Lorenzo Benedetti, Ph.D.

Key qualifications

Experience in: modeling of WWTPs for design, upgrade, optimization and control; modeling of integrated wastewater systems (sewer, WWTP, and river); river water quality modeling; hydrologic sewer modeling; model interfacing and integration; risk analysis; sensitivity analysis; advanced use of the WEST and Sumo simulators.

Education

Ghent University (Belgium), Faculty of Bioscience Engineering: *Ph.D. in Applied Biological Sciences* (1/2003-12/2006)

University of Florence (Italy), Faculty of Engineering: *M.Sc. in Environmental Engineering* (10/1993-11/1999)

Professional activities

Member of the International Water Association (IWA) since 1999

Chair and founder of the IWA Working Group on Modelling of Integrated Urban Water Systems from 2012 to 2016, currently Board Member

Secretary and Treasurer of the IWA Task Group on Design and Operations Uncertainty since 2008

Member of the Water Environment Federation (WEF) since 2008

Member of the WEF Integrated Modeling Workgroup (IMW) since 2015

Member of the WEF Modeling Experts Group of America (MEGA) since 2010

WRRMod IWA/WEF conference, Member of the Scientific Committee, 2018 and 2020

UDM IWA conference, Member of the Scientific Committee, 2015 and 2018

WATERMATEX IWA conference, Member of the Scientific Committee, 2011 and 2015

IWA/WEF WWTMod2008 Wastewater Treatment Modeling Seminar 2008, Workshop Vice-Chair: *Modelling accuracy: dealing with uncertainties*

IWA/WEF WWTMod2010 Wastewater Treatment Modeling Seminar 2010, Workshop Chair: *Modelling micropollutants fate: status and challenges*

IWA/WEF WWTMod2012 Wastewater Treatment Modeling Seminar 2012, Workshop Chair: *How can we evaluate and exploit the interactions of the WWTP with the whole urban water system?*

IWA/WEF WWTMod2014 Wastewater Treatment Modeling Seminar 2014, Workshop Chair: *Wet-weather modelling: Why and how should we tame the beast?*

Other skills

Public speaking skills developed in many presentations at international conferences and seminars, lectures, workshops. Writing and dissemination skills developed with ≈ 50 papers in international peer-reviewed journals and >100 conference papers and posters (see attached list of publications).

Business skills in developing and running a successful independent consulting practice.

Relevant experience

2020 – in course: Extension of the model library with sewer and river models in the WRRF simulator SUMO, for Dynamita (FR).

2019 – in course: Integrated modelling of the Sjölunda WWTP (550,000 PE) and sewer system in Malmö and Lund (SE) for VaSyd, with EnviDan. Baseline calibration and test of BAT scenarios.

2014 – in course: Integrated modeling of the urban wastewater system of the city of Odense (DK) for VCS Denmark, with Jacobs. It includes the whole combined sewer system with 135 CSOs, the storm sewer system with 65 SSOs, the three WWTPs (500,000 PE) and 80 km of rivers and streams.

2011 – 2018: Modeling of the integrated urban wastewater system of the city of Eindhoven (750,000 PE) for the Dommel River Waterboard (NL). The project (www.samenslimschoon.nl) aims at finding cost-effective solutions for wet-weather management of the system in view of the Water Framework Directive implementation. This is the first time the integrated modeling approach was adopted at such detail and large scale in a consulting project. The results of the project are leading to a 70% saving on a budget initially estimated at about 150M EUR. Dr. Benedetti is responsible for the integration of the WWTP, sewer and river models, for the sensitivity analysis and for the scenario analysis leading to the selection of the preferred solutions

2016 – 2018: Modelling of the three WWTPs (total 1.5M PE) in Copenhagen (DK) for the 2025 master plan of BIOFOS, with EnviDan. Baseline calibration and test of BAT scenarios.

2014 – 2018: EU research project QUICS (Quantifying Uncertainty in Integrated Catchment Studies). Dr. Benedetti was Member of the Project Board.

2016 – 2017: Modelling of the Raalte WWTP (Drents Overijsselse Delta Waterboard, NL), with Partners4UrbanWater. Model calibration and test of scenarios for ammonium peak shaving in wet-weather.

2016: Development of a simplified model of the sewer system of the city of Copenhagen (DK) for the utility HOFOR. The model will be used to plan integrated strategies for the operation of the collection and treatment system of the whole city. Pilot project.

2016: Support and supervision of greenhouse emission modelling at a Danish WWTP for the Technical University of Denmark.

2013: Modeling of wet weather scenarios as part of the Northwest WWTP (Odense, DK) Wet Weather Flow Management Study for VCS Denmark, with CH2M. Activities include Information gathering and analysis, simulation of wet weather management scenarios.

2011 – 2015: EU research project SANITAS (Sustainable and Integrated Urban Water System Management) www.sanitas-itn.eu. SANITAS was created to meet the deficiencies in human resources in European Urban Water System management, the need for applications of technology and for sustainability through development of an integrated technology, knowledge and action base. Dr. Benedetti was Member of the Project Board.

2011 – 2013: Realization of the Czajka (Warsaw, PL) WWTP model for plant upgrade and automation. With 2.1M PE, Czajka is the largest WWTP in Poland and includes advanced process control technologies provided by Veolia and Siemens. Dr. Benedetti was selected by DHI Poland to implement and calibrate the model and to provide extensive on-site training of personnel in use of models.

2011 – 2013: Modeling of the Traffeyère (FR) WWTP (110,000 PE) for the plant operator, Semidao, with Primodal. Focus on energy consumption modeling and energy saving scenarios. Dr. Benedetti was responsible for the plant model and scenarios implementation.

2010 – 2014: Modeling of the WWTPs of Lynetten (750,000 PE) and Damhusaen (250,000 PE) in Copenhagen (DK) for BIOFOS, with EnviDan. The system operator requires reducing the pollutant discharge in wet-weather due to the associated costly fees. The aim of the project is to improve the integrated control of sewer and WWTPs. Dr. Benedetti performed the model assessment implementation (which required extensive custom model development), the sensitivity analysis of operational parameters, the connection with data from sewer models and the evaluation of scenarios.

2011: Incorporation of variability and uncertainty evaluations in WWTP design by means of stochastic dynamic modeling, for of the Eindhoven WWTP (Dommel River Waterboard, NL). A post-project audit was conducted on the design for the plant upgrade completed in 2006. For the first time in the wastewater treatment industry, design safety factors have been translated into variability and uncertainty features of a stochastic and dynamic simulation of a plant model. Dr. Benedetti was responsible for the model implementation, for the uncertainty analysis and contributed substantially to the methodology development.

2009 – 2010: Technology transfer project from the Flemish region (BE) to Croatia (VARKOM plant operator, Varaždin). The project aimed at evaluating the impact of WWTP upgrade scenarios on the ecological quality of the Drava River by means of integrated modeling (WWTP, river water quality, river ecology). Dr. Benedetti was responsible for modeling of the Drava River water quality and for scenario analysis for improvements in WWTP effluent quality.

2008 – 2010: EU research project AquaFit4Use (www.aquafit4use.eu) focused in “fit-for-use” sustainable water use in the chemical, paper, textile and food industry. Dr. Benedetti was the coordinator of the development of a software tool for optimization of water networks for industrial water reuse, with special emphasis on streamlining the communication between software developers and water network optimization practitioners.

2009: Modeling of the Ostend (BE) WWTP (650,000 PE) for Aquafin. Dr. Benedetti was responsible for the WWTP model set-up with complex controllers, for aeration and total energy consumption modeling, for scenario analysis to reduce energy consumption.

2008: The Consorci per a la Defensa de la Conca del Riu Besòs (ES) intends to direct part of the influent of the overloaded WWTP La Garriga (10,000 PE) to the underloaded WWTP Granollers (80,000 PE) by means of a 10 km bypass, in order to improve the water quality of the receiving stream especially during summer rain events. This and other measures were evaluated by Dr. Benedetti (in collaboration with the University of Girona) by implementing and using a model of the two plants, their draining catchments and sewers and the river stretch receiving their discharges. To identify critical operational parameters and their optimal values a global sensitivity analysis was performed.

2006 – 2009: EU research project ScorePP (Source control options for reducing emissions of Priority Pollutants) www.scorepp.eu. Dr. Benedetti was leading the work-package on modeling of the release and fate of micro-pollutants in the urban wastewater system (catchment, sewers, wastewater and stormwater treatment, river).

2006 – 2008: Technology transfer project from the Flemish region (BE) to Bulgaria (Sofia WWTP plant operators). The project aimed at evaluating the impact of WWTP upgrade scenarios on the ecological quality of the Iskar River by means of integrated modeling (WWTP, river water quality, river ecology). Dr. Benedetti was responsible for modeling of the Iskar River water quality and for scenario analysis for improvements in WWTP effluent quality.

2003 – 2006: EU research project CD4WC (Cost-effective development of urban wastewater systems for Water Framework Directive compliance). Dr. Benedetti was responsible for WWTP, sewer and river water quality modeling, for the development of tools and methods for probabilistic design of WWTPs, for systems analysis of urban wastewater systems, for model integration.

2002: Water Leak Detection Pilot Project for the Municipality of Nicosia (Northern Cyprus), coordinated by UNOPS. Dr. Benedetti was responsible for the assessment of the distribution system, the creation of a customers’ database for the performance of a water balance, a water audit, district metering and leak detection, for training of personnel on equipment, data collection and processing and management procedures.

Others (academic experience)

Institution	Ghent University (Ghent, Belgium).
Date	2008-2009
Position	Lecturer at the course on “Modelling and Control of Sewage Treatment Installations”

Institution	UNESCO-IHE Institute for Water Education (Delft, The Netherlands).
Date	2009-2010
Position	Lecturer at the course on “Environmental Systems Modelling”

Employment record

Date	From August 2014 to date
Location	Lekenik, Croatia
Company	Waterways d.o.o.
Position	Director
Description	Consultant for modeling of wastewater treatment plants and integrated urban wastewater systems.

Date	From October 2010 to August 2014
Location	Florence, Italy
Company	Waterways s.r.l.
Position	Responsible for Modeling Division
Description	Consultant for modeling of wastewater treatment plants and integrated urban wastewater systems.

Date	From October 2008 to October 2010
Location	Copenhagen, Denmark
Company	Technical University of Denmark (DTU)
Position	Post-doctoral Researcher
Description	Research collaboration, supervision of students.

Date	From August 2008 to July 2010
Location	Kortijk, Belgium
Company	MOSTforWATER NV
Position	Senior Consultant
Description	Consultant for modeling of wastewater treatment plants and integrated urban wastewater systems.

Date	From January 2003 to September 2010
Location	Ghent, Belgium
Company	Ghent University
Position	Ph.D. candidate, then Post-doctoral Researcher
Description	Scientific collaborator and responsible for several EU research projects, coordinator and promoter of research activities.

Date	From November 2001 to December 2002
Location	Florence, Italy
Company	Waterways s.r.l.
Position	Independent consultant
Description	Consultant in environmental engineering.

Date	From November 1999 to October 2001
Location	Florence, Italy
Company	Enki s.r.l.
Position	Partner
Description	Consultant in environmental engineering.