task Group will develop a physicochemical framework with high predictive capacity that is usable across the range of unit operations by both modellers and end-users.

The Task Group composition is currently being finalised, but includes representatives from Europe, Asia, Africa, and the USA, and is well represented by both industrial practitioners and academics.

Contacts:

Chair Dr. Damien Batstone (Advanced Water Management Centre, The University of Queensland)

damienb@awmc.uq.edu.au

Secretary Dr. Stephan Tait (Advanced Water Management Centre, The University of Queensland)

s.tait@awmc.uq.edu.au

MESSAGE FROM IWA

New from IWA - the IWA Water Wiki!

Invitation to Participate



www.iwawaterwiki.org

The **WaterWiki** is a website providing a place for the water community to interact, share knowledge and disseminate information online.

Since the site was launched, we have been working with IWA Specialist Groups, offering them the opportunity to set up their own group work spaces on the WaterWiki – we now have over **20** Groups using the site to communicate and network online.

Want to get involved? We would like to invite members of the **Systems Analysis and Integrated Assessment** Specialist Group to set up their own private Group Space on the Wiki.

WaterWiki Group Spaces – Why participate?

Establishing a Group Space on the WaterWiki is excellent way share information within your group. You can:

- Include contact details of key members in the group
- Upload PDFs, Word documents, presentations etc.
- Circulate minutes from meetings, events, conferences etc.
- Plan up coming events and webinars
- Discuss research developments and group activities

Once you have established your group space on the Wiki, members can add, remove, or edit content at anytime – and we have a dedicated support team on hand to answer any technical queries.

If you are a member of the **Systems Analysis and Integrated Assessment** IWA Specialist Group and would like to establish a Group Space on the WaterWiki, please contact Victoria Beddow (vbeddow@iwap.co.uk).

Call for Contributions – New articles

We are currently looking for new articles in your subject area. If you are able to write on any of the following subjects (about 600-1000 words), please do contact us:

Tools, environments and language; Geographic information systems and virtual imaging
Hydroinformatics; Impact assessment of climate change; Water System Management; Analytical Methods;
Monitoring and data for the MDGs; Systems Analysis; Monitoring

Victoria Beddow
IWA WaterWiki Community Manager
vbeddow@iwap.co.uk



Make a splash.

Recognising excellence and innovation
in water projects throughout the world.



Project
Innovation
Awards

2012 IWA Project Innovation Awards

The IWA Project Innovation Awards (PIA) is a prestigious global awards programme aimed at recognising excellence and innovation in water engineering projects around the world.

Awards are given for the following project categories:

- Applied Research
- Design
- Operations/Management
- Planning
- Small Projects

We invite you to submit your projects in four different regions in Americas, Europe & Western Asia, East Asia and Asia-Pacific for the Regional PIA Awards. All regional winners will be advanced into the global level to compete for the Global Grand PIA Awards which will be presented at the IWA World Water Congress in Busan, Korea in September 2012.

The European and Western Asia Regional PIA is now open for submissions from 15 April to 1 July 2011.



Project
Innovation
Awards
Development

2011 Project Innovation Awards – Development

The IWA Project Innovation Awards – Development are given in recognition of water and sanitation projects in low and middle income countries, in urban and peri-urban areas.

Entries will be submitted under one of two primary categories:

- Drinking Water Supply;
- Sanitation and Wastewater

Within each category, projects which fall within one or more of the following sub-categories will be eligible for consideration:

- Hardware (i.e. physical infrastructure)
- Software (i.e. advocacy, outreach, educational campaigns, etc)
- Applied Research

If you have a project in a low and middle income country that demonstrates innovation and sustainability in one of the above project categories, we invite you to submit it for the 2011 PIA-Development Awards which will be presented at the 2nd IWA Development Congress in Kuala Lumpur, Malaysia in November 2011.

The PIA-Development is now open for submissions until 1 July 2011.



For more information, please visit www.iwa-pia.org
or contact us at pia@iwahq.org / PiaDevelopment@iwahq.org

NEWS FROM IWA PUBLISHING

New and forthcoming books from IWA Publishing with an SAIA theme include the following:



Editors: Krist V Gernaey, Ulf Jeppsson, Peter A Vanrolleghem, John B Copp and Jean-Philippe Steyer

ISBN: 9781843391463 • Dec 2011 • Paperback
IWA members price: £ 51.75 / US\$ 93.15 / € 69.86

This title belongs to the [*Scientific and Technical Report Series*](#)

<http://www.iwapublishing.com/template.cfm?name=isbn9781843391463>

This book is a **Scientific and Technical Report** produced by the IWA Task Group on Benchmarking of Control Strategies for Wastewater Treatment Plants. The goal of the Task Group includes developing models and simulation tools that encompass the most typical unit processes within a wastewater treatment system (primary treatment, activated sludge, sludge treatment, etc.), as well as tools that will enable the evaluation of long-term control strategies and monitoring tasks (i.e. automatic detection of sensor and process faults).

Work on these extensions has been carried out by the Task Group during the past five years, and the main results are summarized in *Benchmarking of Control Strategies for Wastewater Treatment Plants*. Besides a description of the final version of the already well-known Benchmark Simulation Model no. 1 (BSM1), the book includes the Benchmark Simulation Model no. 1 Long-Term (BSM1_LT) – with focus on benchmarking of process monitoring tasks – and the plant-wide Benchmark Simulation Model no. 2 (BSM2). A CD-ROM Appendix containing benchmarking software developed by the Task Group, simulation results and detailed technical reports describing all aspects of the benchmark systems is also included.

Guidelines for Using Activated Sludge Models



IWA Task Group on Good Modelling Practice

ISBN: 9781843391746 • Dec 2011 • Paperback
IWA members price: £ 51.75 / US\$ 93.15 / € 69.86

This title belongs to the [*Scientific and Technical Report Series*](#)

<http://www.iwapublishing.com/template.cfm?name=isbn9781843391746>

The GMP Task Group has developed a Unified Protocol and an Application Matrix as the basis for the modelling framework. The Unified Protocol was developed by synergizing the best salient features of several published modelling protocols and consists of five major steps:

1. Project definition
2. Data collection and reconciliation
3. Plant model set-up
4. Calibration and validation
5. Simulation and result interpretation

The Application Matrix consists of a list of 14 typical modelling applications and indicates the relative rigour with which each of the Unified Protocol steps should be carried out for the particular application.

Additional features in the STR include a chapter on modelling industrial wastewater, an overview on the history, current practice and future of activated sludge modelling and several explanatory case studies. It can be used as an introductory book to learn about Good Modelling Practice (GMP) in activated sludge modelling and will be of special interest for process engineers who have no prior knowledge of modelling or for lecturers who need a text book for their students.

Mathematical Modelling and Computer Simulation of Activated Sludge Systems



Jacek Makinia

ISBN: 9781843392385 • Sep 2010 • 408 pages • Paperback

IWA members price: £ 63.75 / US\$ 114.75 / € 86.06

<http://www.iwapublishing.com/template.cfm?name=isbn9781843392385>

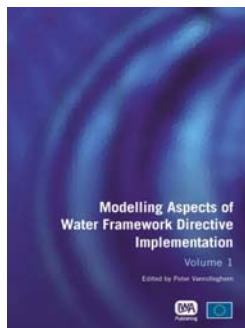
This international, comprehensive guide to modeling and simulation studies in activated sludge systems leads the reader through the entire modeling process – from building a mechanistic model to applying the model in practice.

Mathematical Modelling and Computer Simulation of Activated Sludge Systems will:

- enhance the readers' understanding of different model concepts for several (most essential) biochemical processes in the advanced activated sludge systems,
- provide extensive and up-to-date coverage of experimental methodologies of a complete model parameter estimation (longitudinal dispersion coefficient, influent wastewater fractions, kinetic and stoichiometric coefficients, settling velocity, etc.),
- summarize and critically review the ranges of model parameters reported in literature,
- compare the existing protocols aiming at a systematic organization of the simulation study,
- outline the capabilities of the existing commercial simulators,
- present documented case studies of practical model applications as a guide while planning a simulation study.

Mathematical Modelling and Computer Simulation of Activated Sludge Systems can be used as supplementary material for a graduate level wastewater engineering courses and is useful to a wide audience of researchers and practitioners. Experienced model users such as consultants, trained plant management staff may find the book useful as a reference and as a resource for self-guided study.

Water Framework Series Directive



Peter A Vanrolleghem, Fred Hattermann and Zbigniew W Kundzewicz

ISBN: 9781780400013 • Jan 2011 • Paperback

IWA members price: £ 230.00 / US\$ 414.00 / € 310.50

<http://www.iwapublishing.com/template.cfm?name=isbn9781780400013>

Pre-Publication Offer: Water Framework Directive Series Set

Buy all four titles including Volume 3 and Save £100!

The four volumes in the Water Framework Directive Series are:

- *Water Framework Directive: Model supported Implementation - A Water Manager's Guide* Fred Hattermann and Zbigniew W Kundzewicz
ISBN: 9781843392736 • £ 66.50 / US\$ 119.70 / € 89.78
- *Modelling Aspects of Water Framework Directive Implementation - Volume 1*
Peter A. Vanrolleghem
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- *Integrated Assessment for Water Framework Directive Implementation: Data, Economic and Human dimension - Volume 2*
Peter A. Vanrolleghem
ISBN: 9781843393269 • £ 85.00 / US\$ 153.00 / € 114.75
- *Decision support for Water Framework Directive Implementation - Volume 3*
Peter A. Vanrolleghem
ISBN: 9781843393276 • £ 56.25 / US\$ 101.25 / € 75.94

Water Framework Directive: Model supported Implementation: A Water Manager's Guide

Editors: Fred F Hattermann and Zbigniew W Kundzewicz

This book is one of the concrete outcomes of the Harmoni-CA concerted action (supported by the European Commission). It provides a framework for model-supported participatory planning of measures at various river basin scales and practical guidance to water managers and other interested stakeholders on the model-supported implementation of the WFD.

The objective of the book is to offer guidance to water managers on the model-supported implementation of the Water Framework Directive at the level of a river basin district and at other levels (such as sub-basins, national, or international scale in the case of international river basins). It should help water managers to better understand how models may be used for planning purposes, while special attention is given to the problem of predicting an uncertain future, one very likely to differ from the present.

Six case studies from different parts of Europe are provided to illustrate the practical applicability of the planning framework in the WFD implementation. They are very important for illustrating how concepts from earlier parts of the document are applied to real-world situations. The case studies cover several aspects of mesoscale river basin management, water quantity and quality issues, and the role of modelling, with two case studies located in pilot river basins.

<http://www.iwapublishing.com/template.cfm?name=isbn9781843392736>

Modelling Aspects of Water Framework Directive Implementation, Volume 1

Editor: Peter A Vanrolleghem

Modelling Aspects of Water Framework Directive Implementation: Volume 1 is a concrete outcome from the Harmoni-CA concerted action as part of a 4-volume series of Guidance Reports that guide water professionals through the implementation process of the Water Framework Directive, with a focus on the use of ICT-tools (and in particular modelling). They are complementary to the Guidance Documents produced by the EU Directorate General for Environment.

Water resources planning and management and the development of appropriate policies require methodologies and tools that are able to support systematic, integrative and multidisciplinary assessments at various scales. It also requires the quantification of various uncertainties in both data and models, and the incorporation of stakeholders participation and institutional mechanisms into the various tools and risk assessment methodologies, to help decision makers understand and evaluate alternative measures and decisions.

<http://www.iwapublishing.com/template.cfm?name=isbn9781843392231>

Integrated Assessment for Water Framework Directive Implementation: Data, Economic and Human Dimension, Volume 2

Editor: Peter A Vanrolleghem

Implementing the comprehensive Water Framework Directive requires a thorough planning process that consists of several consecutive steps. The least one can say is that it is a challenging task which needs appropriate ICT tools that are able to cope with the complexity of the water system and this planning process. Integrated assessment, participatory processes and the science-policy interface are one of the newer elements in this overall implementation process that have developed greatly thanks to the WFD. Economic methods, models and instruments are integrative to the WFD implementation as well, with such concepts as cost recovery of water resources being central to debate with stakeholders. Economic valuation of natural resources (willingness-to-pay, willingness-to-accept, ...) should

get sufficient attention and the human dimension (perception, needs, wants, values and behaviours) should be incorporated in the modelling frameworks for decision-making. In the same line there is also a human dimension to the use of models: how do non-modellers, such as managers, policy-makers, other stakeholders feel about models and their use in their day-to-day activities. And finally, this volume deals with the large issue of data: its quality, availability and, not to forget, accessibility. And can we use data both for monitoring purposes (surveillance, operational and investigative in the WFD context) and for modelling. Is there a synergy to be found? These tasks, the underlying concepts, methods, tools and procedures are the subject of this volume.

<http://www.iwapublishing.com/template.cfm?name=isbn9781843393269>

Integrated Assessment for Water Framework Directive Implementation, Volume 3

Editor: Peter A Vanrolleghem

Decision Support for Water Framework Directive Implementation: Volume 3 is a concrete outcome from the Harmoni-CA concerted action as part of a 4-volume series of Guidance Reports that guide water professionals through the implementation process of the Water Framework Directive, with a focus on the use of ICT-tools (and in particular modelling). They are complementary to the Guidance Documents produced by the EU Directorate General for Environment.

Water resources planning and management and the development of appropriate policies require methodologies and tools that are able to support systematic, integrative and multidisciplinary assessments at various scales. It also requires the quantification of various uncertainties in both data and models, and the incorporation of stakeholders participation and institutional mechanisms into the various tools and risk assessment methodologies, to help decision makers understand and evaluate alternative measures and decisions.

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Urban Hydroinformatics: Data, Models and Decision Support for Integrated Urban Water Management



Roland Price and Zoran Vojinovic

ISBN: 9781843392743 • Jan 2011 • 552 pages • Paperback

IWA members price: £ 78.75 / US\$ 141.75 / € 106.31

This title belongs to [*Urban Hydroinformatics Series*](#)

<http://www.iwapublishing.com/template.cfm?name=isbn9781843392743>

Urban Hydroinformatics: Data, Models and Decision Support for Integrated Urban Water Management is an introduction to hydroinformatics applied to urban water management. It shows how to make the best use of information and communication technologies for manipulating information to manage water in the urban environment.

The book covers the acquisition and analysis of data from urban water systems to instantiate mathematical models or calculations, which describe identified physical processes. The models are operated within prescribed management procedures to inform decision makers, who are responsible to recognized stakeholders.

The application is to the major components of the urban water environment, namely water supply, treatment and distribution, wastewater and storm water collection, treatment and impact on receiving waters, and groundwater and urban flooding.

Changes at Water Science and Technology

As you may be aware *Water Science and Technology* has a new publication policy. The journal will now accept individual submissions while still serving as the primary publication journal for the IWA conferences. As a result we hope to see papers related to SAIA not only in connection with a conference but also individually submitted papers. Papers should be submitted via www.editorialmanager.com/wst where detailed instructions and guidance

can be found. We are proud to say that the impact factor for WST is 1.24, an increase from 0.70 in the previous year. During the last few months we have had more than 100 submissions per month to WST. Helmut Kroiss (Vienna University of Technology) is the Editor-in-chief of WST

SELECTED RESEARCH REPORTS

Decision Analysis and Implementation Guidance in Strategic Asset Management

WERF Report SAM1R06c

Authors: Duncan Rose

Publication Date: Mar 2010 • 9781843393320

Pages: 120 • Paperback

IWA Members price: £ 77.25 / US\$ 139.05 / € 104.29

<http://www.iwapublishing.com/template.cfm?name=isbn9781843393320>

An Examination of Innovative Methods Used in the Inspection of Wastewater Collection Systems (CD)

WERF Report 01-CTS-7

Author(s): J Thomson, L Grada

Publication Date: 01 Oct 2004 • ISBN: 9781843397311

Pages: 200 • Paperback

Price: £ 77.25 / US\$ 139.05 / € 104.29

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NEWS: SPECIAL ISSUE ON INTEGRATED WATER RESOURCES MANAGEMENT

A special issue launched by the journal *Irrigation and Drainage Systems* was published in late December 2010. The double issue (Volume 24, Numbers 3-4, pages 155-325) is a compilation of nine articles that originate from the STRIVER IWRM Conference held in Brussels in May 2009:

(<http://kvina.niva.no/striver/Meetings/STRIVERFinalConference/STRIVERFinalConferencedocuments/tabid/169/Default.aspx>).

The special issue brings up new findings in the field of integrated water resources management with a focus on the following aspects (i) developments in IWRM and its principles, (ii) IWRM assessment and methodologies, (iii) the science-policy-stakeholder interface, (iv) the importance of scientific facts and figures, and (v) global change and land-water interactions. The issue is edited by Per Stålnacke (Bioforsk, Norway) and Geoffrey D. Gooch (Linköpings University, Sweden and Dundee University, Scotland).

The articles included are:

- Integrated Water Resources Management by Per Stålnacke & Geoffrey D. Gooch
- Fit for purpose: taking integrated water resource management back to basics by Mike Muller
- Is IWRM achievable in practice? Attempts to break disciplinary and sectoral walls through a science-policy interfacing framework in the context of the EU Water Framework Directive by Philippe Quevauviller
- Towards sustainable water resources management: bringing the Strategic Approach up-to-date by Nigel Walmsley & Geoff Pearce
- The challenge and status of IWRM in four river basins in Europe and Asia by Ingrid Nesheim, Desmond McNeill, K. J. Joy, S. Manasi, Dang Thi Kim Nhung, Maria Manuela Portela & Suhas Paranjape
- Harmonised monitoring of Lake Macro Prespa as a basis for Integrated Water Resources Management by Eva Skarbøvik, Spase Shumka, Dusko Mukaetov & Udaya Sekhar Nagothu
- Good governance and IWRM—a legal perspective by Andrew Allan & Alistair Rieu-Clarke
- Stakeholder participation in the distribution of freshwater in the Netherlands by Joanne Vinke-de Kruijf, Saskia Hommes & Geiske Bouma
- Valuing irrigation water using survey-based methods in the Tungabhadra River Basin, India by David N. Barton & Avinandan Taron
- The impacts of global change in the humid tropics: selected rainfall-runoff issues linked with tropical forest-land management by Mike Bonell

The papers are available online at SpringerLink: <http://www.springerlink.com/content/g76845t14r12nknw/>. For further information contact: Per Stålnacke, E-mail: per.stalnacke@bioforsk.no

NEWS: LAUNCH OF THE LATEST VERSION OF OPENMI VERSION 2

Following on from the success of OpenMI version 1.4, the OpenMI Association (OA) announced the release of version 2.0 at the Integrated Environmental Modelling Summit in Washington DC, USA in December 2010. The OpenMI standard allows the seamless integration of environmental modelling software, significantly enhancing the ability to simulate the interactions between environmental processes. Its main application lies in facilitating the testing of sustainability and evaluating the wider impacts of proposed environmental policies. On a more practical level, it allows model developers to build complex models from linkable components. These can be easily assembled, swapped in and out to test sensitivity, and replaced by better versions as science moves on.

Experience of using OpenMI version 1.4 has led to a number of significant changes in version 2.0. “The new version of OpenMI promises to make linking mathematical models of all sorts much easier”, says Roger Moore, chairman of the OA. “Adoption of the standard allows much more efficient modelling of complex environmental problems, such as the effects of the Hungarian chemical sludge spill or the Deepwater Horizon oil spill. It also improves our ability to investigate complex environmental interactions, facilitating better-informed decisions in the future.”

Summary of technical developments:

- OpenMI 2.0 has become more versatile. Whereas OpenMI 1.4 was mainly restricted to models that progress in time, OpenMI 2.0 offers a set of base interfaces that are not aware of the type of a model and data sources. These interfaces can easily be extended, e.g. with the extension for time and space dependent components for models that do progress in time and/or have a spatial dimension. Future extensions could support parallel computing, compliance with related standards of the Open Geospatial Consortium OGC, and more.
- “Extensions are a really exciting part of version 2.0, they will give the model developer much more flexibility” says Standa Vanecek, chair of the OA’s Technical Committee. The OpenMI 1.4 Standard was developed specifically with the linkage between numerical time-stepping models in mind. However, in integrated modelling systems other components such as data providers, databases and viewers are also used. Therefore OpenMI 2.0 provides the flexible extension capability that allows models to link to these and other components.
- The concept of a link, as a separate object, within the OpenMI has been removed for version 2.0 and replaced by direct references between components. The concept of Data Operation, handled inside components was replaced by the concept of adapters. These can be used to convert the output from one linkable component to match the input requirements of another; they are literally “adapters”. For example, they handle unit conversions and temporal and spatial aggregations and disaggregations among other things. The change ensures that version 2.0 is much more flexible and easier to use with spatial data such as that held within GIS.
- Version 2.0 is also able to handle more data types; as well as being able to exchange numerical data, the OpenMI can now exchange qualitative values, element sets, time sets and value sets.

Migration of existing models and tools:

A number of organisations are already in the process of migrating new and existing tools, models and modelling components to the new OpenMI 2.0 standard. Details are being uploaded to the news section of the OpenMI website (www.openmi.org).

Further information:

Further details can be found on the OpenMI website (www.openmi.org) and the OA Technical Committee has produced a range of documents for the release of version 2.0. These include:

- What's new in OpenMI 2.0
- OpenMI 'in a nutshell
- Scope document
- OpenMI Standard 2.0 Reference(C#/java)
- OpenMI Standard2 specification
- Migrating models

For further information contact Michiel Blind, Deltares, The Netherlands at michiel.blind@deltares.nl.

ARTICLE – INTRODUCTION TO THE OPENMI (OPEN MODELLING INTERFACE)

By Hazel Murphy, OpenMI-LIFE Project Manager, and Roger V. Moore, Chairman of the OpenMI Association

Why was the OpenMI developed?

Modelling has become an increasingly important environmental management tool for understanding a range of issues including the impacts of climate change, the consequences of remedial programmes for the environment and the effect of agricultural policy on biodiversity. With the increasing complexity of the issues and the need to support legislation such as the EC Water Framework Directive (WFD), a requirement emerged for models that could represent the interactions of multiple processes (Fig. 1 summarises the water management drivers). Building new models representing large numbers of processes was neither feasible nor a good use of the huge investment in existing models. A search therefore began to find a way to link the current models.

Following a number of attempts in which much was learned, in 2002 the EC commissioned the FP5 HarmonIT project which led to the development of the OpenMI standard interface. During the initial phase of the project, a survey of existing integrated models was made and an initial list of key model linkage requirements established (see the Box, below). Version 1.0 of the OpenMI was released in 2006 and is now in operational use.

Key model linkage requirements

- Ability to exchange data time step by time step
- Ability to link models at different scales
- Ability to cross reference terminology (i.e. no need for a standard terminology)
- Ability to handle iteration
- Ability to run under external control
- Ability to handle most modelling concepts
- Ability to convert units
- Ability to link models running at different spatial and temporal resolutions – and interpolate and extrapolate in space and time
- Ability to revert to a previous state
- Platform independence
- No framework
- Deadlocking to not be possible
- Minimum change to existing code
- Minimum impact on performance
- Open

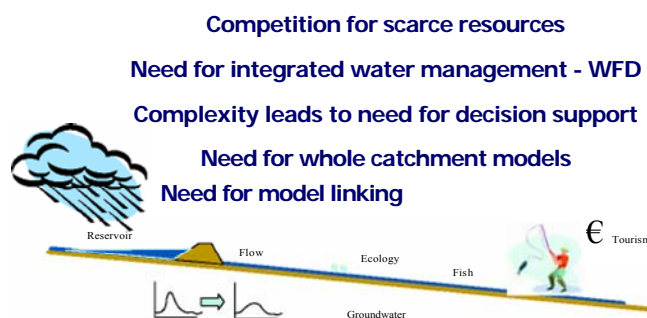


Fig. 1 Water management drivers for integrated modelling.

What is the OpenMI?

The OpenMI is a standard that defines an interface that allows time-dependent models to exchange data at run-time. When the standard is implemented, existing models can be run simultaneously and share information at each time step. A useful analogy to understanding how the OpenMI works is to think of it as the modelling equivalent of the USB cable (Fig. 2). It allows models from different domains, based on different concepts and from different suppliers, to be linked.

Once models have been made OpenMI compliant, they can be linked using a simple drag-and-drop approach. A software development kit (SDK) is provided to simplify the process of making models compliant, linking and running them. Figure 3 shows an example of model linking using the OpenMI Configuration Editor; two models are linked to each other, a user interface and tool monitoring the exchange process.

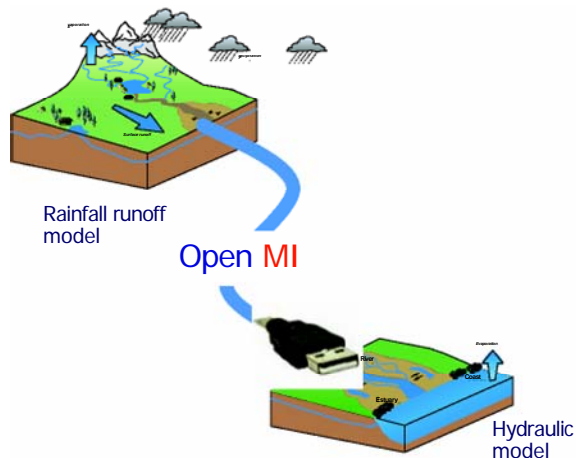


Fig. 2 The OpenMI is the modelling equivalent of a USB cable.

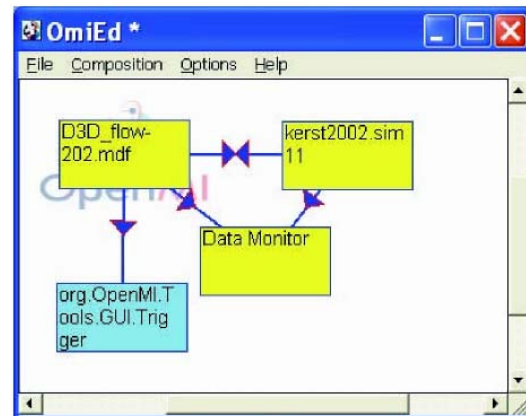


Fig. 3 Example of the OpenMI Configuration Editor

Operational testing and current status

Following HarmonIT, the EC co-funded the OpenMI-Life project, which took the OpenMI from research output to operational standard. The partners included developers and end users, the later comprising government agencies and commercial utilities. Working as they would normally, they applied the OpenMI to seven real integrated water management problems in the international Scheldt basin, which covers Belgium and the Netherlands, and in the Pinios basin in Greece. The project also set up and demonstrated a support organisation, the OpenMI Association, and developed the next version of the OpenMI Standard which was released 2010. The OpenMI Association has now taken responsibility for the OpenMI.

Going forward

Significant interest is now being shown in the OpenMI by the wider international modelling community, in particular in the USA. Although the OpenMI has been developed from an environmental background, the standard is entirely generic. As a result, the OpenMI is starting to be used to link models from other disciplines and the huge potential of linked or integrated modelling has begun to become apparent. However, to achieve that potential will require the overcoming of some considerable challenges. Therefore, in December 2010, twenty five US and European modelling organisations met in Washington to prepare a roadmap for developing integrated modelling and building an international integrated modelling community.

In the spirit of the meeting, the OpenMI Association has started working with the Open Geospatial Consortium (OGC) to enable the OpenMI to become an OGC standard.

For more information about the OpenMI and the OpenMI Association, please see the Association website, www.openmi.org or contact Roger Moore, rvm@ceh.ac.uk.

ARTICLE – CHALLENGES IN PLANNING INFRASTRUCTURE FOR FUTURE GROWTH

By Kathy Baker, Gold Coast Water, Australia

Gold Coast Water was the first water utility in South East Queensland, Australia to develop a Priority Infrastructure Plan (PIP). A PIP is a long term plan for growth related infrastructure over a period of approximately 50years (the ultimate Planning Scheme Density). The PIP in essence is a financial plan to support capital investment in infrastructure for future growth. However, if undertaken in an open minded fashion and as a long term vision, it can lead to innovative solutions for the supply of scarce resources for the benefit of the community.

The ideal of creating a ‘proper’ long term plan is one that all water utilities and Councils should subscribe to.

However, achieving this ideal requires a number of disciplines and resources, all of which rely on suitable systems, policies or information and data but, above all, time. In preparing a PIP, it is essential that the water utility or Council has systems that are easy to interrogate and information and data that is accurate and up to date. Some of the key challenges faced by Council or water utilities in successfully preparing a PIP are detailed below. However, these challenges can be seen as opportunities for continual improvement for a complex and essential process.

Councils define the area where growth will occur and this is incorporated into the town plan. The PIP identifies the Priority Infrastructure Area (PIA) where infrastructure will be provided and this must be consistent with the land use allocations in the town plan. In many cases the water utilities service areas may exclude some parts of the PIA. The Government can often change the timing, location or scale of where development will occur as a result of the revision of regional plans or identification of new growth corridors resulting from political pressures thereby requiring Councils to include these changes in their next town plan and PIP.

An accurate and up to date Geographic Information System (GIS) is a crucial component for planning. In many Council's or water utilities there is often a lag-time for getting accurate information such as subdivided lots and network changes into the system. The existing network information often has important data missing or is incorrect.

Population is reliant on land use codes on the cadastre or in the rating system to be accurate. These codes are used to put existing population from Government population totals (based on Australian Bureau of Statistics data) 'on the ground'. Forward projections are influenced by the town plan, the Government headline population totals and occupancy rates. The forecasting model also needs to take into account falling occupancy rates over time. Rules are established to determine the sequencing of population and employment growth.

Employment forecasting is also reliant on the land use codes for existing uses and the town plan for future development. A sound methodology will need to be developed linking journey to work data with specific industries, the existing land use codes in the rating system and lot sizes. From this information and the town plan, the future industry, retail and commercial types can be predicted.

To ensure hydraulic modelling is accurate and up to date the existing network must be established with all the correct asset attributes. Inaccurate GIS data can create issues and many months can be spent validating the existing network. The population figures are converted to equivalent tenements using specific land use code conversion factors and town plan density conversion rates. The desired standards of service used in modelling must be established using water and wastewater system data and sound information systems are required to ensure the appropriate data is collected.

A key element in delivering the proposed infrastructure is to ensure that the water entity achieves full cost recovery. In Queensland, future developments are required to pay infrastructure charges. These charges are calculated taking into account construction financing costs for future infrastructure, component of the existing infrastructure used for future, ongoing administration costs for the charges schedule and the cost of preparing the charges schedule, the desired standards of service and the plans for trunk infrastructure. The unit cost of the infrastructure and adjustment factors to be applied due to the level of development, soil type etc. become critical factors in the success of the financial modelling.

An emerging challenge that water utilities and Councils in South East Queensland are facing is changing legislation. Additionally the regulators have not been positioned to adapt to the change or are unable to provide clear direction on the implications and requirements to water utilities and Councils. A number of legislative changes have been a consequence of stakeholder input.

Housing affordability has been the argument for recent changes, with many observers falsely believing that infrastructure charges are excessive and are the main driver for house prices and housing affordability. A recent study into the break down of housing costs in South East Queensland found that infrastructure charges (on detached house and land) are estimated at an average of 4% of the total cost in South East Queensland (LGAQ, 2008a). Legislation introduced rules to improve transparency, consistency, coordination, integration and efficiency in the way water utilities and Councils plan and charge for development infrastructure (LGAQ, 2006). PIPs are developed with these rules in mind. Uncertainty arises when changes to legislation occurs and these changes are retrospectively

applied without any phasing in period. The introduction of changes in this fashion can have significant impacts on water utilities and Councils. The most significant impact is through the re-work of the PIP to comply with the new legislation and the loss of revenue due to the delay in introducing the infrastructure charge. Councils and water utilities need to be flexible enough to adapt their methodology and embrace the idea of continual improvement in any process whilst Government needs to be cognisant of the implications of their changes.

Infrastructure for future growth must be funded whether it is a user pays system, increased borrowings for the Council or water utility or by a direct increase in revenue from rates and charges. For the last two options the cost of new infrastructure by new development would be spread across existing rate payers (LGAQ, 2008b).

Planning over the longer term offers synergies with the economic life of an asset. Whilst shortening the planning horizon is an interesting concept, in the long term it delivers false economies to the Council or water utility. The introduction of such a planning method can have the following effects:

- Higher life cycle costs due to parallel augmentations occurring;
- Assets that have not reached their useful life being removed due to operational preference of only one asset to maintain; and
- Increased calculations in financial modelling to ensure that only the cost component of the asset that is required to service demand in the shorter planning horizon is included in the calculation of the infrastructure charges.

Infrastructure planning can offer many challenges to the water utility or Council. A concerted effort must be made to ensure that planning is undertaken with a long term strategic vision and plan in mind. If this is done the Council or water utility can deliver innovative and cost effective solutions that sustainably meet demand coupled with the ever increasing community expectation and regulatory burden.

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ARTICLE – GEPREDO, A FRENCH-SPANISH PROJECT ON THE PREDICTIVE MANAGEMENT OF THE WATER RESOURCE

The increasing use of advanced technologies of information and communication to manage hydrographical systems contributes, largely, to satisfy the social, economic and environmental objectives. The presence of a large number of sensors and tele-controlled actuators on river systems, allows knowing in real time the flows, the levels, the quality of the water, etc., and thus permits to remotely control the gates, in a centralized or distributed way. The demand of water in Pyrenees is connected, on one hand, to the agricultural irrigation, and on the other hand, to the supply of rivers in order to dilute effluents, maintain good condition ecological and provide users with some drinking water.



For the Laboratory LGP (Laboratoire Génie de Production) of National School of Engineers in Tarbes (ENIT), France, an important topic concerns the management, the control and the supervision of distributed systems. The skills of the LGP for this project are carried on the identification, the Information Technology modeling, the multi-modeling for control, the predictive control, the simulation and the diagnosis.



The group SAC (Sistemas Avanzados de Control) of the department ESAII of the Polytechnic University of Catalonia, develops an intense activity in the field of dynamic systems modeling, the diagnosis of faults, the fault tolerant control, the optimization and with predictive control.



Since 1998, the CEIT works in the field of the design, the implementation and the control of networks of purification of urban residual waters. This work allowed the development of dynamic simulators for the description of the hydraulics (flows and levels) in collectors' networks.



The ADASA SISTEMAS company, specialist of the engineering, brings its knowledge and its experience in the field of the cycle of the water. It develops activities in design, development and implementation of automation systems, of control and information systems of large scale infrastructures.



The CACG brings its know-how and its experience in the inter-annual management of the resources, the management of forecasts, the modeling of the influences on a basin, the automation of the transfers of water, the centralized remote processing. It has various current international construction sites.



The Adour institution manages the basin of Adour river with various types of works (24 dams of various capacities) to satisfy the demands of four departments in southwestern regions of France.



In the CEMAGREF, the team TRANSCAN of the UMR G-EAU leads an activity of finalized research on the modeling and the real-time control of dam-river systems.

The project concerns the management of the resource by using at best the means (dams, existing canals) involving short and medium-term decision-making aspects in which it is necessary to adapt itself to the fluctuations in the supply and in the demand. In other words, for a weekly or monthly horizon, the administrator of a basin has to know the state of his network and satisfy the demand according to the contracts of consumption and the forecasts of withdrawals and contributions. The anticipation and the ability to react are qualities becoming necessary to the management systems of the water.

The control of these river systems requires the development of representative dynamic models of the behavior of the open channel hydraulic systems, such as rivers and canals. It is also necessary to take into account the uncertain dimension in the management of these systems. The river systems of are directly influenced by the demand of the users, and by the occurrence of the rain. It is thus necessary to propose techniques of predictive control, allowing defining the future actions of command on an appropriate horizon by taking into account forecasts based on uncertain events.

The techniques of predictive and optimal control allow the implementation of strategies of control of complex dynamic systems with the aim of satisfying the objectives of management (economic, environmental, etc.), while taking into account the dynamics of these systems and their operating characteristics (maximum and minimum flows, capacities) as well as of their equipments. The techniques of predictive and optimal control are based on mathematical models and methods of optimization the criteria of which for their adaptation to the hydrographic systems are to be determined. It is proposed a set of innovative tools of predictive control of river systems. For the management, the main scientific point concerns the consideration of the delays inherent to the operating modes of river systems, which are an important cause of non valuation of the resource. Besides, the sustainable management requires a system of reliable control where the risks of local default are mastered. Collectively in these studies, the real-time estimation of the natural incomes and the withdrawal constitutes an important stake because it has to allow a better decision-making.

This project aims at the following four objectives:

Improvement of the models of forecasts. *The Ordinary Differential Equation model based on the equations of Saint Venant reproduces precisely the behavior of the open channels hydraulic networks, but requires the very detailed knowledge of the physical characteristics of canals or rivers. Besides, the use of techniques from real-time control requires the use of simpler models but representative of real dynamics. These last ones allow the definition of plans of monitoring and alert, the calculation of the quantity of available resource to meet the needs of users, the consideration of the levels of water in dams. It supposes to establish models of incomes, to develop models of the withdrawals forecast and to study these influences on the hydraulic system.*

Proposition of methods of predictive management of the resource for the Pyrenean ponds. *The management of the Pyrenean basins has to allow the definition of strategies of management of dams. The techniques of predictive control, widely used for the management of the drinking water, must be adapted to answer this objective. So, it is planned to conceive predictive models taking into account delays according to the dynamics of the hydraulic systems, to optimize the distribution of the resource between dams and irrigation channels.*

Reliability of the methods of management by the diagnosis of erroneous data. *The use of telecontrol systems requires the guarantee of the quality of information transmitted to the equipments of the network. It is planned to develop techniques of diagnosis of erroneous data (due to sensors or transmission), to develop methods of validation / correction / integration of the data collected by the remote processing system.*

Development of an integrated system and an evaluation of the methods proposed on benchmarks. *The development of an integrated management system of the water is defined; it takes into account the prediction of the flows and the reliability of the measures in the various points of the river system as well as the prediction of the incomes and the demands of water. Finally, the evaluation of the integrated system by experimental processes and real benchmarks will be achieved with the cooperation of companies participating in the project.*

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NEWS – FROM US EPA

By Thomas Barnwell

US National Research Council Concludes EPA's Stormwater Program Needs a Significant Overhaul To Improve its Effectiveness

Radical changes to the U.S. Environmental Protection Agency's (EPA) stormwater program are necessary to reverse degradation of fresh water resources and ensure progress toward the Clean Water Act's goal of "fishable and swimmable" waters, says a new report from the US National Research Council (NRC). Increased water volume and pollutants from stormwater have degraded water quality and habitats in virtually every urban stream system. To provide meaningful regulation, all stormwater and other wastewater discharge permits should be based on watershed boundaries instead of political boundaries. Moreover, the program should integrate stormwater management and land management practices, and focus less on chemical pollutants in the stormwater and more on the increased flow of water.

Although urban stormwater's role in degrading the nation's water supply has been recognized for decades, reducing that role has been difficult. In 1987, the US Congress brought stormwater control into the Clean Water Act and placed it under the supervision of the EPA, which now oversees stormwater discharged by cities, industries, and construction sites. However, the current regulatory framework for stormwater, which was originally designed to address sewage and industrial wastes, has suffered from poor accountability and uncertainty about its effectiveness at improving water quality. In light of these challenges, US EPA asked the NRC to assess its stormwater permitting program.

EPA's current approach is not likely to produce an accurate picture of the extent of the problem, nor is it likely to control stormwater's contribution to impairing water quality, said the committee that wrote the report. Currently, stormwater and wastewater regulations require separate permits; within stormwater regulations, different types of permits exist for municipalities, industries, and construction sites. The committee recommended that EPA should adopt a watershed-based permitting system that would encompass all discharges -- including stormwater and wastewater -- which could impact waterways in a particular drainage basin, rather than having many individual permits. Responsibility and authority for implementing watershed-based permits should be centralized with a lead municipality that would work in partnership with other municipalities.

Additionally, the committee recommended that the stormwater program focus less on chemical pollutants and more on the increased volume of water. In urban areas, stormwater flows rapidly across the land surfaces and arrives at streams in short, concentrated bursts of high water discharges, which in turn increases streambank erosion and accompanying sediment pollution of surface water. The volume of discharges is generally not regulated at all by EPA, the committee noted. Also, little account is given to the cumulative contributions of multiple sources and pollutants in the same watershed, because most discharges are regulated on an individual pollutant basis.

The stormwater monitoring requirements under the EPA Stormwater Program are variable and generally sparse, which has led to considerable skepticism about their usefulness. This report considers the amount and value of the data collected over the years by municipalities (which are substantial on a nationwide basis) and by industries, and it makes suggestions for improvement. Municipal separate stormwater systems and particularly the industrial stormwater monitoring programs suffer from a paucity of data, from inconsistent sampling techniques, and from requirements that are difficult to relate to the compliance of individual dischargers. For these reasons, conclusions about stormwater management are usually made with incomplete information. Stormwater management would benefit most substantially from a well-balanced monitoring program that encompasses chemical, biological, and physical parameters from outfalls to receiving waters.

Many processes connect sources of pollution to an effect observed in a downstream receiving water—processes that can be represented in watershed models, which are the key to linking stormwater dischargers to impaired receiving waters. The report explores the current capability of models to make such links, including simple models and more involved mechanistic models. The report concludes that, at the present time, stormwater modeling has not evolved enough to consistently say whether or not a particular discharger can be linked to a specific waterbody impairment. Some quantitative predictions can be made, particularly those that are based on well-supported causal relationships

of a variable that responds to changes in a relatively simple driver (e.g., modeling how a runoff hydrograph or pollutant loading change in response to increased impervious land cover). However, in almost all cases, the uncertainty in the modeling and the data (including its general unavailability), the scale of the problems, and the presence of multiple stressors in a watershed make it difficult to assign to any given source a specific contribution to water quality impairment.

The report was sponsored by the U.S. Environmental Protection Agency. The National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council make up the National Academies. They are private, nonprofit institutions that provide science, technology, and health policy advice under a congressional charter. The National Research Council is the principal operating agency of the National Academy of Sciences and the National Academy of Engineering.

Copies of Urban Stormwater Management in the United States are available from the National Academies Press on the Internet at <http://tinyurl.com/6mxyz6>. A PDF of the report's Executive Summary can be downloaded at no charge and the report can be read online freely, but there is a charge for the complete report.

Climate Change Strategy to Help Manage Water Resources

To assist in responding to potential effects of climate change, a new strategy focuses on 40 specific actions for the national water program to take to respond to climate change. EPA's "National Water Program Strategy: Response to Climate Change" describes steps for managers to adapt their clean water, drinking water, and ocean protection programs.

"Water is key to clean energy and climate change," said Benjamin H. Grumbles, EPA's assistant administrator for water. "Our water and climate strategy charts a course for timely and practical action, connecting the dots, drops, and watts for coordinated, sustainable results."

EPA water programs are already taking action related to climate change including the WaterSense water efficiency program, green infrastructure for wet weather management, Climate Ready Estuaries, and the proposed national rule for the injection of carbon dioxide underground.

The water strategy identifies specific response actions in five areas:

- Mitigation of greenhouse gases
- Adaptation to climate change
- Research related to water and climate change
- Education on climate change
- Water program management of climate change

Potential impacts of climate change on water resources reviewed in the strategy include increases in certain water pollution problems, changes in availability of drinking water supplies, and collective impacts on coastal areas. The strategy reflects input provided during a public comment period earlier this year.

One report produced to support the strategy is **Climate Change Vulnerability Assessments: A Review of Water Utility Practices** (<http://water.epa.gov/scitech/climatechange/upload/Climate-Change-Vulnerability-Assessments-Sept-2010.pdf>). This report describes the activities of eight water utilities who have conducted climate vulnerability assessments: East Bay Municipal Utility District, City of Boulder Utilities Division, Denver Water, Massachusetts Water Resources Authority, New York City Department of Environmental Protection, Portland Water Bureau, Lower Colorado River Authority, and Seattle Public Utilities. This study examines the steps taken by each, in order to identify the emergent characteristics of water utility climate change vulnerability assessments. The study discusses the approaches taken, and describes the steps, information, and judgments needed for such decision making.

EPA has been working with other federal agencies to coordinate work on climate change and water. Recently, EPA issued a joint memorandum with the U.S. Departments of Agriculture, Commerce, Defense, and Interior to describe cooperative efforts on climate change and water issues. Information on the strategy is available on the web at: <http://www.epa.gov/water/climatechange>

New Document Available: "TMDLs Where Mercury Loadings are Predominantly from Air Deposition"

EPA recently released a document called "TMDLs Where Mercury Loadings are Predominantly from Air Deposition" to assist states in developing TMDLs for mercury-impaired waters under Clean Water Act section 303(d). This document describes considerations when developing mercury total maximum daily loads (TMDLs) in order to address the required and recommended TMDL elements discussed in existing guidance. The document (also referred to as a mercury TMDL "checklist") includes factors to consider when addressing TMDL elements on different geographic scales, such as waterbody, regional, and multi-state. The "checklist" builds on approaches in approved mercury TMDLs.

This effort is part of EPA's multi-pronged approach to listing mercury-impaired waters and developing mercury TMDLs. Recent efforts include revising strategic plan reporting provisions to more specifically account for mercury-impaired waters in tracking waterbody restoration. EPA also issued a memo in 2007 on the "5m" subcategory for listing waters impaired by mercury from air deposition (see <http://www.epa.gov/owow/tmdl/mercury5m/>). For such waters, states may defer the development of mercury TMDLs where a comprehensive state mercury reduction program has been put in place.

The cover memo and checklist are available respectively at:

http://www.epa.gov/owow/tmdl/pdf/cover_memo_mercury_tmdl_elements.pdf
http://www.epa.gov/owow/tmdl/pdf/document_mercury_tmdl_elements.pdf

EPA Announces Release of Indicator Development for Estuaries Manual

The Indicator Development for Estuaries manual is designed to improve measuring progress in the National Estuary Program estuaries and other estuaries. It is organized to provide the user with a logical, stepwise process for developing and implementing indicators for the estuarine environment. Indicators can provide cost-effective information on the status and trends of a system, the effectiveness of management actions and allow for mid-course corrections. Indicators also provide information to inform diverse audiences including environmental managers, scientists, resource managers and the public on the status and progress of restoration efforts. The manual is available at http://water.epa.gov/type/oceb/nep/upload/2009_03_13_estuaries_indicators_manual.pdf

Watershed Handbook Online

EPA's Office of Wetlands, Oceans, and Watersheds released a online document this week to help communities, watershed organizations, and local, state, tribal, and federal environmental agencies develop and implement watershed plans to meet water quality standards and protect water resources. The "Handbook for Developing Watershed Plans to Restore and Protect Our Waters" is designed to help anyone undertaking a watershed planning effort, but should be particularly useful to persons working with impaired or threatened waters. It contains in-depth guidance on quantifying existing pollutant loads, developing estimates of the load reductions required to meet water quality standards, developing effective management measures, and tracking progress once the plan is implemented. New materials were added to the handbook including ways to protect important elements of the landscape and aquatic habitats within a watershed. The document is available on the web at http://water.epa.gov/polwaste/nps/handbook_index.cfm

Water Quality Standards Academy: On-line Training Course

EPA has developed a multi-media, web-based training course for state and tribal employees and the general public on key aspects of the water quality standards program and other related Clean Water Act programs. This internet-based training program is an abbreviated version of the week-long, in-class Water Quality Standards Academy course, and includes the following modules: (1) Introduction to EPA and the Clean Water Act, (2) Waterbody Uses, (3) Water Quality Criteria, (4) Antidegradation, (5) Standards Submittal and Approval, and (6) Variances, Using Attainability Analyses, Mixing Zones and Other Flexibility Options. Each of the modules is designed to be completed in about 15 minutes. The modules present text-based information across a sequence of pages that include user interactions, links to further information and resources, brief video clips that expand on important points, and brief quizzes.

The online training course is designed for people with little familiarity with the water quality standards program, but it can also serve as a good "refresher" for people with experience in this subject. To access the online training course, visit <http://www.epa.gov/waterscience/standards/academy/>.

Other U.S. News

The U.S. Army Corps of Engineers and U.S. Bureau of Reclamation Publish a Report, *Addressing Climate Change in Long-Term Water Resources Planning and Management: User Needs for Improving Tools and Information*

This report identifies the needs of local, state, and federal water management agencies for climate change information and tools to support long-term planning. The report seeks to focus research and technology efforts to address information and tools needed for longer-term water resources planning and management. It found there were gaps in the information and tools to help water managers in how to use climate change information to make decisions, how to assess the responses of natural systems to climate change, and how to communicate the results and uncertainties of climate change assessments to decision-makers. The report is available at: <http://www.usbr.gov/climate/userneeds/>.

Pacific Institute Launches the Water and Climate Bibliography

The Bibliography is a comprehensive database of scientific literature pertaining to climate change and freshwater resources worldwide. The current version contains more than 4,300 entries. The goal is to provide a valuable resource for the academic community, policymakers, and individuals interested in the science and policy of climate change and water resources. Access the Bibliography at: <http://biblio.pacinst.org/biblio/>.

The National Center for Atmospheric Research Releases Report: *Drought Under Global Warming - A Review*

The report reviews recent literature on drought of the last millennium, with an update on global aridity changes from 1950 to 2008. Projected future aridity is presented based on recent studies and an analysis of model simulations. The report is available at: <http://onlinelibrary.wiley.com/doi/10.1002/wcc.81/full>

National Research Council Releases Video on *Advancing the Science of Climate Change*

The National Research Council has released a video based on the report, *Advancing the Science of Climate Change*, one of four panel reports from the America's Climate Choices project. The report maps out the realm of accumulated knowledge regarding climate change and urges that research on climate change enter a new era focused on the needs of decision makers. In this video, the leaders of the panel, Dr. Pamela Matson and Dr. Thomas Dietz, describe the panel's key findings and the lines of evidence that brought them to those conclusions. The video is available at: http://www.youtube.com/watch?v=FxaWVlzgkX4&utm_medium=email&utm_source=The%20National%20Academies&utm_campaign=ACC+Update+21

SUMMARIES OF Ph.D. THESES

Recently completed Ph.D. dissertations are summarized regularly in the newsletter. All Ph.D. students and their supervisors are welcome to contribute capsule descriptions of theses related to systems analysis in water quality to this item of our Newsletter.

Conceptual design of wastewater treatment plants using multiple objectives

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Keywords: conceptual design, wastewater treatment plants, multi-criteria decision analysis, multivariate analysis, uncertainty analysis, benchmarking, critical decisions

The implementation of EU Directive 91/271/EEC concerning urban wastewater treatment promoted the construction of new facilities and the introduction of nutrient removal technologies in areas designated as sensitive. The need to build at a rapid pace imposed economically sound approaches for the design of the new infrastructures and the retrofit of the existing ones. These studies relied exclusively on the use of heuristic knowledge and numerical correlations generated from simplified activated sludge models. Hence, some of the resulting wastewater treatment plants (WWTPs) were characterized by a lack of robustness and flexibility, bad controller performance, frequent microbiology-related solids separation problems in the secondary settler, high operating and maintenance costs and/or partial nutrient removal, which made their performance far from optimal. Most of these problems arose because of inadequate design, making the scientific community aware of the crucial importance of the conceptual design stage. Thus, these traditional design approaches should turn into more complex assessment methods in order to conduct integrated assessments taking into account a multiplicity of objectives and hence ensuring a correct plant

performance. Despite the importance of this fact only a few methods in the literature addressed the systematic evaluation of conceptual WWTP design alternatives using multiple objectives. Yet, the decisions made during this stage are of paramount importance in determining the future plant structure and operation.

The main objective pursued in this thesis targets the development of a systematic conceptual design method for WWTP using multiple objectives, which supports decision making when selecting the most desirable option amongst several generated alternatives. This research work contributes with a modular and evolutionary approach combining techniques from different disciplines such as: a hierarchical decision approach, multicriteria decision analysis, preliminary multiobjective optimization using sensitivity functions, knowledge extraction and data mining techniques, multivariate statistical techniques and uncertainty analysis using Monte Carlo simulations. This is accomplished by dividing the design method into 4 different blocks: (1) hierarchical generation and multicriteria evaluation of the design alternatives, (2) analysis of critical decisions, (3) multivariate analysis and, finally, (4) uncertainty analysis.

Thus, in comparison with the traditional approaches the conceptual design method developed in this thesis addresses design/redesign problems with respect to multiple objectives and multiple performance measures. Also, it includes a more reliable decision procedure that shows in a systematic, objective and transparent fashion the rationale way a certain alternative is selected and not the others. The decision procedure provides to the designer/decision maker with the alternative that best fulfils the defined objectives, showing its main advantages and weaknesses, the different correlations between the alternatives and evaluation criteria and dealing with the uncertainty prevailing in some of the model parameters used during the analysis.

A number of case studies, selection of biological nitrogen removal process (case study #1), optimization of the setpoints in two control loops (case study #2), redesign to achieve simultaneous organic carbon, nitrogen and phosphorus removal (case study #3) and evaluation of control strategies at plant wide level (case studies #4 and #5), are used to demonstrate the capabilities of the conceptual design method.

Available at: http://www.tesisenxarxa.net/TESIS_UdG/AVAILABLE/TDX-0702108-142430//txfa.pdf

Modelling of transient behavior of active biomass in activated sludge processes using a metabolic model

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For wastewater treatment, the activated sludge models (ASMs) 1, 2, and 3 of the International Water Association (IWA) are accepted as industrial standard. However, many authors have observed that the kinetic parameters of these models depend on the type of substrate, process configuration, and sludge age. Some publications showed that the kinetic parameters of ASMs could be influenced by regulation of enzyme production. In the models currently used to describe the activated sludge process, the distribution of the substrate flux between growth and storage is an empirical function.

Therefore, an engineer aiming to make some modifications to a specific treatment system is not able to predict the response of the real system after the modifications and choose the right configuration or modifications with the same set of parameters.

Sixty years ago, Monod (1949) proposed the application of the Michaelis Menten relation describing enzyme kinetics to a culture of micro-organisms. For the purpose of simplification, the mathematical relation proposed by Monod (1949) reduced the entire cell to a single enzyme genetically expressed at a single level. However, cell metabolism is based on a large number of biochemical reactions.

Chapter 2 of this thesis reviews the literature to identify the controlling factors of cell metabolism and the regulation of the specific activity of the cell. The literature review was designed to highlight which regulation mechanisms induce a growth rate variation so that they can be expressed mathematically ($d\mu/dt$). The study of these processes will focus on modeling the specific activity variation. The review is limited to heterotrophic prokaryote organisms growing under aerobic conditions.

Cybernetic models are proposed for modeling cell growth and focus, among other things, on regulation of enzyme production, that is to say on induction. The objective of this work is to present an activated sludge model that mimics the enzymatic induction of active biomass within the framework of ASMs. In the proposed model presented in chapter 3, process rates are modulated according to the environmental conditions and cell history. In a first step, the model was fitted on the basis of data found in the literature. All data collected from short and long transient experiments were fitted with the same set of parameters, which was not possible with various models. The proposed model gave a more realistic picture of active biomass and of its specific activity under highly varying process conditions.

In a second step, an experimental protocol is presented to perform the evaluation of the structured biomass model. The protocol was designed to induce transient behaviour and characterize the evolution of several internal biomass components. In chapter 5, the theoretical model proposed in chapter 3 is adapted to an experimental protocol and fitted to the collected data. In these experiments it was observed that filling the storage capacity of cells leads to special transient behaviour and a temporarily reduced metabolic activity. The model-based interpretation of the results showed that the observed transient behaviour can be explained by cross-regulation of carbon and nitrogen metabolism. Hence, according to an extensive literature review, the cross-regulation of carbon and nitrogen can be used to model some observed transient behaviour and regulation of the storage process in activated sludge.

In chapter 6, rRNA-structured biomass models are proposed to describe the metabolic status of cells using new molecular techniques in view of predicting the growth response ($d\mu/dt$) of cells in the activated sludge process. The autocatalytic reaction rate of the synthesis of the PSS component (rRNA) can provide a mechanistic explanation for the growth response and the growth lag phase. The proposed models were able to properly describe and predict the growth response of the biomass in various types of reactor. Such models could be more widely applicable by using intrinsic model parameters, and this could be a key improvement as it could lead to improved models for design.

Available at: http://modeleau.fsg.ulaval.ca/en/publications/downloadable_phds/

ASM-type biokinetic activated sludge models: Theoretical and functional analysis, towards a default parameter set

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Mathematical modelling of activated sludge systems has become a widely accepted tool and is used in particular for optimization and upgrading of existing plants and for new facilities design, either by engineering and consulting companies, or university and research centres. Ensuring the adequate quality of modelling results is therefore essential. However, an international survey conducted among 96 potential users of activated sludge models (ASM) pointing to two main obstacles to the use of modelling: the selection of the model to use among the available models and the model calibration. The objective of this work was to provide elements to overcome these obstacles and to promote the wider use of biokinetic models for activated sludge systems. It focused on seven published models: (1) ASM1, (2) ASM2d, (3) ASM3, (4) ASM3+BioP, (5) ASM2d+TUD, (6) Barker & Dold and (7) UCTPHO+.

First, an analysis of practical knowledge on the models was performed to improve the transfer of modelling knowledge. A database of practical modelling applications from published case studies and from the answers of a questionnaire sent to model users was created. This database enables to establish ranges of parameter values commonly used for the ASM1 and ASM2d.

Then the theoretical knowledge on ASMs was analysed to help users to better understand the seven studied models and to select the model most appropriate to their project. The studied models were first verified and typing errors and inconsistencies have been corrected. The modelling concepts were compared to each other through a new graphical representation, and confronted with knowledge about the biology of activated sludge, in order to highlight the theoretical limits of each model.

Finally, a methodology has been developed to obtain default parameter values that could be used as initial values for model calibration. To this end, an automated calibration procedure that allows calibration on multiple data sets was

proposed. Then, the quality criteria used in environmental sciences have been synthesised. These criteria are required to determine the best set of parameters based on the goodness-of-fit of the model and to compare results from different models.

Available at: Download: <http://cemadoc.cemagref.fr/cemoa/PUB00031093>

IWA CONFERENCES

Upcoming IWA Conferences with a Systems Analysis component:

Cities of the Future: Sustainable Urban Planning and Water Management, 22-25 May 2011, Stockholm, Sweden

The conference focuses on the intersection between urban spatial planning and the planning, construction and operation of sustainable urban water systems. The conference program will involve city planning and design (water centric cities, water as a design element or defining constraint in the urban setting, water for pleasure and well-being etc.), interaction with other infrastructure systems (biowaste, biogas, heating and cooling, transports, fibre optic communication etc.), the surrounding land (agriculture and food production, energy, aquaculture, recreation), as well as evolving technical and managerial solutions.

SAIA relevant themes at the conference include:

- Integrating water services with energy production and use of nutrients for agriculture.
- Governance aspects of integrating urban planning and water management.

More information can be found at www.cof2011stockholm.org

LET 2011, 8th IWA Leading-Edge Conference on Water and Wastewater Technologies, 6-10 June 2011, Amsterdam, The Netherlands

The annual leading-edge conference on water and wastewater technologies is focused specifically on advances and development in water and wastewater technologies.

The plenary sessions with invited speakers on day one of the conference will focus on:

- International Perspective on Sustainable Urban Water: Emerging Challenges and Opportunities
- Leading Science and Technologies for the Cities of Tomorrow

The platform presentations on day two and three fit within the following topics:

- Novel Materials and Emerging Approaches for Water Purification and Reuse
 - Water and Wastewater Treatment Technologies for Developing Countries
 - Emerging Opportunities for Ion-Exchange
 - Technologies in Alternative Water Sources
 - Desalination Biological Treatment of Drinking Water
- Opportunities and challenges in wastewater treatment technology
 - Water, Energy & Climate Change
 - Innovative Wastewater Treatment Technologies
 - Micro-Algal Systems
 - Emerging Contaminants - Which Ones Truly Emerged?

More information can be found at <http://let2011.org/>

SWAT2011, International SWAT Conference and Workshop, 13-17 June 2011, Toledo, Spain

The Soil and Water Assessment Tool (SWAT) is a public domain model jointly developed by USDA Agricultural Research Service (USDA-ARS) and Texas AgriLife Research, part of The Texas A&M University System. SWAT is a river basin-scale model to simulate the quality and quantity of surface and ground water and predict the environmental impact of land management practices on different soil patterns and land use patterns. SWAT is widely used in assessing soil erosion prevention and control, non-point source pollution control and regional management in watersheds. Conference topics include: Climate change applications; Sensitivity, calibration and uncertainty; Biofuel and plant growth; Environmental applications; BMPs; Hydrology; Sediment, nutrients, and carbon; Pesticides, bacteria, metals, and pharmaceuticals; Model developments; Database and GIS applications and

development; Urban processes and landscape/river continuum; and In-stream sediment and pollutant transport. In addition to the technical sessions, the conference will include workshops on Introductory SWAT, Advanced SWAT, SWAT Developers, and ArcAPEX.

See <http://swatmodel.tamu.edu/conferences/2011> for more information.

LWWTP2011, Conference on Design, Operation and Economics of Large Wastewater Treatment Plants, 4-8 September 2011, Budapest, Hungary

This conference will focus on:

1. Overall case studies of large treatment plants
2. Design of (large) treatment plants, including:
 - Simulation modelling for process optimisation
 - Applying CFD modelling for design
3. Operation of (large) treatment plants, including:
 - Simulation and modelling for process optimisation
4. Sludge handling and its effect on wastewater treatment
5. Costs and economics, including:
 - Benchmarking
6. Advanced technologies for wastewater treatment

See the conference website for additional information: <http://www.lwwtp2011.org>

The 12th International Specialised Conference on Watershed & River Basin Management, 14 - 16 September 2011, Recife, Brazil

Integrated River Basin Management and Climate Changes are important issues for the future of our planet. IWA presents a very special opportunity to engage in three days of innovative discussion on the subjects of River Basin Management Planning, Water Resource Management, Climate Change, Water Supply Protection, Governance Methods, Flood Control & Decision Support System.

SAIA relevant themes at the conference include:

- Integrated water resources and wastewater asset management
- New developments in integrated approaches of river basin management
- New economic instruments in river basin management
- Application of advanced computation and decision support systems in river basin management

The conference web site provides additional information at: www.iwa2011recife.org/

Automation in Water Quality Monitoring Conference (AutMoNet2011), 18-21 September 2011, Querétaro, Mexico.

This conference is dedicated to the whole range of sensor and monitoring technologies and their applications on the whole water cycle, including sewers, wastewater treatment plants, drinking water plants and distribution networks. The AutMoNet conferences have been held twice in Vienna, Austria (2002 and 2004), and a third time in Ghent, Belgium (2007). In 2011, it will take place in the beautiful colonial city of Querétaro, Mexico, its first incursion outside Europe, right after the Independence Day festivities in Mexico.

The conference will take place at the *Juriquilla* campus of the National University of Mexico (UNAM www.unam.mx), the largest, oldest, and top-ranked university in Latin America.

The conference themes are leading edge sensor technology, design of monitoring systems, data to information transfer, and successful end-user applications.

See the conference website for more information: <http://eventos.iingen.unam.mx/AutMoNet2011>

UDM2012, 9th International Conference on Urban Drainage Modelling, Belgrade, Serbia, 4-7 September 2012

The series of Urban Drainage Modelling (UDM) conferences started back in 1986 in Dubrovnik, former Yugoslavia, when the first conference was organized by Čedo Maksimović and the late Miodrag Radojković from the University of Belgrade. Since then, Professor Maksimović has been the spiritus movens of the whole UDM conference series. The group of his former co-workers, involved in the organization of the first four UDM conferences, are paying him

a tribute by organising the 9th UDM conference in Belgrade in 2012, when Professor Maksimović will retire from Imperial College London.

UDM conference topics are traditionally related to modelling urban drainage (UD) systems and the interactions with other urban water systems and the urban/suburban environment. Topics are from both theoretical and practical developments and applications.

A. DATA ISSUES

- Data availability, reliability and uncertainty in UD modelling
- Climate change and UD systems
- Hydroinformatic support to UD modelling
- Monitoring urban design systems

B. MODELLING

- Urban stormwater and floods analysis
- Model and parameter identification and propagation of uncertainty
- Hydrodynamics of sewer networks and structures
- Urban runoff quality
- Real time control of UD systems
- Integrated modelling (interactions between urban catchments, groundwater, WWTP and receiving water bodies)
- Uncertainty and sensitivity analysis
- CFD modelling in UD systems
- Sediments in sewer systems
- Artificial intelligence based methods in UD systems
- Modelling of odours from UD systems
- Calibration of UD models

C. APPLICATIONS

- Urban floods forecasting
- Interaction of pluvial with fluvial, coastal and groundwater flooding in urban areas
- Rainfall forecasting
- Stormwater control facilities
- Modelling of Water sensitive urban design systems (LPD □ low impact development)
- Blue □ green corridors and urban drainage interactions

D. MANAGEMENT

- Stormwater and UD management
- Risk analysis in UD management
- Outlook for the UD future (blue sky)
- Combined sewer overflows
- UD systems' asset management

E. SPECIAL TOPICS

- UDM under extreme conditions
- Urban hydro-ecology and urban amenities
- Performance trends, indicators and life span assessment
- Socioeconomic interactions and involvement of stakeholders
- Specific issues in UDM in particular climates
- UDM in developing countries
- Education, training and technology transfer

Website: <http://hikom.grf.bg.ac.rs/9UDM/>

OTHER CONFERENCES

Enviromatics 2011: The Second International Conference on Information Technology and its Applications in Environmental Management & Planning, 21-24 November, 2011, Amman, Jordan

Enviromatics 2011 addresses recent developments in Geomatics and their applications in the field of environmental management. It addresses all aspects of the geo-information cycle, from data acquisition, processing, management, visualization and delivery. Enviromatics 2011 brings together researchers, developers, data providers and users from all over the world to discuss the potentials and challenges of using information technology in environmental management and planning. The symposium provides a forum to examine and discuss current practices and future directions related to the application of information technology to environmental management and planning. The symposium aims to provide the participants an occasion to share and exchange experiences and research findings, to stimulate more ideas and useful insights regarding the uses of Geomatics and their applications in the field of environmental management, and to debate their views on future research and developments.

Conference themes include:

- Ecological and Environmental Geomatics
- Artificial Intelligence for Ecological and Environmental Studies
- Analytical and Monitoring Technologies for Environmental Studies
- Modeling for Ecological and Environmental Systems
- Geographical Analysis for Urban and Regional Planning & Development
- Virtual Realty Applications in Environmental Studies
- Informatics of Biodiversity
- Geospatial Intelligence
- Modeling of Spatio-temporal Processes
- Technologies for Greenhouse Gas Emissions Mitigation
- Knowledge Systems for Environmental Management
- Decision Support Systems
- Expert Systems
- The Economics of Environmental Informatics
- Usability and Interface Design for Environmental Applications
- Methods of and Issues Related to Accessibility and Interoperability
- Other Areas of Environmental Systems Science and Information Technology

More information is available at: <http://www.enviro-arab.com/enviromatics11/>

MODSIM2011 International Congress on Modelling and Simulation, 12-16 December 2011, Perth, Australia This congress is organized every two years by the Modelling and Simulation Society of Australia and New Zealand Inc. since 1974, making 18 MODSIM Congresses in Australasia. The Society represents modellers and managers with interests in using quantitative methods to manage practical problems in industry, environment, science, societal and economics areas. It is affiliated with the International Association for Mathematics and Computers in Simulation.

The themes of the congress are the following:

- Applied and computational mathematics
- Biological systems
- Computer sciences
- Economic and financial systems
- Environment and ecology
- Global change
- Participatory decision making and modelling social systems
- Planning
- Water resources

The venue of the conference is Perth, the capital city of Western Australia, at the centre of geographical irony. It is the city at the focus of Australia's resources boom and the increasing mining activity is one of the driving forces behind Australia's economy. Yet, it is also a city surrounded by natural beauty, like the wild flowers in Wooleen Station, the famous Ningaloo Reef where you can swim alongside whale sharks with easy access to large and spectacular coral reefs; and let's not forget Margaret River and Swan Valley, the origins of some of the best wines produced in Australia.

This contrast between mining activities in WA and the existence of its amazing environmental exquisiteness make Perth the ideal home for MODSIM 2011 – Sustaining our Future: understanding and living with uncertainty. Note as well that Perth has been subject to major droughts in recent years and has been an example of integrated management to ensure water supply under climate change.

Website: <http://mssanz.org.au/modsim2011>.

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