



Venice International University
International PhD Academy | Global Challenges series
WATER

Monday May 8

9:00 – 10:00 WELCOME

Umberto Vattani, *President of Venice International University (Italy)*

Carlo Giupponi, *Dean of Venice International University (VIU/Ca' Foscari University, Italy)*

Alain Boudou, *Scientific Coordinator (Bordeaux University, France)*

Presentation of the participants

Presentation of the program

Practical arrangements



10:30 – 12:30 – WATER ON EARTH

Gabrielle de Lannoy (*KU Leuven, Belgium*)

Water is everywhere on Earth. This introductory lecture will discuss the distribution of water around the globe in its different physicochemical states (liquid, solid, vapor), and methods to estimate the amounts of water in the various compartments of the Earth. Special attention will be devoted to estimating water in the surface soil layers, vegetation, snow, and groundwater via remote sensing observations, modeling and data assimilation.



14:30 – 17:00 – ECOLOGY OF AQUATIC SYSTEMS (marine and estuarine environments)

Laure Carassou (*LabEx COTE, University of Bordeaux - Irstrea, Bordeaux, France*)

Coasts and estuaries - diverse systems and multiple drivers : definition of coastal seas and estuaries ; geomorphological classification of estuaries ; physico-chemical properties.

Natural communities in coastal and estuarine waters: major groups of flora and fauna, focus on migratory fishes, estuaries and fisheries

Major human-induced stresses on coastal seas and estuaries: fishing, habitat fragmentation, pollution, water supply in estuaries ...

'Hot topics' of biological research in estuaries; the importance of transdisciplinary research for the management of estuarine and coastal marine systems.



17:30 – 19:00 – GENERAL DISCUSSION

Tuesday May 9

9:00 – 10:30 – FROM THE WATERSHED TO THE SEA: NUTRIENT CASCADE AND EUTROPHICATION

Gilles Billen (CNRS- Pierre and Marie Curie University – Paris, France)

Nutrient pollution of groundwater, surface water and marine ecosystems remains a major environmental threat in spite of large efforts devoted in developed countries to reduce its causes and effects. A systemic approach to these problems leads to the conclusion that only a radical change in the water-agro-food system at the regional and global scale will be required to solve them.



11:00 – 12:30 – POTABILITY OF WATER RESOURCES: A CRUCIAL ISSUE

Xavier Litrico (Suez Environnement-Lyonnaise des Eaux, Bordeaux, France)

Water is an essential and critical resource for mankind. It is sparsely distributed on earth: freshwater, which is used for drinking water supply is not always available in quality and quantity to satisfy the needs. Water therefore has to be treated and transported to be drinkable. The talk will focus on water quality issues for drinking water supply, as well as the interaction with the management of the drinking water network. Examples taken from SUEZ experiences in various countries will illustrate the talk.



14:00 – 15:30 – IMPACT OF CLIMATE AND ANTHROPOGENIC CHANGES ON WATER RESOURCES MANAGEMENT

Emmanuel Reynard (University of Lausanne, Switzerland)

Climate change (changes in precipitation regime, temperature warming) is influencing both water resources (changes in hydrological regimes, increased evapotranspiration) and water demands (in particular due to the development of new needs (e.g. artificial snowmaking in mountains, irrigation of golf courses or building cooling). Modeling water management in the future also needs to take into account changes in anthropogenic systems. Based on several case studies carried out in the Alps and in the Mediterranean area, this presentation will focus on the need of integrated modelling systems.



16:00 – 17:30 – EXTREME EVENTS IN COASTAL AREAS

Marco Marani (Duke University, USA – University of Padova, Italy)

Changing extremes are an important aspect of anthropogenic and natural environmental change. In this seminar, I will discuss the general statistical theory that describes extreme events in a broad family of Earth's system processes, accompanied by specific applications to the evaluation of storm-surge frequency and magnitude under sea level rise. Case studies for several coastal sites of global interest will illustrate the use of the theory.



18:00 – 19:00 – ROUND TABLE

Wednesday May 10

**9:00 – 12:00 Pollution of aquatic systems (1) – SYSTEMIC ECOTOXICOLOGICAL APPROACH
BASED ON FRESHWATER SYSTEMS AND HEAVY METAL POLLUTION**

Alain Boudou (*University of Bordeaux, France*)

Peter Campbell (*INRS University, Québec - Canada*)

Contamination of natural systems results from actions and interactions between three sets of factors: abiotic (physico-chemistry of media), biotic (whole biological component) and contamination factors. They are characterized by a very great diversity with jointly a quasi-permanent variability in space and in time. The seminar will be based on a systemic approach at the level of continental aquatic ecosystems, based on different steps: sources of contamination (natural/anthropogenic), fate of contaminants in the water column, key role of sediment compartments, bioaccumulation at the organism scale, biomagnification along food chains and ultimately transfers to human populations with more or less severe toxicological damage. The discussion will be based on two toxic metals: mercury and cadmium.



14:30 – 16:00 – Pollution of aquatic systems (2) – EMERGENT ORGANIC POLLUTANTS: MYTH OR REALITY ?

Hélène Budzinski (*CNRS, University of Bordeaux, France*)

The preservation of water quality is a major issue for both the Environment and Human Health and it is thus important to characterize and comprehend the factors that can affect it. Amongst these factors is chemical contamination, with the aquatic environment being its ultimate sink. The knowledge concerning presence, pathways of introduction, sources of micropollutants in aquatic ecosystems, has considerably increased in recent years. Beside historical contaminants such as PCBs, PAHs, the concept of emerging contaminants has arisen in the past decade in relation with instrumental improvements. This presentation will present the status of current knowledge about these compounds on the analytical and environmental point of view. The presentation will discuss analytical developments and especially analytical challenges regarding these compounds (trace levels, complex mixtures and matrices) and will debate the source, introduction pathways and fate in the environment, highlighting related challenges and need of future developments.



16:30 – 18:00 – Pollution of aquatic systems (2) – EMERGENT ORGANIC POLLUTANTS: A SOCIOLOGICAL ANALYSIS

Geoffrey Carrère (*Irstrea, Bordeaux, France*)

With air pollution, the contamination of aquatic areas by the emergent organic pollutants, such as pesticides, PCB or drugs, appears as one of the important environmental challenges of our societies. But, paradoxically, if the contamination of water is invested by political, associations and economical actors, this risk still remains not very well known by a wide



public. By taking the example of the contamination of aquatic areas by drugs, this sociological presentation will analyze this paradox by presenting the interplay of actors around this issue. We will see specifically some actions implemented in Sweden, Switzerland and France and we will highlight the social constraints experienced.

18:15 – 19:30 – ROUND TABLE

Thursday May 11

9:00 – 10:30 IMPACTS OF MINING ACTIVITIES ON OUR WATER *resources*: IS GREEN MINING AN ATTAINABLE OBJECTIVE OR AN INDUSTRIAL SMOKE SCREEN ?

Peter Campbell (INRS University, Québec - Canada)

The mining industry has a chequered history with respect to its environmental footprint. This presentation will deal with the life cycle of a typical mine (geochemical exploration; mine construction and operation; mine closure) and will consider the potential environmental impacts of mining activity on freshwater systems. Contrasting examples from research in northern Canada will be presented – both negative and positive – and considered in the context of Canada's Green Mining Initiative.



11:00 – 12:30 – HOLISTIC TREATMENT AND MANAGEMENT OF EFFLUENTS – VALUE-ADDED APPROACH

Satinder Kaur Brar (INRS University, Québec - Canada)

Wastewater generated from municipal, industrial and agricultural activities has been increasing exponentially over the last decades driven by population increase. There has been a continual momentum towards advances in wastewater treatment stemming from innovation and strictly enforced regulations. Earlier, simple treatment and removal efficiency of the processes was the trend. Nowadays, there has been a shift towards value-extraction from these effluents mobilizing a new residual based bioeconomy. This talk will discuss the value-added approach of these effluents and as to how they have become the building blocks in the residual sourcing era.



14:00 – 15:30 – SCIENCE-POLICY INTERFACE IN SUPPORT OF WATER POLICIES: HOW RESEARCH, DEVELOPMENT AND INNOVATION CAN HELP WATER MANAGERS IMPLEMENT THE EUROPEAN WATER FRAMEWORK DIRECTIVE (WFD)

Olivier Perceval (French Agency for Biodiversity, Paris, France)

Setting the scene: how is Europe dealing with water pollution? (e.g. substance-oriented regulation - REACH, source- and emission-oriented regulation - IED and Nitrates directive, and media-oriented regulations - WFD and MSFD). What are the current methods used for water bodies classification under the WFD (Environmental Quality Standards for priority/priority hazardous substances, and biological quality elements)? The challenges faced by member states of the EU in evaluating the quality of surface water bodies under the WFD have spurred on research and development in ecotoxicology and environmental chemistry to improve



both chemical and ecological status assessment (e.g. organization of nationwide campaigns to identify emerging contaminants, development of passive sampler devices for the characterisation of chemical exposure, simplified tools to account for metal bioavailability – BLMs, innovative bio-analytical tools to monitor the quality of surface waters and effluents and account for mixtures, etc.).

16:00 – 17:30 – GOVERNING WATER RESOURCES WITH ENVIRONMENTAL INDICATORS: LOCAL, REGIONAL, AND GLOBAL ISSUES TOWARD SUSTAINABILITY

Gabrielle Bouleau (*Irستrea, Bordeaux, France*)

Local co-production of ecological indicators by science and society (the emergence of ecological issues in water resources and the politics of green knowledge, path-dependency). Regional harmonization: experimentalist governance and policy learning in the *EU Water Framework Directive* (intercalibration and democratic challenges). Sustainable development vs ecological modernization (current global debates, critical questions for the future).



18:00 – 19:30 – ROUND TABLE

Friday May 12
The Venice Lagoon as a case-study

9:00 – 10:00 – INTEGRATED WATER DESIGN FOR URBAN SETTLEMENTS IN THE DRAINAGE BASIN OF VENICE LAGOON

Maria Chiara Tosi (*Università luav di Venezia, Italy*)

Integrated water design, the process which promotes the coordinated development and management of water, land and related resources, is fundamental for the sustainability of Venice and its mainland. The lecture will consider the Water system in the drainage basin of Venice lagoon, focusing on the relationships between water system and the decentralized urban landscape. Topics such as loss of landscape diversity and the increasing problems of flood, drought and water pollution in the drainage basin of Venice lagoon will be treated. Moreover, design measures based on decentralized water storage systems as well as multifunctionality - strategies and models which promote mutual benefits for both agriculture and urbanization will be introduced.



10:15 – 11:15 HISTORY OF VENICE FROM THE 5TH CENTURY

Luca Pes (*Venice International University, Italy*)

The History of Venice is the outcome of a constant interaction between water, land and humans, not only from the point of view of architectural forms, but also from the point of view of the economic, political and cultural developments of the city. The origins of the city, its development,



its early environmental sustainability management, its Republican form and its merchant and military projection in the Eastern Mediterranean can be described in this light and in the context of a local political and cultural identity based on the idea of a commonwealth built on water. Such heritage explains certain features of the contemporary city debate on the Lagoon, which is so often based on the history of the Republican State.

11:30 – 12:30 – ECOLOGICAL CHARACTERISTICS OF THE VENICE LAGOON

Roberto Pastors (*Ca' Foscari Univ, Italy*)

The functioning of the Venice Lagoon "Ecosystem" as a whole is, in fact, the result of a complex set of interactions among the biotic and abiotic components characterizing its different habitats. This lecture will provide an overview of: 1) the main physical, biogeochemical and ecological processes, driving its dynamics; 2) the recent evolution of its status, in relation to the main anthropogenic pressures.



14:00 – 15:30 pm – HYDRODYNAMICS AND SEDIMENT TRANSPORT

Georg Umgiesser (*National Research Council of Italy - ISMAR, Venice, Italy*)

The Venice Lagoon is mainly shaped by its hydrodynamic characteristics. The inlets regulate the water exchange with the open sea and rivers are bringing fresh water to the lagoon. Moreover, sediments are exchanged with the sea, are imported through the rivers, and are reworked inside the lagoon. All of these processes have contributed in the last thousands of years to form the lagoon. However, mankind has heavily impacted this natural equilibrium, creating the lagoon as we know it nowadays. New channels have been dredged, inlets have been fortified, and mobile barriers are under construction. Only future will tell us what this means for the Venice Lagoon.



15:30 – 17:00 pm – THE BIG QUESTIONS ABOUT THE FUTURE OF VENICE

Pierpaolo Campostrini (*CORILA, Venice, Italy*)

Venice is a unique city inserted in a unique environment, where interaction between humanity and natural ecosystems is most pronounced and intense. Several environmental, social, economic and governance challenges arise from it and the future of Venice will depend on its capacity to face them and to be resilient to the changing situation. The lecture will give an overview of the challenges and possible solutions, including the debate among the different positions on its management.



17:30 – 19:30 pm – ROUND TABLE



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Saturday May 13

**8:30 – 9:30 MONITORING SYSTEMS AND MANAGEMENT OF COASTAL AREAS:
THE CASE OF THE VENICE LAGOON**

Sonia Silvestri (*Duke University, USA*)

Coastal areas, lagoons and estuaries are extremely complex systems, characterized by continuous evolution of morphological features and water quality changes. A continuous and reliable set of observations is essential to monitor the evolution of these systems, and plan effective management strategies. In this seminar, Silvestri will present how satellite and airborne sensors, combined with observations performed in the field, are applied for a comprehensive monitoring of the state of coastal systems. Applications to the Venice lagoon will be discussed.



10:00 – 14:00 – THE VENICE LAGOON: VISITS TO DIFFERENT SITES BY BOAT

The Venice lagoon will be explored by boat in order to understand better the natural and artificial features characterizing water management issues. In particular, the visit will focus on the works of the MOSE, the system under construction to protect Venice from high water, and on the natural and artificial salt marshes.