



] 9 & 10 JUNE 2014

INTERNATIONAL CONFERENCE ON DATA, INFORMATION AND KNOWLEDGE FOR WATER GOVERNANCE IN THE NETWORKED SOCIETY

] UNIVERSITY OF SEVILLE, SPAIN

Vice-Rectorate of Postgraduate and Doctoral Studies, Pavilion of Mexico
Avenida de la Palmera, s/n.

] CONFERENCE PROGRAM

] MONDAY, JUNE 9TH, 2014

9:00h] Arrival and accreditation

9:30h] Welcome and introduction

M^a Fernanda Pita. Department of Geography, University of Seville.

Franck Poupeau. SWAN Project Leader, Centre National de la Recherche Scientifique.

Leandro del Moral. Head of the SWAN University of Seville Team.

] Session 1. POWER, COMMUNICATION AND THE POLICY PROCESS

The purpose of the first session is to reflect on the current political, historical and socio-economic context that frames the radical changes occurring in the world of information and knowledge affecting political decision processes in general and discussions on water policy paradigms in particular. It is important to discuss about the key theoretical and political issues (the current traits of power, the neoliberal globalization, the post-political age, post-democracy, etc.) that are determining the needs, the strengths and the limitations of the instruments of the 'networked society'.

Moderator: Tom Evans, Ostrom Workshop in Political Theory and Policy Analysis

Rapporteur: Violeta Cabello, University of Seville

10:15h] **Political and Technological Innovation. P2P Democracy and policy co-production**
Joan Subirats; Autonomous University of Barcelona, Spain.

11:00h] **COFFEE BREAK**

11:30h] **Interrogating Post-Democracy: Reclaiming egalitarian political spaces**
Erik Swyngedouw; Manchester University, United Kingdom.

12:15h] **Questions and debate**

13:00h] **LUNCH**

] Session 2. KEY DEBATES ON WATER MANAGEMENT MODELS

The session focuses on the debates about current and emerging paradigms of water resources management. It is necessary to critically reflect on the limitations, contradictions and conflicts found in the practical applications of the IWRM paradigm. The session aims to include different lines of reflection: critical discourses about the ideas surrounding 'nirvana concepts' and 'panaceas'; analysis of the relationships between water governance and the global socio-economic and political processes; and emerging alternative (or complementary) proposals such as ecosystem management, polycentric management or eco-adaptive management of water.

Moderator: Chad Staddon, University of the West of England

Rapporteur: Owen King, University of the West of England

14:30h] From panaceas towards a diagnostic approach in water governance and management
Claudia Pahl-Wostl; Institute of Environmental Systems Research, University of Osnabrück, Germany.

15:00h] Water management models and the formation of policy bubbles
François Molle; Institute for Research and Development (IRD, France) & International Water Management Institute (IWMI, Egypt).

15:30h] Questions and debate

16:15h] COFFEE BREAK

Moderator: Nuria Hernández-Mora, University of Seville

Rapporteur: Belén Pedregal, University of Seville

16:45h] The river basin organization, reflections on politics and performance
Dave Huitema; VU University-Amsterdam, The Netherlands.

17:15h] Learning to swim in the troubled waters of impure public goods
Bernard Barraque; International Center for Scientific Research on Environment (CNRS AU CIRED – HDR, France).

17:45h] Questions and debate

18:30h] ADJOURNMENT

20:30h] WELCOME COCKTAIL RECEPTION (U. OF SEVILLE MAIN BDG.)

] TUESDAY, JUNE 10TH, 2014

] Session 3. POLYCENTRIC INFORMATION FOR WATER GOVERNANCE: GENERATION, QUALITY CONTROL AND SUSTAINABILITY

This session will focus on new practices of collaborative and distributed generation of data prompted by the New ICTs in the era of the networked society, and to their potential for meeting the information needs for water management. Particular attention will be paid to data and information quality control. This process must ensure the consistency of information on water throughout its life cycle, despite the complexity and diversity of the sources that a networked society offers. The issue of information sustainability will also be addressed. This implies ensuring its free access, optimizing generation efforts and minimizing overlaps.

Moderator: Graciela Schneier, Centre Nationale de la Recherche Scientifique

Rapporteur: Murielle Coeurdray, Centre Nationale de la Recherche Scientifique

9:00h] Socially networked citizen science as a mechanism for supporting conservation and behavioral change
Janice Dickinson, Professor of Natural Resources and Director of Citizen Science at the Cornell Lab of Ornithology, Cornell University

9:30h] Processes of social participation in information: The experience of the Water Remunicipalization Tracker
Satoko Kishimoto, Transnational Institute, Water Justice Project Coordinator

10:00h] Questions and debate

10:45h] COFFEE BREAK

Moderator: Juan Valdés, University of Arizona

Rapporteur: Natalia Limones and Sergio Segura, University of Seville

11:15h] **Public Data, ICT and Water Governance: The Need for an Information Policy to Achieve the Goal**

Arturo Fernández-Palacios, IECA & **Jose María Hurtado**, Directorate of the Environment, Regional Government of Andalusia

11:45h] **Collaborative production and management of water information. How to make polycentric information available to managers, agencies and the public: Spanish experience with Water WISE, INSPIRE Directive and other water related databases.**

Javier Ruza, Water Directorate, Ministry of Agriculture, Food and the Environment of Spain

12:15h] Questions and debate

13:00h] LUNCH

] Session 4. KEY ISSUES IN INFORMATION DISSEMINATION, VISUALIZATION, AND TRANSLATION TO DIFFERENT AUDIENCES

The fourth session looks at how different platforms for exchange and collaboration allow the forging of social learning and knowledge on water, as products of the last stage of the information cycle. Special attention will be given to the new tools and methodologies that allow the generation of useful knowledge for water management and decision-making: indicators, creation of web viewers, modeling, etc. and how these tools evolve in the light of the continuing scientific, technological and social change. The session will analyze the conditions under which knowledge could be produced and openly shared, freely and easily according to the potential characteristics of the new network society.

Moderator: Stoyan Nedkov, BAS-NIGGG

Rapporteurs: Kremena Boyanova and Tanya Trenkova, BAS-NIGGG

14:30h] **Sustainable Development Indicators: Dealing with complexity in governance**

Mario Giampietro; Catalan Institute for Research and Advanced Studies (ICREA) and Autonomous University of Barcelona, Spain.

15:00h] **Tools for collaborative management of information**

J. Félix Ontañón, Open Kratio, Seville, Spain

15:30h] Questions and debate

16:15h] COFFEE BREAK

Moderator: Laszlo Heyde, UNESCO-IHE

Rapporteur: Juanma Camarillo and Maria Villarín, University of Seville

16:45h] **The National Drought Mitigation Center: Building a conduit to bring the science to citizen**

Brian Fuchs; Drought Mitigation Center, University of Nebraska – Lincoln, USA.

17:15h] **Participatory knowledge generation for decision making**

Hoshin Gupta & Aleix Serrat-Capdevila; University of Arizona, USA

17:45h] Questions and debate

18:30h] CLOSING REMARKS

18:45h] ADJOURNMENT

] ABSTRACTS

] Session 1. POWER, COMMUNICATION AND THE POLICY PROCESS

] Political and Technological Innovation. P2P Democracy and policy co-production

Joan Subirats; Autonomous University of Barcelona, Spain.

In this article, we aim to provide elements to rethink the ways in which the Internet has so far been used by the institutional policy, the policies and public administrations. We offer some alternatives to facilitate a better understanding of what is involved with the change of era in which we are immersed. Change of era that involves breaking with many of the fundamentals underlying the representative delegation in the political field or in the management in the administrative intermediation field. We will first examine the most common guidelines that have been followed so far – which characterize Internet as a new tool to keep doing better or more nimbly what has been done –, noting what for us are clear limits to this approach. We then analyze the extent to which the Internet can encourage, and indeed is already favoring, changes in the elaboration, formation and implementation of public policies, and how those changes requires repositioning the position and role of governments and public administrations.

Is the growing presence and significance of Internet involving significant changes in the traditional ways of doing politics and public decision making?. In this paper we aim to provide answers to this question. In general, we understand that although many habitual patterns remain unchanged, we also begin to detect significant changes in the number and configuration of actors, resources available to these actors, how they use them, and also interaction and political participation strategies. We understand that we cannot simply call "crisis," the set of changes and transformations that are occurring worldwide. Technological transformation involves structural changes, also in politics and public policy.

The new social reality that is configuring itself via technological change has multiple effects and is opening new avenues for social and scientific innovation. It is clear that the Internet, as a platform for communication and exchange, has generated and will continue to generate numerous initiatives that break the traditional models of creating wealth or knowledge, for instance. Possibly the most obvious example, and the one most intrinsically connected to the process of creation of the Internet, and its functional characteristics, is the movement created by the possibility of sharing, of building collectively, of collaborating to create goods and knowledge based on aggregation and cooperation between users.

That's why we are also interested here in the democratic implications of the debate over the role of ICT's, which lead inevitably to debates around access and regulation - precisely the domain in which politics has traditionally operated. Harold Laswell once said that politics is about deciding who gets what (access), when and how (regulation). Today we see political ferment gathering around these ever-more-frequent conflicts that do not find an adequate response in the traditional market-state dichotomy, and creating new social dynamics that increasingly turn to the arena of the commons to try to find a way out of their dilemma.

] Interrogating Post-Democratization: Reclaiming Egalitarian Political Spaces

Erik Swyngedouw, University of Manchester, UK/Sciences Po, Paris

There is now an emerging body of thought on the dynamics of de-politicization, the 'disappearance of the political', the erosion of democracy and of the public sphere, and the contested emergence of a post-political or post-democratic socio-spatial configuration. I situate and explore this alleged 'post-democratization' in light of recent post-Althusserian political thought. I proceed in four steps. First, I discuss the contested configurations of this post-politicization and the processes of post-democratization. In a second part, I propose a series of theoretical and political arguments that help frame the evacuation of the properly political from the spaces of post-democratic policy negotiation. This diagnostic is related to a particular interpretation of the distinction between 'the political' and 'polic(e)y/'politics'. In a third part, I argue how emancipatory-democratic politics can be reclaimed around notions of equality, and freedom. In the concluding part, perspectives for re-vitalising the political possibilities of a spatialized emancipatory project are presented. The crux of the argument unfolds the tension between politics, which is always specific, particular, and 'local' on the one hand and the universal procedure of the democratic political that operates under the signifiers of equality and freedom on the other. Attention will be paid to the role and place of the 'environmental concern' within this process of de- and re-politicization.

] Session 2. KEY DEBATES ON WATER MANAGEMENT MODELS

] From panaceas towards a diagnostic approach in water governance and management

Claudia Pahl-Wostl; Institute of Environmental Systems Research, University of Osnabrück (Germany).

Numerous recommendations often relying on simplistic 'standard' panaceas have been put forward for water governance reform without testing of appropriateness in diverse contexts. Furthermore water governance problems have become more and more complex and defy simplistic solutions. A diagnostic approach supports context-sensitive analysis, assesses the transferability of insights between similar classes of problems and contexts and develops guiding principles that can still be tailored to context.

The paper will summarize conceptual and methodological foundations and results from comparative analyses of water governance systems using such a diagnostic approach. It will argue that a transformation is under way towards adaptive and integrated water governance and management putting more emphasis on societal learning. It will elaborate on the yet untapped potential offered by new modes of coordination and knowledge generation in a networked global community to support such a transformation.

] Water management models and the formation of policy bubbles

François Molle; Institute for Research and Development (IRD, France) and International Water Management Institute (IWMI, El Cairo, Egypt).

This communication addresses the issue of the production of knowledge, focusing on the emergence and promotion of policy concepts. Taking the example of water pricing in agriculture, it describes and analyzes how the idea/concept was mainstreamed as a global policy recommendation in the 90s, and how the associated policy bubble grew before being deflated in the mid 2000s. Another example, irrigation management transfer from water bureaucracies to water user associations, is used to show how the literature on the topic can be used to manufacture evidence out of thin air. It provides broader insight on how common wisdom is reproduced through the repetition of general statements in largely shallow and self-serving accounts of actual processes. In conclusion the presentation offers a reflection on intellectual conformism and several mechanisms whereby a certain type of depoliticized knowledge is produced in ways that are consistent with the interests and ideologies of the individuals and institutions that have the power to influence the production of knowledge in the water sector.

] The river basin organization, reflections on politics and performance

Dave Huitema; VU University-Amsterdam, The Netherlands.

This presentation will detail the conceptual groundwork and the results from of a book that appears in August this year and that will provide an in depth investigation of the formation of river basin organizations (RBOs) in a very diverse set of countries around the globe (*Huitema and Meijerink, The politics of river basin organisations. Coalitions, institutional design choices and consequences, Edward Elgar*).

Conceptually, the book accomplishes various goals: (1) on the basis of Elinor Ostrom's rule types it develops a systematic typology of RBOS that distinguishes between autonomous RBOs, agencies, coordinating and partnership type of RBOs. (2) It suggests that the process of establishing RBOs can be understood as a highly political process of institutional change, with opponents and proponents that seek to strengthen their power bases by steering institutional change trajectories in a certain direction. (3) it introduces and defines relevant concepts for the evaluation of RBO performance, notably their contribution to improved coordination, accountability, legitimacy, and environmental effectiveness.

Empirically, the book contains a set of (national, regional) case studies that were selected on the basis of author expertise in connection with these cases (not random). Given the emphasis on autonomous and more recently partnership type of RBOs, it is interesting to observe that in most case studies presented in the book, the type of RBOs proposed are of the coordinating and the agency type. The chapters in the book also demonstrate how strongly politicized discussions about the foundation of RBOs are. Using Thelen's typology of institutional change – RBOs are often intended as a displacement of existing institutions, but in reality they end up as an extra layer of institutions on top of what existed already. Control over data and information is often a key issue in these debates, with pre-existing institutions sometimes being unwilling to share information with new RBOs. The effects of this are clearly visible in the performance of RBOs that are eventually formed: the book arrives at a relatively pessimistic conclusion on the added value of the RBOs that have been discussed in the book. The main conclusion is that the foundation of RBOs does not always enhance coordination across policy sectors, and often creates complex accountability relationships.

] Learning to swim in the troubled waters of impure public goods

Bernard Barraque, International Center for Scientific Research on Environment (CNRS AU CIRED – HDR, France).

The public vs private debate which developed after the World Bank and other liberal institutions expressed their support for various forms of water privatization, and attracted the opposition of many supporters of public management instead, has remained in a sort of myopic antagonism resulting in a double confusion of water as a resource and water as a service on the one hand, and of developed and developing countries' situation on the other.

In the paper we shall recall the quadrangle of Samuelson and the Ostroms based on rivalry and excludability to insist on water being a common pool resource in frequent territorial situations (rivalry but no excludability); but we shall also insist on the other category of water as impure public good: no rivalry but excludability characterizes a club or toll good, and this is how modern water supply started in western Europe and the US; except that when these services became public services for the sake of public health, club membership dues were progressively lowered together with the universalisation of tap water so as to make it attractive to all urban (and later most rural) population, but under the shape of a commercial service: not a simple *marchandisation* as French-speaking opponents of privatization simplify, but a consumerization for sure (public utilities in US, CH, NL and DE have no moral problem in sending water bills to their customers), where water users and the operator are bound in the long term by the fixed costs of the infrastructure.

Our recent research was attracted to the transition which took place between the two forms of impure public goods along the decades of capitalist societies' development: from an 'ostromian' ideal of equitable allocation of rights and duties, to another ideal based on freedom and equality instead, this one based on the quantification (rationalization/ monetization) of water use thanks to decisive innovations like the network under pressure, the closing tap and the volumetric meter. We shall illustrate this (still incomplete) transition with a few historic examples, and comparisons of urban water supply with irrigation communities, with sanitation (and the passage of from a duty to a commercial service), and with garbage collection (where metering is quasi-impossible).

Lastly, we would like to propose a differentiation between developed and developing countries, where the level of trust in public services at the scale of the city is too low for good public services to develop at a reasonable cost, and where the only alternative we can see is to adopt technologies embedded in water as a resource at neighborhood level, which will unfortunately materialize, and may be reinforce, the pursuance of the fragmented city (Jaglin) or the splintering urbanism (Graham, Guy and Marvin).

] Session 3. POLYCENTRIC INFORMATION FOR WATER GOVERNANCE: GENERATION, QUALITY CONTROL AND SUSTAINABILITY

] Current and future potential of Web-based citizen science

Janice Dickinson, Professor of Natural Resources and Director of Citizen Science at the Cornell Lab of Ornithology, Cornell University, Ithaca, New York.

Citizen science has been transformed by the Worldwide Web and continues to grow as electronic sensors and other smart phone technologies find their ways into the pockets of people worldwide. At first, Web-based citizen science was very "top down"; professional scientists decided what they wanted to know and designed projects that would engage participants in providing the data. This opened up potential to monitor things and organisms across months and years and at huge geographic scales, generating "big data". New computational methods were then devised to observe patterns in the data and produce dynamic visualizations that have never been seen before. Next we saw an emerging interest in the human side of citizen science practice, beginning with the idea that as people learn, the quality of their data improves. Today, we have begun to recognize that traditional citizen science projects are not built to take full advantage of the collective capacity of large human groups. Recognizing the human capacity for collaboration and collective intelligence, we can design projects to generate new information, ideas, and solutions, taking fuller advantage of the social Web's capacity to tap human participants' capabilities, and recognizing that, while smart phones can be built that contain more accurate sensors, human participants are certainly the most intelligent "sensors" in the world today. By combining social networking and offering participants the ability to provide user-generated content, citizen science platforms can be designed for socially-mediated collective action, where participants not only generate data, but also take part in data validation, the development of new tools, as well as the design, enactment, and testing of restoration and management solutions, allowing us to work more efficiently and in larger groups than ever before.

] Processes of social participation in information: The experience of the Water Remunicipalization Tracker

Satoko Kishimoto, Transnational Institute, Water Justice Project Coordinator

An important characteristic of the global water justice movement is that those belonging to it regard it as a united network and the numerous victories achieved with the movement are felt as collective achievements. This is the case despite the fact that it has no systematic global coordination mechanism and that it enjoys a non-hierarchical and open character. Another important feature is that local resistance against privatization projects and local movements for building democratic water systems on the ground are organically connected and supported internationally, while at the same time the global policy advocacy work for democratic public water provision is strengthened by local experiences and victories.

There is a stark contrast between grass-root activists and campaign NGOs on the one hand, who maximize their capacity and political impact by sharing experiences and knowledge and on the other hand the far better resourced neoliberal actors who anxiously protect and guard information as a commercial asset. Clearly, the networked society equipped with information technologies has enabled these interconnected grassroots movements to have such rich local-to-global (and the other way around) transnational exchanges. TNI plays a connecting role as a transnational actor, with the challenge to develop (and renew) strategic tools for information-sharing and practical cooperation. Facilitating and helping create the conditions in which knowledge is produced and shared by movement actors through collaborative methods builds a basis for developing joint strategies. The *Water Remunicipalisation Tracker* (www.remunicipalisation.org) is one such tool to contribute to better integration of local knowledge into global advocacy for water justice.

Over the last 5 years, the Water Justice project has compiled examples of how communities in different parts of the world are moving from failed privatised water management to successful publicly managed water and wastewater services. These examples are presented on the *Water Remunicipalisation Tracker*. Approaches differ depending on local circumstances but important lessons can be learned from the different experiences of remunicipalisation.

When the tracker was launched in 2007, 'remunicipalisation' as a term existed but was rarely used in the water movements, nor in academic circles or among water sector professionals. Since then the term has been popularised and become a key political demand for many citizens' campaign for democratic control over water services. Remunicipalisation is now a growing political trend, not only in the water sector but also for electricity and other essential services in Europe and elsewhere. More than 86 cities in the world remunicipalised water services¹. Of these, all except three took place between 2000 and 2013, and the pace has nearly tripled since 2009. There is growing awareness that private sector water management is very expensive and that 'public-private partnerships' makes it difficult for municipalities to monitor services and contracts. Many local authorities choose for remunicipalisation as a practical and logical option.

Through this tracker, TNI's Water Justice project aims to increase the visibility of the remunicipalisation trend by bringing together diverse and inspiring experiences. Rather than providing a comprehensive overview of the often complex processes that involve a wide range of actors, the tracker focuses on understanding why and how the remunicipalisation process took place as well as the obstacles that were encountered and the results that were achieved. The cases thus outline background, key actors, current water management model, financing, status and provide resources for details. Target audiences of the tracker are politicians, trade unions, water users, ecologist associations, activists, public water officials and other key actors in the struggle for fair, democratic and sustainable public models.

The tracker is work-in-progress and clearly designed to actively invite contributions from local campaigners. This participatory approach has proven not to be so easy and active facilitation from TNI has been necessary. Local campaigners, for example, may need encouragement to contribute to the website as well as guidance in writing up a concise story that allows international readers to grasp the essence of the remunicipalisation experience. So TNI needs to facilitate the process actively and case studies are often written by commissioned researchers based on the input from local water campaigners. In this way, the tracker integrates local knowledge and the website comes to life in a sustainable manner.

While the tracker is a good tool to provide a global overview and to share stories, the necessity was felt to provide in-depth studies on certain cases, based on rigorous research methodology. The book "Remunicipalisation: Putting Water Back into Public Hands" was published in 2012. In order to reach a broader audience, a five minute animation video to introduce water remunicipalisation was also created. These different communication tools can reinforce each other in networked society.

¹ <http://www.psuru.org/reports/list-water-re-municipalisations-worldwide-november-2013>

] Public Data, ICT and Water Governance: The Need for an Information Policy to Achieve the Goal
Arturo Fernández-Palacios, IECA & **Jose María Hurtado**, Directorate of the Environment, Regional Government of Andalusia

New technologies bring about large potential improvements in the production of public information and, by enabling immediate access to huge amounts of data, to the process of information disclosure. This colossal supply of data masks, however, important gaps and inadequacies in the capacity to process information and use it for actual improvements in governance. To address these issues, data must be relevant to the definition of problems, it must be provided in the correct format, it must be certified and also have the capacity to integrate with other information sources. The public must not only have access to information for consultation, but it should also be able to tap the information with readily available technologies. This paper reflects on the need to implement a cross-cutting public sector information policy in order to ensure that information fulfills its catalytic role in the improvement of governance. The article discusses the need to: address the sustainability of costly data gathering processes through coordination mechanisms; implement information gathering and dissemination processes within a framework of interoperability; ensure that the cross-relationship and comparison capacity, that are essential for integrated approaches such as that of the Water Framework Directive, are built into the information system; and establish proactive processes for data dissemination through channels and formats that promote public awareness and public participation.

] Collaborative production and management of water information. How to make polycentric information available to managers, agencies and the public: Spanish experience with Water WISE, INSPIRE Directive and other water related databases.
Javier Ruza, Water Directorate, Ministry of Agriculture, Food and the Environment of Spain

In a society that is becoming more and more complex and in which the improvement of the communication possibilities significantly expands the scope of the environmental management decision-making process, no longer an exclusive field for administrators, collaboration in the production and management of water information, becomes increasingly more important. One of the key issues is the growth in the number of actors involved, such as water users, NGOs, the scientific community and stakeholders related to the water management.

At European level, 28 Member States have to share information in order to define strategies and policies and also to assess the compliance with the European legislation. The source of information for the development, adoption, implementation and evaluation of the water policy is the European Environment Agency (EEA). It involves 33 member countries and 6 cooperating countries, using a European Environment Information and Observation Network (Eionet) where more than 1000 experts and 350 national institutions cooperate.

The water management organization in Spain is as complex as the European one. Many organizations are involved in data provision and in the decision making process. 25 River Basin Districts have been identified in the water planning process required by the Water Framework Directive WFD (2000/60/EC). But it is not just a question of water agencies, water issues cannot be addressed without coordination with sectoral policies (rural and urban development, irrigation plans, transport, energy...) most of them developed under the responsibility of the 17 regional governments existing in Spain.

The article makes an historical review of the process carried out by the EU institutions, since 1998 when Eionet priority data flows started, compared with the process in Spain, focusing on the evolution of the strategic decisions taken, analysing the main drivers and the results. Starting from the reports presented in writing paper; to the electronic spreadsheets; the use of email soon replaced by electronic tools that incorporate automated data checking routines; to the ultimate trends in online data sharing. In essence the process has led us, from reporting, to online access to data and interoperability; from centralised databases to decentralised systems that ensure the possibility to combine datasets from different sources in a consistent way at national and European level. Some of the initiatives at EU level analysed in the article are: Central Data Repository (CDR) and the Reporting Obligations Database (ROD) both part of the Repornet tools of the EEA; Water Information System in Europe (WISE); the Infrastructure for Spatial Information in Europe INSPIRE (directive 2007/2/CE).

The experience in Spain in developing the National Inventory of Wastewater Discharges (*Censo Nacional de Vertidos*); National Water Rights Registry (*Registro de Aguas*) ; NABIA (National System on Water Status and Water Quality); National Mapping System for Flood Prone Areas (SNCZI); Urban Waste Water Database (EDARNET) is also analyzed jointly with the efforts to implement INSPIRE. A review is also made on some yet to be born initiatives to involve all the society, mainly through the implication of volunteers in observation programs (algae bloom observation in reservoirs, collaborative completion of the inventory of pressures, collaborative stock photos on water taxa ID-TAX).

The main lesson learnt in all this process is that collaboration is not just a question of technology. To make polycentric information available to managers, agencies and the public, the paramount attention needs to be placed on standardization, institutional arrangements and organizational aspects without forgetting that reliable collaboration needs awareness by all parts involved requiring education and loyalty.

] Session 4. KEY ISSUES IN INFORMATION DISSEMINATION, VISUALIZATION, AND TRANSLATION TO DIFFERENT AUDIENCES

] Sustainable Development Indicators: Dealing with complexity in governance

Mario Giampietro, Catalan Institute for Research and Advanced Studies (ICREA) and Autonomous University of Barcelona, Spain

The use of sustainable development indicators in a process of governance requires the ability of guaranteeing an effective quality control on the production and selection of quantitative information. This quality assurance has to deal with three sources of uncertainty: (i) uncertainty on the normative side – who decided the relevance of the problem structuring? How do we know that “the problem” to be solved is considered as such in the narratives used by the other social actors?; (ii) uncertainty on the descriptive side – how robust are the explanations and the predictions generated by scientific models? How can we deal with a complex information space including different scales and dimensions of analysis?; (iii) uncertainty on the efficacy of the process of decision making – is the process used for the deliberation guaranteeing political legitimacy to the final decision? Was the method used to compress the different perceptions, narratives and motivations for action considered in the deliberation fair?

The talk first discuss the complex nature of the concept of indicator – a number measuring a relevant attribute that in order to get meaning has to be contextualized within a system of benchmarking. Then, it illustrates the unavoidable entanglements between the normative and the descriptive side when dealing with integrated assessment (the combined use of sustainable development indicators). The need of adopting a new approach to the development of sustainable development indicators, based on complex system thinking, is illustrated with a few examples taken from practical applications. When dealing with an integrated analysis based on multiple indicators – e.g. when studying the nexus between food, energy, water and land use – it is impossible to rely on reductionism – i.e. on quantitative assessments based on the adoption of a scale and a dimension at the time. Finally, in relation to the quality control on the process of production and use of quantitative information it is possible to help the structuring of the discussion and the framing of the quantitative analysis using in combination three tools developed in the field of participatory integrated assessment: equity matrix, impact matrix and ethical matrix.

The very concept of complexity entails that the three sources of uncertainty cannot be tamed and that that therefore it is impossible to select “optimal solutions” or “the right policy”. On the other hand, if we can enrich the diversity of perspectives and narratives used to deliberate about a given issue we can at least hope to get better decisions.

] Tools for collaborative management of information

J. Félix Ontañón, Open Kratio, Seville, Spain

Several European policies about management of water has been called for helping members of the EU on their decision-making process. The databases built, as result of these policies, have a huge potential for concerning citizens about the importance of the management of water. Opening those databases freely available, without copyright restrictions, would boost the interest of re-using it, and even of building commercial applications. Actually, opening data is today one of the key points at the Digital Agenda: Europe has an Open Data Strategy², which is expected to deliver a €40 billion boost to the economy per year.

While opening water management data could be done in a variety of ways, there are some guidelines that could be followed in order to make the work of citizens and developers easier. This conference introduces the project #adoptaunaplaya³, which aims to correlate pollutant and waste report data with the quality of bathing waters in Spain. The challenges found on re-using this databases and the lessons learnt will lead us to talk about some recommendations for the water open-data strategy.

² http://europa.eu/rapid/press-release_IP-11-1524_en.htm

³ <http://openkratio.github.io/calidad-aguas>

] The National Drought Mitigation Center: Building a conduit to bring the science to citizen
Brian Fuchs; Drought Mitigation Center, University of Nebraska – Lincoln, USA.

The National Drought Mitigation Center works as a partner with the National Oceanic and Atmospheric Administration (NOAA) and the United States Department of Agriculture (USDA) to produce the weekly United States Drought Monitor (www.droughtmonitor.unl.edu). In the effort of producing the weekly U.S. Drought Monitor product, the scientists involved have relied on an open flow of data as well as commentary from “citizen scientists” who are contributing by the way of reporting of drought impacts and collecting precipitation reports. As the U.S. Drought Monitor has evolved, one key to the success of the product has been the open sharing of data as well as the development of unique datasets for drought monitoring. Almost all of the data associated with U.S. Drought Monitor is open and obtainable freely via the web. Recently, some contributors are providing raw data in GIS formats to allow the U.S. Drought Monitor authors to plot these data values directly to better analyze these data while producing the map each week. The abundance of multiple drought indicators and indices used to create the weekly U.S. Drought monitor has continued to grow in that now each week up to 50 different and unique data inputs are used. With the influx of all these data, the accuracy of the map has also improved.

The National Drought Mitigation Center recently released a new product, the Drought Risk Atlas (www.droughtatlas.unl.edu). To create an atlas of historical drought indices, the best long-term and most complete weather stations were compiled. Over 12,000 stations are in the NOAA cooperative network, with observations going back to the 1870’s. To provide the best climate assessment of drought indices, only the best stations were used. The criteria were established and of the 12,000 stations available, 3,059 stations were identified to calculate drought indices for to provide a historical perspective of how drought has impacted these locations. It is hoped that these stations best represented the United States and provide a tool to quickly understand drought in any area of interest.

] Participatory knowledge generation for decision making

Hoshin Gupta and Aleix Serrat-Capdevila; University of Arizona, Tucson, USA

This is a talk presented by “physical scientists” who have, over the years, been progressively drawn into the experience of interacting with social-behavioral scientists, stakeholders, managers, and policy experts, in the context of problems related to the sustainability of water and related environmental services. We will discuss our experiences, beginning with the University of Arizona-based Water Center called SAHRA, and progressing through the EU Funded SWAN project, towards a planned international activity/organization to be called the Transatlantic Dialogue On Water. Our goal is to reflect on experiences and lessons learned through our interactions with people from diverse backgrounds and perspectives. The overarching challenge seems less to be one of understanding the problem” and more one of understanding each others’ understandings of the problem” –in the context of Systems Theory, this might be perceived as the challenge of developing what might be called a shared Conceptual Model. As physical scientists, this seems to require us to relinquish our desire to progress rapidly towards a “solution”, and instead focus on the movement towards a shared understanding of the problem and its various dimensions.

] SPEAKER BIOS

Bernard Barraqué. CNRS (National Scientific Research Centre), Paris. He is emeritus research director on water policies within CIREN, Centre International de Recherches sur l'Environnement et le Développement. In the last years before retiring, he coordinated EAU&3E, a research project on the sustainability of water and sanitation services in large cities in France (and other developed countries): environmental, economic, social and governance dimensions (see <http://eau3e.hypotheses.org>).

Janice Dickinson, Cornell University. Her research has evolved gradually from studies of the behavioral ecology of insects and birds to a program that incorporates elements of conservation science, public education, and human cooperation within the contexts of citizen science and sustainable practices. Currently, her work includes citizen science research on climate change effects on winter bird distributions, continuing studies of cooperation and population ecology of western bluebirds, and pursuit of understanding of the human dimensions of sustainability, including human denial of climate change. Viewing citizen science as a collective action, she is interested in how the internet can best be used to support science-based conservation communities enacting and sharing residential habitat improvement strategies and energy conservation practices. Taking this further, can we mobilize the highly educated aging population to bring their talents to the table with new solutions and inventions? While her background is in evolutionary ecology, her interests in human behavior have come to incorporate psychological bases of behavior and proximate decision rules with emphasis on how we might use the internet to support cooperative endeavors around shared meaning. Her newest citizen science project, The YardMap Network, will pursue these ideas.

Arturo Fernández-Palacios, is a geographer and, since 1988, has been specialized in remote sensing, cartography and information systems applied to the evaluation of natural resources and in environmental management, performing this for the Regional Environmental Ministry of Andalusia. He has been the Chief of the Service in charge of coordinating the strategic planning and the participatory processes for this same body. Since 2007, he is the Deputy Director of Cartography of the Statistics and Cartography Institute of Andalusia, organization in charge of coordinating the production of information necessary for all public policies of the regional government and of promoting its maximum diffusion and accessibility. Much of its current task is devoted to the implementation of the INSPIRE Directive in Andalusia.

Brian Fuchs is a faculty member and climatologist for the National Drought Mitigation Center (NDMC) <http://www.drought.unl.edu> which is housed within the School of Natural Resources at the University of Nebraska in Lincoln. He received a B.S. in Meteorology/Climatology in 1997 from the University of Nebraska and a M.S. in Geosciences, with an emphasis in Climatology, in 2000 from the University of Nebraska. He first came to the School of Natural Resources in May of 2000, working as a Climatologist for the High Plains Regional Climate Center. He started working with the National Drought Mitigation Center in December 2005. His job functions are quite broad, but he is focused mainly on drought related issues and research projects. The drought related work concentrates on research involving mitigation, risk assessment, monitoring, impacts and reporting of drought. As a Climatologist, he work on the applied research projects for the center as well as authoring the United States Drought Monitor <http://www.droughtmonitor.unl.edu> and the North American Drought Monitor with several others. The work he does helps others to better understand the impacts related to drought across a diverse group of industries from agriculture, energy, tourism, transportation as well as social and environmental concerns.

Mario Giampietro, Autonomous University of Barcelona, Catalan Institution for Research and Advanced Studies (ICREA), Spain. He works on integrated assessment of sustainability. Using new concepts developed in Complex Systems Theory, he has created an innovative scientific approach that can integrate quantitative analyses referring simultaneously to technical, economic, demographic, social and ecological variables. In this way, it becomes possible to characterize, in relation to multiple criteria of performance, the interaction of socio-economic systems and ecological systems across multiple scales using integrated sets of indicators, which can be chosen "à la carte" by social actors.

Hoshin Gupta is a professor of Systems Analysis in Hydrology at the University of Arizona (USA). He is very interested in the interaction between climate and hydrology and in the application of emerging technologies to the science of water, as well as in the interaction between hydrology and society and the application of models combining hydrological and socio-economic data. He is an expert in modeling for decision-making and investigates how to combine quantitative and qualitative data in the construction, calibration and application of mathematical models.

Dave Huitema. VU University - Amsterdam and Open University (Netherlands). He is Professor Environmental Policy at the Institute for Environmental Studies (IVM) at the VU University Amsterdam and the School of Sciences at the Netherlands' Open University. He specializes in Public Policy and Public Administration and mainly works on environmental governance issues, with a focus on water and climate change specifically. His

research interests include adaptive co-management, policy innovation, change and learning, public participation, science-policy interactions, and policy instruments.

José María Hurtado, Civil Engineer, began his career in 1983 working for an important company specialized in Hydraulics Engineering until 1990, when he joined the Regional Government of Andalusia, where, after running hydraulic constructions and projects, he has been Deputy Director of the regional administration body in charge of water management since 2004, which is currently the General Secretariat for Integral Management of the Environment and Water of the Junta of Andalusia. In this post, he has participated in the strategic planning of the management of water resources and especially in the implementation of the Water Framework Directive in the Andalusian autonomous community, in which public information and participation play a prominent role.

Satoko Kishimoto, Transnational Institute. She was an environmental activist and active in the youth environmental movement in Japan in the 1990s. She began working with TNI in 2003, at the time of 3rd World Water Forum held in Kyoto, Japan. TNI successfully organized a seminar on *Alternatives to Water Privatisation*, which was the starting point of the Water Justice Project. In 2005, the Reclaiming Public Water (RPW) Network was created with the contributors to the book *'Reclaiming Public Water'*. TNI serves as the coordinating hub of the RPW network and Satoko is the coordinator of the network. The RPW network connects activists, trade unionists, researchers, community activists, and public water operators from around the world, and advocates progressive public water reforms and Public-Public Partnerships as the key elements for solving the global crisis in access to clean water and sanitation.

François Molle is Director of Research at the Institut de Recherche pour le Développement (IRD), France. He has 27 years of experience working on issues of water management, water governance and water policies. He is currently seconded to the International Water Management Institute and based in Cairo, where he develops research activities in the Middle-East and North-Africa region. He has authored 200 publications, including 80 journal articles, book chapters, and edited volumes. He serves as an editorial board member for several journals and is co-editor of *Water Alternatives* (www.water-alternatives.org). François Molle graduated from Ecole Polytechnique, France, holds a Ph.D from the University of Montpellier and teaches in several Master programs in the field of Human Geography.

J. Félix Ontañón (<http://fontanon.org>) is a computer engineer and Digital Citizenship ICT consultant. As a committed citizen he is a member of OKFN-sp and co-founder of the citizen organization OpenKratio (formerly Open Data Sevilla), which advocates spreading the principles of *#opengovernment*, *#openculture* and *#opendata* at Spain. In these groups he has helped Universities to open and visualize their economic data and contributed to the future [Transparency](#) and [Citizenship Participation](#) Regional Laws of Andalusia. OpenKratio is the organization behind [Open Data Sevilla](#), an annual national summit about *#opendata* and *#opengovernment*. *His motto: I want the Administration to be electronic, the Government open ... and the software, free!* [Open Kratio](http://openkratio.org) (openkratio.org) is made up of a group of people that aim to disseminate the principles of Open Government and Open Data, especially in public administration. OpenKratio intends to be a citizen action group that helps to increase social transformation and interest in order to improve democracy. This group believes this could be achieved through participation and collaboration initiatives in the public and political space by adopting the principles of the "open" movement.

Claudia Pahl-Wostl is professor for resources management and director of the Institute for Environmental Systems Research at the University of Osnabrück, Germany, and co-chair of the Global Water System Project (www.gwsp.org). Her major research interests are adaptive, multi-level governance and management of water resources, social and societal learning and their role in sustainability transformations, and conceptual and methodological frameworks to analyze social-ecological systems. She is (co)author of numerous papers in peer-reviewed journals, chapters in edited books, policy briefs and popular reports.

Javier Ruza, Ministry of Agriculture, Food and the Environment of Spain. Javier Ruza is a specialist in Environmental Hydrology. He has been working in the world of water both in the public and private sectors since 1990; the last 17 years in the Directorate General for Water of the Ministry of Agriculture, Food and Environment where he has been Deputy Director for water management. His work has dealt with the coordination of the 25 different River Basin Authorities and in particular with the exchange of information on different water aspects. He has been the creator and coordinator of the working group on *'Water status'* for the exchange of information on water status and water quality between River Basin Districts and the Ministry; and the working group to create the [National Inventory on Waste Water Discharge Permits](#). He has been in charge of the National Register on Water where all water abstractions and their uses are registered, and of the [National Mapping System for Flood Prone Areas](#) (SNCZI). One of the purposes of these data collection system is to attend to [European Environmental Agency EIONET priority dataflows](#), and to give an answer to the information required by the European Commission Water Information System in Europe ([WISE](#)). He is currently the representative of the Spanish Central Government in the Directive Council on the Spatial Information Infrastructure ([CODIIGE](#)), created for the implementation of the [INSPIRE Directive](#) (Infrastructure for Spatial

Information in the European Community) in Spain. He is also the coordinator of the Technical Working group on '[Hydrology](#)' of CODIIGE. He is also in charge of the follow-up of the implementation of the 25 Programmes of Measures ([PoM](#)) of the different River basin management plans in Spain.

Aleix Serrat-Capdevila is a Research Associate Professor in the Department of Hydrology and Water Resources (HWR) at the University of Arizona. He holds an engineering degree from the Polytechnic University of Catalonia and MS and PhD in HWR from the University of Arizona. He has worked in refugee camps and neighboring villages in Guinea-Conakry, West Africa and for a consulting firm in Barcelona and the Catalan Water Agency. His research focuses on change impacts in hydrology and participatory modeling. Since 2010, he has worked for the International Center for Integrated Water Resources Management (ICIWaRM), a Category II UNESCO Center, through a National Research Council Fellowship.

Erick Swyngedouw. Manchester University, UK, School of Environment and Development. He is committed to political economic analysis of contemporary capitalism, producing several major works on economic globalisation, regional development, finance, and urbanisation. Latterly his interests have turned to political-ecological themes and the transformation of nature, notably water issues, in Ecuador, Spain, the UK, and elsewhere in Europe.

Joan Subirats. Professor of Political Science and director of the Doctoral Program of the Institute of Government and Public Policy at the Universitat Autònoma de Barcelona. His research fields include: political analysis, democratic innovation, public participation and local and regional government. He has been a visiting professor at the University of California- Berkeley, CIDE-Mexico, New York University, Università di Roma, and Distinguished Visiting Professor of the Prince of Asturias Chair in Georgetown University (2002-2003).