DANIEL A. NOLASCO, NAE

Daniel is recognized internationally as an expert in water and sanitation. He specializes in water systems design and optimization, adaptation and mitigation to climate change.

Daniel was honored in 2024 as **International Member of the United States National Academy of Engineering (NAE)** for his "*distinguished contributions to engineering, to advance wastewater treatment technologies and adapt treatment processes to climate change*."

Daniel is **Fellow and past Vice-President of the International Water Association** (IWA).

As **Fellow of the Water-Energy Nexus Center of the University of California, Irvine,** Daniel contributes to cutting edge research in this field.

Daniel is a Civil Engineer from the **University of Buenos Aires,** Master in Environmental Engineering from **McMaster University** (in Canada) and Master in Management of Technology from the **Massachusetts Institute of Technology (MIT**).

He is co-author of 10 books and more than 100 technical articles.

Daniel holds Canada and Argentina citizenships; speaks English, Spanish, and Portuguese.

<u>Daniel's areas of expertise include:</u>

- **Expert Witness**: water, sanitation and environmental systems.
- **Municipal and industrial wastewater treatment**: planning, management, process selection, design, troubleshooting, and mathematical modeling. Plant evaluation, optimization, process intensification and operation. CapEx and OpEx optimization.
- **Resource Recovery and Circular Economy**: Process intensification, water reuse, biosolids programs, and energy co-generation for municipal and industrial facilities.
- **Water and Energy**: energy efficiency measures in wastewater treatment plants.
- **Climate change adaptation and mitigation** in water and sanitation utilities: evaluation, design, carbon foot-printing and credits, methodology development, modeling.
- **Climate Change Financing:** Evaluation, development and implementation of funding proposals for international financial institutions (e.g., **Green Climate Fund**) for energy, biodiversity, agriculture, water and sanitation, transportation, and industry sectors.
- **Strategic management of water and wastewater utilities**: planning, financing, evaluation, and operation. Urban and rural systems.
- **Infrastructure Funding**: Due diligence, feasibility studies, risk assessment, regulatory and institutional issues, tariffs, public-private partnerships.
- **Cleanup programs for rivers and lakes**: assistance, development and evaluation.
- **Technology transfer and professional training programs**.
- **Benchmarking of water utilities**: evaluation and optimization. Performance indicators. Development of country-wide water sector performance database systems.

WORK EXPERIENCE

WATER-ENERGY NEXUS CENTER, Univ. of California, Irvine 2014-Present

Visiting Scholar (2014-2015) and Fellow (2014-present)

UCI Water-Energy Nexus Center (WEX) is a research unit led with more than 40 affiliated faculty working on various facets of applied research on the water-energy nexus. As part of this fellowship, research in applied technologies for resource recovery, energy efficiency, and carbon neutrality is carried out. Related field work at existing full-scale facilities.

Teaching two official UCI courses:

- 264 - Carbon and Water Footprint Analysis of Water and Wastewater Systems (on campus course, Spring 2015; guest lecturer in Spring 2016).
- Applied Dynamic Modeling for Wastewater Treatment Plant Efficiency and Resource Recovery (online course, Spring 2015-present).

http://unex.uci.edu/courses/sectiondetail.aspx?year=2015&term=SPRING&sid=00136

Green Climate Fund, (http://www.greenclimate.fund/home), 2021-2023

Chair of the independent Technical Advisory Panel (iTAP)

As an operating entity of the financial mechanism of the UNFCCC and of the Paris Agreement, and the largest multilateral climate fund, the Green Climate Fund (GCF) promotes the paradigm shift towards low-emission and climate-resilient development pathways by providing financial support to programs/projects in developing countries aimed at limiting or reducing their greenhouse gas emissions and adapting to the impacts of climate change.

The independent Technical Advisory Panel is made up of ten international experts (members) in climate change adaptation and mitigation. iTAP provides independent assessment and advice to the Board of the GCF. The iTAP provides the last and thorough evaluation of the funding proposals, endorsing them or not before passing them to the Board for final approval. Funding proposals no endorsed by iTAP do not reach the Board approval level.

As Chair of independent Technical Advisory Panel, I lead this group of experts in the evaluation and assessment of funding proposals submitted by Accredited Entities (e.g., Asian Development Bank, World Bank, and many others from public as well as private institutions). Funding Proposals were assessed based on six criteria: Impact Potential, Paradigm Shift Potential, Sustainable Development Potential, Needs of the Recipient, Country Ownership, and Efficiency and Effectiveness. This includes technical and financial evaluations of projects within the whole spectrum of sectors: energy, biodiversity, agriculture, water and sanitation, transportation, industry, etc.

Over the 7 years with iTAP, I reviewed over 240 funding proposals amounting to a total funding (from GCF plus other sources) of over US $40 billion.

Green Climate Fund, (http://www.greenclimate.fund/home), 2016-2020

Member of the independent Technical Advisory Panel (iTAP)

See above

NOLASCO & Assoc. Inc., Ontario, Canada

NOLASCO y Asociados S. A., Buenos Aires, Argentina 2002-Present

President and Founding Partner *of these water, sanitation and climate change consulting groups.*

Examples of Projects:

World Bank, 2024: *Water Resource Recovery Facility Expert.* "Evaluation of Wastewater Treatment Options for Castries, Saint Lucia".

Castries, the Capital City of St. Lucia is in need to develop a wastewater treatment plant that could be transformed into a water resource recovery facility (WRRF). This project involves evaluating optional locations for the WRRF, select adequate treatment processes, making sure the system is resilient to climate change and meets sustainability goals (Environmental, Social and Economic).

World Bank, 2024: *Water Resource Recovery Facility Expert.* "Expansion and Upgrade to Circular Economy of the Konya Wastewater Treatment Facility, Turkey".

The objective of this consulting effort is to support the World Bank team in the due diligence effort related to the expansion of the existing wastewater treatment plant of the City of Konya (3 m^3/s to 4.6 m^3/s). New nitrogen and phosphorus removal limits for the new plant are needed, taking into account the objectives of water reuse and plant/process efficiency improvement. Various treatment processes

were evaluated taking into consideration a proposed design, while considering the project objectives of energy efficiency, environmental and financial criteria. A dynamic mathematical model of the proposed expansion was developed.

World Bank, 2024: *Water Resource Recovery Facility Expert.* "Evaluation of Construction Progress for the Merinos Wastewater Treatment Plant, Guayaquil, Ecuador".
The objective of this consulting effort is to support the World Bank team in evaluating the budget and schedule challenges encountered in the construction of this new facility for the City of Guayaquil. A summary of the issues leading to a budget overrun and schedule extension was developed based on the review of design and contractual documents, site visits, and interviews with key stakeholders. A proposal for improving the ongoing construction effort was prepared and presented to the Bank.

World Bank, 2024: *Water Treatment Plan Expert.* "Water Supply for the City of Beirut, Lebanon".
The Bank requested an evaluation of the add-ons proposed for the new 3 m^3/s water treatment plant for Beirut, which is the first in the city that uses surface water as its main source. Deterioration of raw surface water due to undesirable algae growth, caused by lack of domestic wastewater treatment and surface runoff from agricultural activities demand costly changes to water treatment processes. These process changes, plus the situation at the water sources upstream of the plant, were evaluated as part of this consulting project.

International Finance Corporation (IFC, World Bank Group), 2023-2024: *Expert in evaluation and optimization of Water Resource Recovery Facilities.* "Evaluation of potential to implement wastewater reuse in Los Cabos, Baja California Sur, Mexico." Assessment of current status of existing wastewater treatment plants and their potential to turn them into Water Resource Recovery Facilities by implementing the reuse of water treated by these plants.

International Finance Corporation (IFC, World Bank Group), 2023-2024: *Expert in evaluation and optimization of Water Resource Recovery Facilities.* "Wastewater Reuse Systems on the Mexico-USA Border". Analysis of the status of WWTPs in the six states of Mexico bordering the USA. Support for the selection of optimal system(s) for implementation of wastewater reuse in industry. IFC-North American Development Bank (NAD Bank) collaborative project.

Ashurst, Brisbane, Australia, 2023-2024: *Expert Witness.* Dispute between Monadelphous Engineering Pty Ltd (MEPL) and Unity Water over the design and construction contract for the expansion and upgrade of the Kawana Wastewater Treatment Plant (150,000 population equivalent) in Australia.

World Bank 2023-2024: *Expert in Climate Change Mitigation and Adaptation in the Water Sector.* "Addressing Climate Change through Decarbonized Water and Sanitation Systems".
Climate change has amplified the urgency of ensuring universal access to safe water supply and sanitation (WSS) services, as these sectors play a pivotal role in both public health and sustainable development. The intertwining impacts of climate change on sanitation systems and water availability have underscored the need for resilient and decarbonized approaches in low- and middle-income countries. This World Bank will expand current knowledge of the connections between climate change, urban WSS, and the potential for decarbonizing the water cycle. In addition, specialized technical advisory will bridge the realms of climate change adaptation and mitigation, urban sanitation, and the broader mission of decarbonizing the water and sanitation sectors. Insights to enhance the integration of climate resilience measures into sanitation practices, while also exploring opportunities for reducing the carbon footprint of sanitation systems, will be part of the outcome from this initiative.

SANASA, Campinas, São Paulo, Brazil 2022-2023: *Expert in evaluation and optimization of wastewater treatment plants (Water Resource Recovery Facilities).* Technical support for evaluation of optimization opportunities in existing WWTPs owned and operated by SANASA.

World Bank 2022-2023: *Expert in wastewater reuse.* "Wastewater Reuse Program – Chennai, India".
Assistance in the evaluation of the process design and strategic approach to reuse wastewater for recharging urban lakes prior to reuse for drinking water purposes. Evaluation of two tertiary treatment

pilot plants (10 MLD) using SBRs, chlorine-disinfection, multi-stage filtration, activated carbon, ultra-filtration and UV disinfection.

SABESP, São Paulo, Brazil 2022-2024: *Expert in evaluation and optimization of wastewater treatment plants (Water Resource Recovery Facilities).* Technical support for expansion and upgrade of SABESP Metropolitan wastewater treatment plants (ETEs) Barueri (22 m^3/s = 4 million population equivalent served), ABC (6 m^3/s = 1.1 million p.e.), São Miguel (5 m^3/s = 0.9 million p.e.), Suzano (1,5 m^3/s = 0.3 million p.e.) and Parque Novo Mondo (5 m^3/s= 0.9 million p.e.), plus other four regional ETEs in the State of São Paulo, Brazil. After a successful process audit evaluation and design of upgrades/expansion for SABESP's large ETEs which generated CapEx savings of over USD 1 Billion, SABESP retained NOLASCO's services to support the engineering design of the proposed solutions. In addition to this, the project will assist in the biosolids strategy and energy cogeneration with biogas from digesters for the Metropolitan area, all within a concept of Circular Economy. Development of greenhouse gas (GHG) emission baseline for the utility and emission projections for 2030, 2040 and 2050 are part of the products to be delivered.

World Bank 2021-2023: *Expert in wastewater treatment design, operation and optimization.* "Design support for Canoas WWTP, Bogotá, Colombia". Assistance in the process design and bidding documents for a new 14 m^3/s activated sludge wastewater treatment plant for the City of Bogotá (2500 meters over sea level – 7 million people served).

World Bank 2021-2022: *Expert in wastewater treatment design, operation and optimization.* "Evaluation of El Salitre WWTP, Bogotá, Colombia. "Brief evaluation and process audit of the newly constructed 7 m^3/s activated sludge wastewater treatment plant for the City of Bogotá (2500 meters over sea level). Field evaluation focused on potential risks for the sustainability of the future operation of this plant.

Lavan, Perth, Australia 2021-2022: *Expert Witness.* Dispute between Monadelphous Engineering Pty Ltd (MEPL) and Unity Water over the design and build contract for the expansion and improvement of the Kawana Wastewater Treatment Plant (150,000 population equivalent) in Australia.

BHP, Australia 2021: *Member - Science and Innovation Council.* BHP is a world-leading resources company. The company extracts and processes minerals, oil and gas, with more than 60,000 employees and contractors, primarily in Australia and the Americas. The purpose of the Science and Innovation Council is to advise on: (i) Emerging trends and innovations in the global technology landscape; (ii) How to accelerate and identify conditions to support the success of BHP's innovation, technology and technical agenda; (iii) Current and future science, technology and other global trends; and (iv) The status of BHP's capabilities required to develop, adapt and adopt innovation at the scale and pace required to deliver the necessary productivity, safety, sustainability and social value gains.
The Council consists of up to 12 experts: global thought leaders, each bringing a different skill set, perspective, geographic and knowledge base and includes BHP executives.

SABESP, São Paulo, Brazil 2019-2022: *Expert in evaluation and optimization of wastewater treatment plants (Water Resource Recovery Facilities).* "Evaluation and optimization of effluent treatment stations (ETEs) Barueri (16 m^3/s), ABC (3 m^3/s), São Miguel (2.5 m^3/s), and Parque Novo Mondo (2 m^3/s), State of São Paulo, Brazil". SABESP is facing the expansion of these four facilities with a preliminary CapEx estimate of over USD 2 Billion. The objective of this project was to maximize the use of the existing infrastructure to avoid wasting materials while taking advantage of wastewater resources (water for reuse, beneficial use of biosolids, and energy cogeneration with biogas from digesters), all within a concept of Circular Economy. The project achieved considerable over USD 1 Billion in savings in capital investments (CapEx) and in operation and maintenance costs (OpEx). To achieve these goals, a team of experts, led by Daniel Nolasco evaluated the real treatment capacity of the different unit processes that make up the four plants. The evaluation involved the use of various tools, which are part of the Process Audit methodology developed by Nolasco and others, for Environment Canada: monitoring with online instruments, laboratory analysis, stress tests, oxygen transfer tests, digester tracer tests with lithium (LiCl), hydraulic models to quantify and balance flow distribution, dynamic process modelling with BioWin, energy savings studies, among others. Project financed by the World Bank. Reporting directly to SABESP's CEO and Sanitation Manager.

World Bank 2019-2021: *Expert in wastewater treatment optimization.* "Evaluation of treatment plants to increase wastewater reuse and cogenerate energy in Mexico City (CDMX)." Analysis of the current state of the 20 treatment plants owned by SACMEX, the water and sanitation utility in CDMX. Field evaluation focused on two plants: Cerro La estrella (4.4 m^3/s) and San Juan de Aragón (1.5 m^3/s). Reporting directly to SACMEX's CEO and WB task-team leader.

Superintendencia de Servicios Sanitarios de Chile (Water Regulator) 2019: *International Expert.* "Tariff *Renegotiation 2020-2024".* Technical and financial evaluation of utilities operated and services provided by Aguas Andinas (private water utilities serving Santiago de Chile and Greater Santiago). Determination of infrastructure, operations & maintenance, investment requirements, and performance indicators for tariff setting. Use of mathematical models to predict wastewater treatment plant sizing, CapEx and OpEx. Defense of tariff proposal on behalf of the Government of Chile. Project done in association with AKROS S. A. (Chile).

Yacimientos Petrolíferos Fiscales (YPF) 2019: *Expert in wastewater treatment design.* "Evaluation and improvement of technical proposals for two new wastewater treatment plants for Refinería de la Plata and for Petroquímica La Plata, the two largest refinery and petrochemical installations in Argentina". Study of technical proposals, evaluation of potential to meet water quality requirements for reuse, energy consumption and savings, and operation and maintenance costs. Dynamic modeling of processes.

Inter-American Development Bank (IDB) 2019: *Expert in wastewater treatment design.* "Process selection and design of two treatment plants for the cities of Concordia and Gualeguaychu, Prov. de Entre Rios, Argentina".

Aguas y Saneamientos Argentinos S.A. (AySA) 2019: *Wastewater Treatment Expert.* "Evaluation of sludge incineration for wastewater treatment plants". AySA is the water and sanitation utility for Buenos Aires City, serving 14.4 million people. The study involved the analysis of all wastewater treatment plants operated by AySA to generate a twenty-year projection of sludge generation. Evaluation of sludge incineration technologies and an overall sludge management strategy for the utility, including life cycle cost analysis (CapEx y OpEx), risk evaluations, and sustainability considerations. Preparation of technical documentation for bidding process. Reporting directly to AySA's CEO.

World Bank 2018: *Wastewater Treatment, Sanitation, and Clean-Up Expert.* "Evaluation and Recommendations for Regulatory Framework for Sanitation in Paraguay". Study of existing legislation. Analysis of current situation of wastewater treatment: master plans, state of contamination and clean-up plans for receiving water bodies. Analysis and recommendations for a new regulatory framework. Evaluation of advantages of a gradual application effluent requirements. Preparation of technical selection process for development of new legislation.

World Bank 2018: *Wastewater Treatment, Sanitation, and Clean-Up Expert.* "Evaluation and Selection of Priority Measures to Improve the Reservoir System of Water Provision to the City of Mexico (Cutzamala)". Study of measures for the reduction of eutrophication of the Cutzamala System water reservoirs: improvement/optimization of wastewater treatment plants discharging to water bodies and water treatment plants that provide drinking water to the City of Mexico and neighbouring areas.

Aguas y Saneamientos Argentinos S.A. (AySA) 2018: *Wastewater Treatment Expert.* "Developmentof a Sludge Management Plan with Potential Co-Generation from Biogas". Development of sludge generation 20-year projection. Study of strategic options for sludge management: beneficial use of biosolids, thermovalorization for energy co-generation (incineration), sludge drying and pelletizing. Cost-benefit analysis of options. Recommendations for strategic management alternatives. Reporting directly to AySA's CEO.

Aguas y Saneamientos Argentinos S.A. (AySA) 2017-2018: *Wastewater Treatment Expert.* "Evaluation of 11 (eleven) Wastewater Treatment Plants (WWTPs) in a New Jurisdiction in Buenos Aires". Based on information gathered during site visits and historical design data (at the time of the

evaluation there were no operational data available), and using advanced dynamic modeling techniques, the treatment capacity of these plants was quantified and the process bottlenecks identified. A series of process improvement recommendations and energy savings measures were proposed. The combined additional treatment capacity demonstrated during this project was in excess of 2 m^3/s (in excess of U$D107 Million in Capital Investment savings). Reporting directly to AySA's CEO.

World Bank 2017: *Wastewater Treatment Expert*. "Evaluation of Public-Private Participation (PPP) to Generate Energy from Sludge". Study wastewater treatment plants (WWTPs) with potential to co-generate energy (heat and electricity), estimation of potential energy, risk evaluation, PPP schemes, and preparation of a list of recommendations to be used in a bidding process. Anaerobic digestion of sludge, biogas generation, and co-generation from biogas were quantified and studied for 10 WWTPs.

U. de California, Irvine 2016: *Fellow Water & Energy Nexus Center*. "Mathematical Modeling and Design of Three Wastewater Treatment Plants for Leather Tanning in the District of Tuscany, Italy". Technical support in dynamic simulation and design to select best treatment option (aerobic and anaerobic) for the effluent of three tanneries: Aquarno y SGS (chrome-based tanning processes) y Cuoiodepur (vegetable-based tanning process).

World Bank 2017-2023: *Wastewater Treatment Expert*. "Preparation of "Flagship" for Latin America on Circular Economy in Wastewater treatment". Evaluation of successful application of wastewater reuse, energy co-generation, beneficial use of biosolids and optimization of the use of existing infrastructure. Development of case studies to demonstrate successful application of circular economy and how it increases the sustainability of wastewater operations, while contributing to Sustainable Development Goals (UN Agenda 2030). Preparation of a final report (in progress) and development of cases for public access: https://www.worldbank.org/en/topic/water/publication/wastewater-initiative

Aguas y Saneamientos Argentinos S.A. (AySA) 2016-2017: *Wastewater Treatment Expert.* "Evaluation of 10 Wastewater Treatment Plants (WWTPs) for the Buenos Aires Water and Wastewater Utility". Based on information gathered during site visits, design data, and historical operational data available, and using advanced dynamic modeling techniques, the treatment capacity of these plants was quantified and the process bottlenecks identified. A series of process improvement recommendations and energy savings measures were proposed. The combined additional treatment capacity demonstrated during this project was in excess of 1 m^3/s (in excess of U$D50 Million in Capital Investment savings – Expansion plans for over U$S200 Million were cancelled or postponed based on the results from this evaluation, which represents considerable savings to the utility). Reporting directly to AySA's CEO.

Inter-American Development Bank (IADB) 2017: *Wastewater Treatment Expert.* "Evaluation of Puchukollo Wastewater Treatment Plant (WWTP) in El Alto, Bolivia". As part of the "Programa de Saneamiento del Lago Titicaca" (Lake Titicaca Cleanup Program), an expansion of the Puchukollo WWTP was planned. The objective of the project was to evaluate the current operational capacity of the plant (0.54 m^3/s) and design process expansion to treat 1.4 m^3/s. Nutrient removal (N and P) were required. Plant altitude (4000 meters over sea level) had to be given special consideration in the design and planning exercise. CapEx and OpEx were optimized as part of this planning and design project.

Inter-American Development Bank (IADB) 2017: *Wastewater Treatment Expert.* "Program for Cleanup of Bay of Asunción and Sanitation of City of Asuncion, Paraguay". Program objectives: (i) to reduce contamination of the Bay of Asunción and San Lorenzo Creek; and (ii) improve sanitary and environmental conditions of the population living on neighbouring shores. One of the main infrastructure investments is the Bella Vista Wastewater Treatment Plant (WWTP). The project consisted in designing the process for preliminary treatment of the facility and preparing terms of reference for the detail design of the WWTP.

World Bank 2015-2016: *Wastewater Treatment Expert*. "Wastewater strategies and policies for LAC". Background: Latin America and the Caribbean (LAC) experienced during the last couple of decades an expansion in access to basic water supply and sanitation (WSS) services. Most LAC countries are reaching coverage rates in track to reach universal coverage in few years. Nevertheless, future investing decisions for service coverage expansion need to consider attributes such as the performance of

infrastructure provision and quality standards for end-users for all types of WSS services, but in particular for wastewater treatment. Objectives: (i) To provide an in-depth analysis of policies, institutional structures, technologies and financing mechanisms that could provide an adequate set of incentives to achieve the goal of significantly increasing the levels of wastewater treatment and its adequate disposal in LAC; and (ii) For Peru, to revise and complement preliminary policy issues for interventions in wastewater treatment, including technologies, investments, operations and maintenance costs, financial, environmental, reuse and disposal, resource recovery (e.g., energy efficiency, beneficial use of biosolids), climate change considerations, legal and institutional issues; and (iii) to prepare a final WWT policy proposal, including its implementation.

Inter-American Development Bank (IADB) 2015: *Water and Wastewater Planning/Financing Specialist.* "Water and Sanitation Master Plans for the Cities of Sucre, Potosi and Oruro, Bolivia". Objective: Provision of technical assistance in the conceptualization of the Terms of Reference to develop three master plans for these metropolitan regions in Bolivia. Supervising master plan consulting firms in strategic aspects of master plan development: governance and institutional restructuring, hydrogeological balances, scenarios and alternatives to resolve current and future problems in the provision of potable water and sanitation services, prioritization of capital investments, financial and economical sustainability of the master plans.

IWA/GIZ 2016: *Water & Energy Specialist*. "*Energy Efficiency, Wastewater to Energy and Carbon Footprinting of a Utility in Cusco, Peru".* The International Water Association (IWA), in cooperation with the German International Coop. Agency (GIZ) is undertaking the project "Water and Wastewater Companies for Climate Mitigation" as part of the International Climate Initiative (IKI). GIZ and IWA aim to improve the carbon balance of water and wastewater utilities, while ensuring that these companies reduce their operational costs and maintain or improve their services. As part of this program, this project was carried out to provide recommendations to the Water Supply and Wastewater Systems in the province of Cusco (SEDACUSCO), in Peru, on how to best reduce their carbon footprint per serviced population based on their existing systems and potential plans for future expansion using a holistic water cycle approach. Energy efficiency and generation was a central part of this project which produced recommendations in the form of a short-, mid- and long- term plan with actions to be taken on different parts of the water cycle, based on the analysis of the current operation of the utility, a baseline assessment, and a holistic water cycle approach. Feasibility analyses: timeline, CapEx, OpEx, potential savings, staff capacity, long-term non-value benefits, and need for involvement of other stakeholders were assessed.

IWA/GIZ 2015: *Water & Energy Specialist*. "*Energy Efficiency, Wastewater to Energy and Carbon Footprinting of a Utility in Guanajuato, Mexico".* The International Water Association (IWA), in cooperation with the German International Cooperation Agency (GIZ) is undertaking the project "Water and Wastewater Companies for Climate Mitigation" as part of the International Climate Initiative (IKI). GIZ and IWA aim to improve the carbon balance of water and wastewater utilities, while ensuring that these companies reduce their operational costs and maintain or improve their services. As part of this program, this project was carried out to provide recommendations to Comisión Nacional del Agua (CONAGUA), GIZ, and IWA on how to improve energy efficiency of San Francisco del Rincón WWTP (operated by SITRATA). For this purpose a cost-benefit analysis was prepared and a description how to implement the most promising recommendations was given. Feasibility analyses: timeline, CapEx, OpEx, potential savings, staff capacity, long-term non-value benefits, and need for involvement of other stakeholders were assessed.

World Bank 2014-2015: *Water & Energy Specialist*. "*Wastewater to Energy: A Technical Note for utility managers and decision makers on urban sanitation in EAP countries" (P145830)".* Preparation of a Technical Note to inform utility managers and technical decision makers in East Asian countries on appropriate technologies available for wastewater treatment with energy recovery processes under their specific local conditions, which would allow them to reduce operating costs without compromising on effluent quality. The Note explained: 1) the benefits of adopting these technologies and 2) what factors need to be in place for a successful implementation. 6 (six) international case studies (successful and failed ones) under conditions comparable to the focus countries were developed. As part of this project, a pre-feasibility study for a wastewater to energy project in one of the focus countries was developed as an example. http://www-

wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/08/06/090224b08305481a/2_0/Rendered/PDF/Main0report.pdf

IWA/GIZ 2014: *Water & Energy Specialist*. "*Development of Energy Efficiency and Carbon Footprint Clauses for an O&M Contract for a Wastewater Treatment Plant in Cusco, Peru".* The International Water Association (IWA), in cooperation with the German International Coop. Agency (GIZ) is undertaking the project "Water and Wastewater Companies for Climate Mitigation" as part of the International Climate Initiative (IKI). GIZ and IWA aim to improve the carbon balance of water and wastewater utilities, while ensuring that these companies reduce their operational costs and maintain or improve their services. As part of this program, a contract for operation and maintenance of a new wastewater treatment plant by third-party was developed to include incentives, benchmarks, and penalties to promote energy efficiency (savings and generation) and carbon footprint reductions at this WWTP for 300,000 p.e.

LEAO S.A. (Coca-Cola Brasil Bottler) 2014: *Expert in Industrial Wastewater Treatment*. "Optimization of an anaerobic-aerobic WWTP". Provided technical assistance to optimize the operation of this large IC (internal circulation anaerobic reactor, Paques) followed by a hybrid (suspended growth and biofilm) aerobic reactor. Evaluated operating conditions and provided guidance for performance improvement, including upstream CIP (cleaning in place) modifications to reduce toxicity sent to the wastewater treatment system. LEAO is one of the largest bottlers of fruit juices in Latin America.

Superintendencia de Servicios Sanitarios de Chile (Water Regulator) 2014: *International Expert*. "Tariff *Renegotiation 2015-2019".* Technical and financial evaluation of utilities operated and services provided by Aguas Andinas (private water utilities serving Santiago de Chile and Greater Santiago). Determination of infrastructure, operations & maintenance, investment requirements, and performance indicators for tariff setting. Use of mathematical models to predict wastewater treatment plant sizing, CapEx and OpEx. Defense of tariff proposal on behalf of the Government of Chile. Project done in association with AKROS S. A. (Chile).

Coca-Cola VITAL S.A. (Chile) 2014: *Wastewater Treatment Specialist* "Process Design for New Industrial Wastewater Treatment". Process design and modeling for considerable expansion of an existing WWTP for this Coca-Cola fruit juice products bottling plant in Santiago de Chile. Influent characterization, existing process and equipment analysis, expansion design based on technical and NPV evaluation. Preparation of bidding documents and evaluation of bids from various turn-key WWTP suppliers.

World Bank - Global Environmental Facility (GEF) 2013: *Wastewater Treatment Expert. "*Adriatic Sea Environmental Pollution Control Project (I), Croatia and Bosnia and Herzegovina". The project consists of: a) two demonstration investments to reduce nitrogen discharges, one each in Croatia and Bosnia and Herzegovina, b) technical assistance to support the preparation of funding proposals to be presented to the EU and to assess the relative sources of nutrient contributions, facilitating the progress towards compliance with EU Directives and policies. The Project fully adheres to the Mediterranean Strategy for Sustainable Development "Promoting sustainable management of the sea and coastal zones and taking urgent action to put an end to the degradation of coastal zones", and to the initiatives to introduce the Ecosystem Approach (EcAp) adopted by the parties to the Barcelona Convention. The project's development objective is to reduce transboundary pollution in selected hot-spots of the Eastern Adriatic Sea and improve regional capacity for project preparation and environmental monitoring of sensitive areas.

Inter-American Development Bank (IADB) 2012-2014: *Urban Water Planning Expert.* "Water and Sanitation Master Plans for the Cities of Santa Cruz and Cochabamba, Bolivia". Objective: Provision of technical assistance in the conceptualization of these two metropolitan regions in Bolivia (2nd and 3rd largest in population). Leading strategic aspects of master plan development: governance and institutional restructuring, hydrogeological balances, scenarios and alternatives to resolve current and future problems in the provision of potable water and sanitation services, prioritization of capital investments, financial and economical sustainability of the master plans.

World Bank – Global Partnership for Output-Based Aid (GPOBA) 2012-2013– *Results-Based Water Specialist* "Development of an OBA Program for Accra, Ghana". Objectives: to design the an output-based aid program for provision of water and environmental sanitation services for the Capital City of Accra, with focus on technical, institutional, operational and fiduciary mechanisms. Tasks: Definition of eligible facilities, services, service providers, unit costs, and propose sub-project pipeline; Estimation of the subsidy level required; Definition of outputs and associated indicators for verification and payment purpose; and Implementation of disbursement arrangements for the OBA Fund.

ECAPAG + Hogan-Lovells US LLP 2012-2014: *Water Sector Expert.* "Tariff litigation International Water Services Guayaquil (Interagua) vs. Empresa Cantonal de Agua Potable y Alcantarillado de Guayaquil (ECAPAG)". Expert witness for this tariff litigation between the water regulator (ECAPAG) and the private contract operator (Interagua) for the City of Guayaquil, Ecuador. Reporting directly to ECAPAG's CEO.

PETROBRAS, Brazil 2013-2014: *Wastewater Treatment Modeling Expert.* "Calibration of a dynamic model to 2 (two) Petrochemical Wastewater Treatment Plants*".* Program objectives were: (i) to assist with the development of 2 calibrated dynamic simulation models for WWTPs located in the State of Sao Paulo, Brazil; (ii) Simulate various operating scenarios to optimize process treatment; (iii) Train plant engineers to perform model calibration to other utilities; and (iv) Report results and recommend future efficiency improvement and operator training actions.

Inter-American Development Bank (IADB) 2012: *Wastewater Treatment Expert.* "Wastewater Treatment Plant (WWTP) for Mar del Plata, Argentina". Evaluation of conceptual plant design, treatment process alternatives, design parameters, and costing for this 8 m^3/s (2 million people equivalent) plant.

Inter-American Development Bank (IADB) 2012: *Wastewater Treatment Expert.* "Wastewater Treatment Plant (WWTP) for the City of Potosí, Bolivia". Viability analysis, conceptual plant design, evaluation of treatment process alternatives, definition of design parameters, technical support to water utility and bank personnel. CapEx USD 20 million, approx.

CETREL, Camaçari, Bahia, Brazil 2015: *WWTP Modeling Expert.* "Calibration of a dynamic model to a petrochemical wastewater treatment plant*".* The Camaçari Industrial Pole is located in the state of Bahia, Brazil. It is the largest industrial pole in the state, housing several chemical, petrochemical and automobile industries. The Camaçari Industrial Pole is currently experiencing a new expansion cycle, the physical area of which increased from 13,400 to 29,300 hectares, implementing new production routes. Together, all the companies of the Industrial Pole invest annually 16 billions of US dollars and generate 15,000 direct jobs, accounting for 20% of Bahia's GDP. CETREL treats all the wastewater generated by the industries located in the Camaçari Pole. Project tasks: (i) Evaluated historical performance of this 1 m^3/s treatment plant and determined potential areas for improvement; (ii) Based on plant data, developed and calibrated a dynamic model of the plant (both liquid and solid train); (iii) Simulated various operating scenarios to optimize process treatment; and (iv) Report results and recommend future efficiency improvement and operator training actions.

Inter-American Development Bank (IADB) 2012: "Preparation of Terms of Reference for Non-Revenue Water (NWR) Reduction Project for Greater Paramaribo, Suriname". Including network rehabilitation, and NRW reduction strategies, technical support to bank and SWM (local utility).

Celulosa Arauco y Constitución S. A., Chile 2012: *WWTP Modeling Expert.* "Calibration of a dynamic model to 2 (two) Industrial Wastewater Treatment Plants*".* Program objectives were: (i) to assist with the development of 2 calibrated dynamic simulation models for pulp and paper WWTPs (Capacity = 1 m^3/sec, approx., 86,000 m^3/day); (ii) Simulate various operating scenarios to optimize process treatment; (iii) Train plant engineers to perform model calibration to other utilities; and (iv) Report results and recommend future efficiency improvement and operator training actions.

Coca-Cola de Argentina S. A. **2013**: *Wastewater Treatment Plant Specialist*. "Evaluation of 6 WWTPs". Process audits at activated sludge plants in six soft drink bottling plants in Chile. Historical

data review, process evaluation, design of process upgrades, development of contingency plans with cost estimates, and WWTP conceptual design.

Empresa Pública Metropolitana de Agua Potable y Saneamiento (EPMAPS), Quito, Ecuador 2012: *WWTP Modeling Expert.* "Wastewater Treatment Plant Design and Operation using Dynamic Modelling*".* Program objectives were: (i) to develop and deliver a wastewater treatment course to engineers of this public utility, taking into account); (ii) to train EPMAPS on dynamic modeling techniques for design, operation and optimization of WWTPs.

WWTP Modeling Specialist 2004-2023: Delivered over 50 wastewater treatment plant dynamic modeling courses and services to:

Engineering groups: Aguas y Riles S.A. (Chile), Ecopreneur S. A. (Argentina), Odebrecht (Brasil), Dellaqua (Peru), Manantial S. A. (Chile), Lahmeyer Agua y Energia (Peru), ITT Water and Wastewater Peru, etc.

Research Institutions and Universities: Universidad de Chile, Universidad Catolica Argentina, Instituto Mexicano del Petroleo, Superintendente de Servicios Sanitarios, Universidade Federal do Rio de Janeiro (Brazil), Universidad Javeriana (Colombia), Instituto Mexicano de Tecnología del Agua (IMTA), Associação Brasileira de Engenharia Sanitária e Ambiental (ABES, Brazil), etc.

Water Utilities and WWTP Operators: SABESP (Sao Paulo, Brazil), AySA (Buenos Aires, Argentina), ESSBIO S.A. (Concepción, Chile), ESVAL (Valparaíso, Chile), CETREL (Brazil), Aguas Andinas (Santiago, Chile)**,** etc.

Industries: PETROBRAS (Brazil), Celulosa Arauco y Constitución S.A. (Chile).

Regulators: Superintendencia de Servicios Sanitarios (SISS, Chile), Portal da Prefeitura da Cidade do Rio de Janeiro (Brasil), etc.

World Bank 2009-2011: *Results-Based Disbursement Expert*. "Output-based Disbursement (OBD) Program for Water and Sanitation Utilities in the States of Oaxaca and Michoacan - Mexico*".* Program objectives were: (i) to assist with the development implementation of results-based projects in Mexico; (ii) presenting the definition, rationale, lessons learned, implementation structure, case studies, design and implementation aspects, and recommendations on past results-based projects throughout the GPOBA experience worldwide; and (iii) evaluation of potential for implementation of results-based programs in each of these States.

International Finance Corporation (IFC-World Bank Group) and Reybanpac S. A. (Ecuador) **2011**: *Waste Audit and Cleaner Production Specialist*. Reybanpac is one of the leading conglomerates in Ecuador's agribusiness sector. The overall objective of this project was to develop a cleaner production action plan to help Reybanpac Dairy meet internationally accepted Key Performance Indicators (KPIs) in the Dairy sector. The action plan established thresholds (expressed in %) of efficiency improvements in energy, water and raw materials consumption to be achieved considering zero or low cost, medium cost, and high cost recommendations. Process selection and basic design of two new wastewater treatment plants for two of Reybanpac's operations were carried out as part of this project.

Inter-American Development Bank (IADB) 2011: *Wastewater Infrastructure Rehabilitation Specialist.* "Development of Strategy for Wastewater Treatment Rehabilitation in Trinidad & Tobago (T&T)." T&T has over 240 wastewater facilities. However, most of them are small and in poor operating conditions. In 2009, T&T Water & Sanitation Authority (WASA) started the takeover of these small plants which were previously owned by the Housing Development Corporation (HDC). The adoption of these additional plants proved unprofitable due to the high O&M cost and the low wastewater tariffs. The project consisted in developing a strategy to implement the adoption and re-commissioning of these plants in order to improve environmental protection. The project results will entail the prioritization of actions based, which will be partly funded by an initial loan from IADB of USD30 million.

World Bank 2011: *Results-Based Disbursement Expert*. "Output-based Disbursement (OBD) Program for Water and Sanitation Utilities Mexico*".* Program objectives were: (i) to assist with the

development implementation of an OBD facility to support water and sanitation utilities in Mexico; (ii) presenting the definition, rationale, lessons learned, implementation structure, case studies, design and implementation aspects, and recommendations on past results-based projects throughout the GPOBA experience worldwide; and (iii) to prepare a report and guidelines for mainstreaming results-based projects within a utility efficiency improvement program.

Empresa Metropolitana de Alcantarillado y Agua Potable de Quito (EMAAP-Q) 2010: *Water and sanitation specialist.* "Evaluation of Strategy and Planning of Decontamination of Rivers in Quito": Support CEO and Technical Manager in the analysis and evaluation of proposed plan for water body cleanup and sanitation program for the City of Quito, Ecuador. Development of overall cleanup strategy, economic analysis of alternatives, provision of recommendations for program implementation. Project involved the review of basic designs for several wastewater treatment plants for both municipal and industrial effluents, ranging from 100 L/s to 7000 L/s.

Inter-American Development Bank 2009-2012: *Sanitation Specialist* "Evaluation of Sanitation Programs in Argentina". Evaluation of sanitation strategies, planning, conceptual design, performance indicators, and program budget and schedules for programs in five municipalities: Mina Clavero, Termas de Rio Hondo, Villa Allende, Resistencia y San Miguel de Tucumán. Project included the review of basic designs for WWTPs in these municipalities. Total Budget for five programs: USD30 million.

Coca-Cola Uruguay (MONRESA) 2010: *Wastewater Treatment Specialist*. "WWTP Optimization for Uruguay's Bottler". Evaluation of plant's operation, current and future wastewater treatment demand, identification of process bottlenecks, development of optimization solutions. Cost-benefit analysis.

Empresa Metropolitana de Alcantarillado y Agua Potable de Quito (EMAAP-Q) 2009: *Wastewater Treatment Specialist* "Evaluation of Strategy for De-Contamination of Quito's Rivers". Provide support to the CEO of EMAAP-Q, the water utility in charge of wastewater collection, treatment, and disposal for the City of Quito, Ecuador's Capital. Assist lead engineers in evaluation of wastewater treatment master plan for Quito and environs. Development of overall strategy for sanitation, including regulatory, technical, and cost-benefit aspects. Evaluation of wastewater treatment alternatives.

United Nations (UN Habitat – WATSAN LAC) 2009-2010: *Project Manager*. "Development of La Plata Basin Water and Sanitation Initiative Programme". Project carried out in coordination with the Chief of the Water, Sanitation and Infrastructure Branch and the UN HABITAT Regional Office, among other UN officials. The project consisted in the development of documents to promote La Plata Basin Water and Sanitation Initiative and included a diagnostic of the water and sanitation situation in the countries of La Plata basin Region plus a Report on potential strategic partners and donors to the initiative. Task 2 consisted on the development of key discussion points and strategies to promote La Plata Basin Water and Sanitation Initiative.

World Bank 2010-2011: *Water & Sanitation Specialist*: "Consultancy Services for the Urban Flood Prevention and Drainage APL II - Argentina". The Urban Flood Prevention and Drainage Project will help reduce the vulnerability of Argentina to flooding, through a mix of structural and non-structural measures. The project consists of the following components: Component 1) aims at providing provincial institutions with flood risk management instruments that can assist with the implementation of specific institutional development activities. Component 2) will provide housing in safe areas for those families that may be resettled from the lands required for the works and for lower income families living in flood prone areas in their immediate proximity. Component 3) will finance works to protect important urban areas against flood effects. It will contain minor rehabilitation of existing schemes and would include fortification of flood defences in geographic areas with strong economic activity and the greatest vulnerability to serious repeated flood damage. Component 4) Technical assistance would be provided for US$2.39 million (or 3.4 percent of project loan) to help implement the project. Project Budget: USD91.6 Million

World Bank 2010: *Water & Sanitation Specialist* "Rural Private Operator Initiatives in Latin America". Knowledge of regional initiatives and contacts with other LAC water supply specialists were the basis for this project, which was supplemented by literature review and interviews. Produced short case studies on three initiatives (projects, programs, and policies) in which the private sector operates rural water schemes.

World Bank 2009-2010: *Results-Based Disbursement Expert*. "Output-based Disbursement (OBD) Program for Water and Sanitation Sector - Mexico*"*. Program objectives were: (i) to assist with the development implementation of an OBD facility to support water and sanitation utilities in Mexico; and (ii) to develop and demonstrate replicable models of successful and sustainable provision of water and sanitation services through OBA (output-based aid) and OBD (output-based disbursement). Performance indicators needed to be developed in order to establish performance-based disbursement schemes. The results-based program is currently under operation within the Program for Water Utility Efficiency Improvement (PROME).

Inter-American Development Bank 2009: *Sanitary Engineer* "Development of Cleanup Program for San José de Costa Rica". Planning and technical support to environmental and sanitation program for the metropolitan area. Evaluation of strategy for wastewater collection and treatment, and biosolids program. Total CapEx USD300 million, approximately.

Embotelladora Andina S. A. - The Coca-Cola Company, Chile 2009: *Wastewater Treatment Specialist.* Evaluation and selection of treatment processes. Basic design for this industrial wastewater treatment plant (largest bottler in Chile).

Envases Central S. A., Chile 2009: *Wastewater Treatment Specialist.* Evaluation of existing wastewater treatment plant operation. Design of WWTP retrofit. Cost evaluation. Preparation of technical documentation for bidding.

Coca-Cola Embotelladora del Atlántico S.A., Argentina 2009: *Wastewater Treatment Specialist.* "Design of a new Wastewater Treatment Plant". Effluent characterization, wastewater projections, selection and design of treatment processes, preparation of bidding documents, evaluation of bids, project direction, and plant start-up. Evaluation of potential greenhouse gas emission reductions.

Carbon Finance Unit, World Bank 2009: *Greenhouse Gas Emission Reduction Specialist.* Development of an umbrella methodology to quantify, monitor, and verify greenhouse gas emissions and future reductions in urban areas. Development of a mathematical toolkit for the waste sector (urban solid waste, water, wastewater, and other initiatives, e.g., reducing, recycling, reusing. Application and demonstration of use at a large municipality.

World Bank 2008-2010: *Water & Sanitation Expert*. "Programa de Apoyo Técnico para la Mejora de la Eficiencia de Organismos Operadores, PATME - Mexico*"*. PATME aimed at providing technical support to improve the efficiency of water utilities in Mexico. Program objectives were: (i) to assist with the modernization of Mexico's water supply and sanitation sector through strengthening the sector policies at the federal and state level; (ii) to develop and demonstrate replicable models of successful and sustainable provision of water and sanitation services, by supporting selected service providers and the municipalities of which they are a part in improving operational and financial performance, and (iii) to develop a sector performance database of performance indicators on which to base the initial status of the system (benchmarking).

Inter-American Development Bank (IADB) 2009: *Climate Change Mitigation Specialist* "Development of a Field Note on Green House Gas Emission Reduction Strategies for Wastewater Treatment Plants". Based on approved methodologies for Clean Development Mechanism (CDM) projects, a manual was developed to assess the potential for emission reduction certification at wastewater utilities. Step-by-step guidelines to develop CDM projects, from the initial evaluation to budgeting and treatment process implementation were developed to assist utilities in implementing climate change mitigation measures. Different aspects related to the evaluation of energy issues were developed to give a full picture of CDM projects.

The Coca-Cola Company bottlers in Bolivia, Paraguay and Peru 2009: *Wastewater Treatment Specialist* "Evaluation, optimization, and design of wastewater treatment processes". Multiple projects involving effluent characterization, selection and design of treatment processes, provision of operational support to existing plants.

AKROS S. A. (ESSBIO S.A.): *Wastewater Treatment Process Specialist* "Design of Agua Prieta WWTP". Selection and design of treatment processes for an 8.5 m^3/s (735,000 m^3/day) new wastewater treatment plant in the State of Jalisco, Mexico.

World Bank, Uruguay: *Climate Change Specialist. "*Development of an improvement program for the dairy industry in Uruguay". Working with a team of dairy experts from the National Secretary of the Environment (DINAMA), put together a program for wastewater treatment, energy generation, and greenhouse gas emission reductions within a Clean Development Mechanism (CDM) Programmatic. Preparation of Project Idea Note (PIN).

National Water Commission (CONAGUA), Mexico – *International Wastewater Treatment Expert* – "Expert opinion on process design for Atotonilco de Tula Wastewater Treatment Plant "serving the City of Mexico and surrounding municipalities (20 million population equivalent and 24 and 35 m3/s of nominal capacity). Evaluation of treatment process alternatives for wet-weather flow conditions. Preparation of green house gas emission reduction strategy and methodologies for Kyoto Protocol. Strategic analysis and technical support to CONAGUA for the preparation of bidding documentation for design, build, operate, and transfer of this facility (DBOT).

Superintendencia de Servicios Sanitarios de Chile (Water Regulator) 2009: *International Expert*. "Tariff *Renegotiation 2010-2014".* Technical evaluation of utilities operated and services provided by Aguas Andinas and ESVAL (private water utilities serving Greater Santiago and Valparaiso cities, respectively). Determination of infrastructure, operations & maintenance, investment requirements, and performance indicators for both private utilities. Use of mathematical models to predict wastewater treatment plant sizing, CapEx and OpEx. Defense of tariff proposal on behalf of the Government of Chile. Project done in association with AKROS S. A. from Chile.

Tribunal de Arbitramento de Empresa de Acueducto y Alcantarillado de Bogotá (EAAB) vs. Concesionaria Tibitoc S. A. E.S.P, Colombia 2008-2010– *Expert Witness (Perito)* – Empresa de Acueductos y Alcantarillados de Bogotá (EAAB, water utility for Greater Bogotá) vs. Concesionaria Tibitoc S. A. (contract operator for a water treatment plant and distribution system serving an area of Greater Bogotá). Present to The Designated Tribunal an expert opinion on technical, financial, tariffs, economic, contract structuring, and management questions put forward by the litigating parties.

Inter-American Development Bank (IADB): *Sector Specialist* "Development of Country Sector Strategy for Water and Sanitation for Argentina". Lead a group of sector specialists in the evaluation of the current situation of Argentina wrt water, sanitation, and urban solid waste. Interview sector leaders in government, private sector, and public utilities, as well as key stakeholders. Prepare a diagnosis of the situation with short, medium, and long term needs and challenges. Development of a country-wide database of sector performance indicators. Preparation of the country-wide sector strategy.

Inter-American Development Bank (IADB): *Sector Specialist* "Development governance, management, financial, and working structure for a Region-wide network of water utilities for Latin America and the Caribbean – WOP-LAC". Following recommendations from the Hashimoto Plan presented at the World Water Forum, Mexico, 2006) and with support of UN-HABITAT and IADB a Water Operator Partnership (WOP) was put in place for LAC. An organization document and a 3-year workplan and financial plan were proposed to UN-HABITAT, IADB and a large number of utilities participating in WOP-LAC. An initial Seminar on "Wastewater Treatment Plant Design and Operation Using Simulation Software" was organized and delivered at the WOP-LAC Kick-Off Meeting in Santiago de Chile (AIDIS International Bi-Annual Conference, 2008) and a Course on Wastewater Treatment Plant Design and Operation was organized and delivered at the CWWA Conference in Montego Bay, Jamaica (2008).

World Bank: *Project Manager* "Improving Database of Performance Indicators of Water Utilities in Latin America". Data mining and analysis. Implementation of a benchmarking system for optimization of public utilities. Updating World Bank's IB-NET database. Use of WEF, IWA, and ADERASA performance indicator systems for benchmarking of water utilities.

Coca-Cola EMBOL S. A. (Cochabamba, Bolivia): *Wastewater Treatment Specialist*: "Design of a New WWTP". Effluent characterization, process selection and design, preparation of bidding documents, technical-economical evaluation of offers.

Carbon Finance Unit, World Bank: *Greenhouse Gas Emission Reduction Specialist.* Development of a new methodology for recycling of paper, plastics, glass and other materials. Life-cycle assessment. Preparation of a Project Design Document (PDD) for a recycling utility (CEAMSE, Buenos Aires, Argentina). The methodology developed by NOLASCO et al. was approved by the CDM Panel of the UNFCCC: "*AMS-III.AJ Recovery and recycling of materials from solid wastes*".

Province of San Luis, Argentina: *Project Manager and Greenhouse Gas Emission Reduction Specialist:* Evaluation of potential for emission reductions at the province's largest industrial park of meat producers (piggery, cattle and poultry), analysis of wastewater treatment and waste disposal strategies, environmental impact evaluation, legal assessment, evaluation of technical proposals by third parties. Development of a Province-wide strategy for Kyoto Protocol.

Carbon Finance Unit, World Bank: *Greenhouse Gas Emission Reduction Specialist.* Development of a 8 (eight) toolkits to facilitate the use of approved methodologies for the calculation of greenhouse gas emission reductions in wastewater treatment facilities: toolkits were developed for 8 methodologies covering municipal, industrial, and agricultural wastewater and solids treatment.

Carbon Finance Unit, World Bank: *Greenhouse Gas Emission Reduction Specialist.* Modification of an approved methodology (AM0025: "*Avoided emissions from organic waste through alternative waste treatment processes*"). Incorporation of wastewater sludge. Preparation of final document for presentation to Methane Panel of the UNFCCC.

UNILEVER de Argentina S. A.: *WWTP Design Specialist and Project Manager. "*Design of a Wastewater Treatment Plant (WWTP) Retrofit". Process audit of the existing WWTP for this factory of soap, detergent, and other household cleaning products. Estimation of future loadings, determination of process bottlenecks, design of process upgrades, preparation of bidding documents.

Biomas S. A.: *Project Manager:* Conceptual Design of a wastewater treatment plant to treat 250 m3/d of urine. Evaluation of treatment alternatives for this industrial facility producing female hormones for human reproduction purposes. Pilot testing of struvite generation, as a cost-effective means to remove ammonia. Process modeling.

World Bank: *Results-Based Specialist. "*Loan P080149 – Financing of Integrated Sector Strategies (FESI) – USD100 Million". Evaluation and auditing of 10 wastewater treatment plants built in the State of Guanajuato, Mexico. Audit aimed at assessing pollutant removal capabilities towards loan payments on a results-based schedule. Performance (payment) indicators were assessed, improved, audited and used for project payment

World Bank: *Sanitation Specialist. "Clean-up and Restoration Plan for the Apatlaco River".* Technical and strategic support at the Identification Phase of a loan USD70 Million Loan to the State of Morelos, Mexico. Evaluation of river modelling status, assessment of existing cleanup strategies, consultation with key stakeholders in the State, evaluation of existing wastewater treatment facilities, assessment of WWTPs conceptual designs, recommendations to the WB on optimization and improvement of existing plan. Assessment of potential for greenhouse gas emission reductions in water facilities.

World Bank: *Greenhouse Gas Emission Reduction Specialist. "*Loan P080149 – Financing of Integrated Sector Strategies (FESI) – USD100 Million". Evaluation of potential for GHG emission reductions in wastewater treatment plants in the State of Guanajuato, Mexico. Development of

knowledge transfer strategy for key sectors in the State through the use of "*learning activities*". Development and delivery of workshop on GHG emission reduction opportunities, technologies and mechanisms within Kyoto Protocol.

World Bank: *Certified Emission Reductions Specialist:* Quantification of greenhouse gas emission reduction potential in wastewater treatment plants and urban solid waste landfills in the State of Morelos, Mexico.

Empresa Municipal de Acueductos y Alcantarillados de Quito (EMAAP-Q): *Water and wastewater operations specialist: Development of Strategic Planning Structure for EMAAP-Q*. Assessment and evaluation of current planning strategy and structure, development and implementation of new planning system for the utility. Project funded by "Environmental Program for Metropolitan Quito (PSA) Inter-American Development Bank Loan 1424/OC-EC-0200". (EMAAP-Q is a water utility providing potable water and wastewater services to 2 million people in Quito, Ecuador).

Ente Regulador de Servicios de Agua y Saneamiento de Honduras (ERSAPS): *Project Manager*: "Development of Regulation for Water Measurement for Honduras": Evaluation of current situation in the country, analysis of regulations and regulatory frameworks in various countries, proposal of regulation for water consumption metering and tariff setting for Honduras, preparation of guidelines for development of a strategy for increasing water metering in Honduras. Project financed by Inter-American Development Bank (IDB).

Inter-American Development Bank (IADB): *Water Sector Specialist:* "Evaluation of potable water systems in rural communities in Argentina". Programa de agua potable y saneamiento VI Etapa (857/OC-AR). Evaluation of operation and maintenance status of 22 systems built with IADB funding in 6 provinces. Assessment of sustainability of the systems, development of lessons learned for design of future investments.

Inter-American Development Bank: *Water Sector Specialist:* "Systematization of Rural Water and Sanitation Experiences". Analysis of experience in rural water and sanitation investments in Haiti leading to the design and establishment of new interventions in this sector in Haiti. Review of experiences and lessons learned of the factors that influence sustainability of such systems in Latin America and the Caribbean, systematization of experiences and lessons learned in Haiti.

Frali S. A., Argentina: *Project Manager:* Development of a legal and environmental strategy to abate industrial contamination of the Lujan River (Río Luján, Province of Buenos Aires). Investigated sources of pollution, located discharge points and approximate pollutant loadings. Development of administrative and legal actions leading to the elimination of these discharges. Evaluation of technical proposals for the construction of a Wastewater Treatment Plant for a residential neighborhood and a hotal chain nearby the river.

World Bank – Global Partnership for Output-Based Aid (OBA) *–Results Based Specialist*
"Development of an OBA Facility for Honduras". Provision of advisory services to assist the Fondo Hondureño de Inversion Social (FHIS), a government ministry mandated to provide technical assistance and provide sector specific funds, design and implement an Output Based Water Infrastructure Fund. The project objective is to develop an OBA Fund aimed at improving access to water and sanitation services to low income households. In its first stage, the Fund will comprise 12 projects across Honduras and a subsidy amount of US$4 million but with potential for scale-up of up to US$7 million. Contract extended to provide assistance during program implementation: from project selection to finalization of construction and start-up. Since implementation, this Output-Based Aid Facility has become a world-wide case study.

Empresa Municipal de Acueductos y Alcantarillados de Quito (EMAAP-Q): *Project Manager*. Technology Strategy for Project Development for PSA Program. Project funded by "Environmental Program for Metropolitan Quito (PSA) IDB Loan 1424/OC-EC-0200". The general objective of this program is to reduce the occurrence of flooding and landslides in the capital city, strengthen the institutional capacity of the water company, and optimize the performance of water and wastewater services (EMAAP-Q serves 2 million people in Quito). This project aimed at organizing the strategy

taking into account projects already developed and future projects needed to achieve PSA program goals and objectives.

World Bank – Public-Private Infrastructure Advisory Facility (PPIAF) – Association of Water and Sanitation Regulators for the Americas (ADERASA): *Project Manager* "Development of National Management Indicators for Mexico". Implementation of water-sector performance indicator database for Mexico's National Association of Water Utilities: ANEAS (Asociación Nacional de Empresas de Agua y Saneamiento). Staff training and implementation of a country-wide benchmarking system.

EMGASUD S. A. – *Project Manager* "Feasibility Study and Strategy Development for GHG emission reductions and CER generation". Baseline calculation, monitoring plan, and budget and schedule analysis for gas pipeline "Gasoducto Transpatagónico".

Inter-American Development Bank: *Sector Specialist:* "Sustainable Coastal Management Program for Sinaloa State". Provided support for the evaluation of needs and risks. Working with a multi-disciplinary team, designed the credit program. Special emphasis was placed on small coastal communities and public infrastructure needed to improve their environmental and sanitary conditions. As a Sanitary Engineer, diagnosed environmental and hydraulic performance of shrimp farms and their impact on coastal receiving water bodies.

Empresa Municipal de Acueductos y Alcantarillados de Quito (EMAAP-Q): *Project Manager:* Assessment of EMAAP-Q's Operation and Maintenance (O&M). Development of Terms of Reference for optimization of O&M system for water treatment plants and distribution networks. Project funded by "Environmental Program for Metropolitan Quito (PSA) IDB Loan 1424/OC-EC-0200". The general objective of this program is to reduce the occurrence of flooding and landslides in the capital city, strengthen the institutional capacity of the water company, and optimize the performance of water and wastewater services (EMAAP-Q serves 2 million people in Quito).

World Bank – Water and Sanitation Program (WSP): *Project Manager* "Development of Field Note on "*Lessons Learned on the Factors that Influences Sustainability of Rural Water and Sanitation Systems in Latin America*". Ex-post assessment of investment projects for policy development.

World Bank – Public-Private Infrastructure Advisory Facility (PPIAF) – Association of Water and Sanitation Regulators for the Americas (ADERASA): *Project Manager* "Development of National Management Indicators for Colombia". Implementation of performance indicator database for the regulatory body in Colombia: CRA (Comisión de Regulación de Agua Potable y Saneamiento). Staff training and implementation of a benchmarking system for water and sanitation utilities in Colombia.

Coca-Cola VITAL S.A. (Chile): *Wastewater Treatment Specialist* "Treatment Process and Equipment Selection for Industrial Wastewater Treatment". Provided technical support and documentation to this Coca-Cola bottling plant in Santiago de Chile). Influent characterization, process and equipment analysis and selection based on technical and NPV evaluation, preparation of bidding documents, evaluation of bids from various turn-key WWTP suppliers.

World Bank – Water and Sanitation Program (WSP): *Project Manager* "Development of Lessons Learned on the Factors that Influences Sustainability of Rural Water and Sanitation Systems in Latin America". Historical documentation review and systematization of published studies on sustainability of rural water and sanitation systems in all countries within the region. Presentation of results and lessons learned oriented towards identifying main obstacles and key factors that will assist in policy development for future projects in the region.

World Bank – Public-Private Infrastructure Advisory Facility (PPIAF) – Association of Water and Sanitation Regulators for the Americas (ADERASA): *Project Manager* "Development of National Management Indicators for Costa Rica". Implementation of management indicators for the regulatory body in Costa Rica: ARESEP (Autoridad Reguladora de Servicios Publicos de Costa Rica). ARESEP staff training, development and follow-up of activities leading to the implementation of a

benchmarking system for water and sanitation utilities in Costa Rica.

IDAAN (Panamá) – "Benchmarking – Institutional Strengthening Program of the National Institute of Water and Sanitation of Panama, IDAAN)". Selection and use of management indicators for comparison, evaluation, and assessment of needs for optimization of water utilities in Panama.

Inter-American Development Bank (IDB): *Sanitary Engineer:* "Environmental Program for Metropolitan Quito (PSA) IDB Loan 1424/OC-EC-0200". Engineering and water business support to reduce the occurrence of flooding and landslides in the capital city, strengthen the institutional capacity of the water company, and optimize the performance of water and wastewater services. Assistance to IDB in the mid-term evaluation of this loan. Evaluation of water treatment plants and networks.

Inter-American Development Bank (IADB*: Lead Sanitary Engineer:* "Support Program for Sanitary Sector in Peru, Phase II, Peru Loan 0142". Preparation of program for private sector participation through concession of water and sanitation services for the cities of Piura, Tumbes, Huancayo, Chiclayo, Pucallpa y Trujillo (4 separate contracts). Socio-economic assessment, operational analysis, evaluation of water treatment plants, technical assessment of contractual documents, evaluation of capital and operation & maintenance projections, risk analysis, development of investment strategies.

Coca-Cola Polar S.A. (Chile): *Wastewater Treatment Specialist* "Coquimbo Wastewater Treatment Plant Design". Provided technical support and documentation to this Coca-Cola bottling plant in Chile. Influent characterization, process and equipment analysis and selection based on technical and NPV evaluation, preparation of bidding documents, evaluation of bids from various turn-key WWTP suppliers.

Beca Pty Ltd. (Australia): *Wastewater Treatment Specialist* "Design of an aeration system for an industrial WWTP at **Wolf Blass Winery**". Development and calibration of a dynamic simulation model for this activated sludge plant using BioWin. Process optimization and effluent prediction.

World Bank: *Project Manager* "Study on post-project sustainability of rural water supply and sanitation services in Ecuador". Assessed the prevalence of sustainable rural water and sanitation services among those installed five years ago or older and evaluate the factors related to the sustainability of these services. Ninety (90) rural communities were visited and evaluated. Socio-economic assessments were carried out together with technical evaluations to determine rehabilitation needs and evaluate factors and performance indicators with major impact on service sustainability.

Ente Tripartito de Obras y Servicios Sanitarios (ETOSS): *Consultant:* "Regulatory Accounting". Development of a performance indicator reporting system to facilitate ETOSS (regulatory agency) the regulation of Aguas Argentinas (private contract operation of water & wastewater services for the Buenos Aires). Pilot testing and final implementation of the first regulatory accounting system in the country.

Empresa de Servicios Sanitarios de la Araucania S.A. (ESSAR S.A., Chile): "Update of Wastewater Development Planning". Development of an optimized wastewater treatment program for this prívate contract operation in Chile serving 34 municipalities. Updating existing master plan for each of the areas served by this utility. Project done with Aguas y Riles S. A. (local consulting firm).

Coca-Cola Servicios de Perú: Evaluation of non-alcoholic beverage wastewater treatment in Perú. Study industrial wastewater and environmental legislation in Peru, so as to plan industrial effluent treatment levels for this bottling company with 7 WWTPs.

Superintendencia de Servicios Sanitarios (Chile Regulatory Agency): *International Expert.* "Study of Tariffs for ESVAL S.A., Period 2005-2010". Assessment of new tariffs applicable to water and sanitation services provided by Empresa Servicios Sanitarios de Valparaiso (ESVAL, approx. 1 million people served).

Superintendencia de Servicios Sanitarios (Chile's Regulatory Agency)*:* *International Expert.* "Study and Negotiation of Tariffs for Aguas Andinas S.A., Period 2005-2010". Technical evaluation of the wastewater collection, treatment, and disposal infrastructure for this private contract operation (6 million people served). Evaluation of infrastructure requirements using the "model company" approach for optimization. Economical assessment of actual requirements at plants serving the City of Santiago: El Trebal (4.4 m3/s), La Farfana (8.8 m3/s), and Los Nogales (6.6 m3/s). Evaluation and application of international design guidelines to define correct sizing of wastewater infrastructure. Dynamic modelling of these utilities to assess operational costs at different scenarios.

Coca-Cola de Chile: Process selection and design to retrofit two industrial WWTPs.

Monresa, Uruguay: Reduction of energy costs through process optimization. Mathematical modeling of WWTPs for the largest bottling company in Uruguya.

Ingersoll, Ontario, Canada: Design of a fine pore aeration system for this wastewater treatment plant serving 50.000 people in Ontario. Mathematical modeling to predict future oxygen demand scenarios. Project contracted by Contestoga Rovers Associates, Canada.

Compañía Tucumana de Refrescos S.A., Argentina: Influent wastewater characterization study: design of sampling methodology, sampling and laboratory analyses. Conceptual design of wastewater treatment plant: process selection and design for this Coca-Cola bottling plant.

Coca-Cola South American Latin Division, Argentina: Development of a methodology for water consumption reduction in bottling plants. Historical data review, bottling process study, development of methodology and implementation manual for operators. Preparation and delivery of training course: online interactive training (via Internet) for 10 bottling plants in South America. Implementation resulted in water consumption savings of U$S500.000/year.

Agrosuper S. A. (with Ecopreneur, Chile): Design of a wastewater treatment plant aimed at achieving GHG emission reductions and CERs for Agrosuper S. A. at the Peralillo Facility (the largest pig farm in Chile,118,000 pigs). This project resulted in the largest purchase of CERs achieved in this industry so far.

Superintendencia de Servicios Sanitarios (Chile Regulatory Agency)*:* "Evaluation of Wastewater Treatment Alternatives for Chile". Technical and economic assessment of alternative technologies with the objective to improve sustainability and meet regulatory requirements in urban communities. Regulatory analysis and economic assessment of various technologies for four ranges of communities.

Azurix Buenos Aires S.A.: P*roject Manager*. **"**Water & Sanitation Service Quality Assessment". Technical and economic assessment of damages and losses caused by the contract operation. Reviewed and analyzed all institutional, regulatory, and quality service parameters for this former private water and sanitation utility. Analyzed water quality and population health indicators. Evaluated infrastructure conditions and operational status of 14 water treatment facilities.

Azurix Buenos Aires S. A., Buenos Aires, Argentina 2001- 2002

Quality & Process Manager *for this utility providing drinking water and sanitary services to 72 municipalities in the Province of Buenos Aires, Argentina (800,000 clients, 2.5 million people served). Led a multidisciplinary team of 40 professionals in 4 divisions: Engineering, Construction, Health & Safety and Laboratories. Reported directly to the CEO. Managed technical operation of 14 water treatment plants and 43 wastewater treatment plants.*

Examples of projects:

- Benchmarking of utility: historical data gathering and review, preparation of key performance indicators, comparison with other water utilities in the region, analysis of strengths, weaknesses, opportunities, and threats (SWOT analysis).
- US$ 1.4 million savings in City of Bahía Blanca with a 15% increase in service quality, achieved through the recovery of an existing piping system.

- US$ 1.2million/year savings in chemicals and energy through optimization of activated carbon use in water treatment (blue-green algae)
- Technical evaluation and operational supervision of 43 wastewater treatment and 14 water treatment plants.

Hydromantis, Inc. Hamilton, Ontario, Canadá 1997-2000

Principal and Senior Process Engineer *for this consulting group providing worldwide consulting engineering services in water & wastewater systems. Numerous projects for public and industrial sector in North and Latin America, project development, management of environmental programs.*

Designed, upgraded, optimized, modeled, and/or troubleshooted over 60 industrial and municipal wastewater treatment plants.
Examples of projects:

- ***Water Environment Federation (WEF) & Water Research Centre (WRc)***: **Utility Benchmarking** Investigated the application of metric and process benchmarking methodologies for economic and technical optimization, evaluation, and regulation of water utilities. Analysis of tariffs, utility economic parameter analysis, solid waste management, air emissions, odour control, environmental management. Study financed by the 1998 WEF & WRc Travel Fellowship Award. *England (1999).*

- ***Canadian International Development Agency, and Environment Canada: CIDA,*** **Watershed Management 2000 Program.** Executing agency: Environment Canada/São Paulo State Secretary Environment. Over a three-year period (1997-1999), participated in four projects within this program: Development and Delivery Canadian Technology Transfer Workshops for SABESP (public utility running water & sanitation services in the State of Sao Paulo), Feasibility and Relative Economics of Phosphorus Removal Options, and on-site Demonstration of simple evaluation and optimization technologies to Brazilian engineers.

- ***Aguas de Barcelona, Dragados y Canales, Canal de Isabel II:*** **Engineer Training and Technology Transfer.** Developed and delivered a four-day course for senior technical officers on Canadian Technologies for Computer Modeling of water and sanitation utilities for design, operation and infrastructure optimization. Main focus on plant design and retrofits. *University of Zaragoza, Spain (2000).*

- ***Environment Canada y Ontario Ministry of the Environment (MOE):*** **Evaluation of Sequencing Batch Reactor (SBR) Technologies Applicable to Small Communities.** *Project Manager.* Historical data review of SBR wastewater treatment plants. Effluent quality, energy consumption, capital expenditure and operation and maintenance costs were evaluated for 80 municipal and industrial WWTPs. *USA y Canadá (1997)*

- ***CEPA –El Salvador International Airport:*** **WWTP Commissioning, Start-Up and Operator Training** *Project manager*. Including troubleshooting of this Sequencing Batch Reactor (SBR) facilty treating domestic (airplane wastewater) and industrial (food production, airplane refueling, and petrochemical) effluent for this airline hub for Central America. *El Salvador (1999)*

- ***Regional Municipality of Halton***: **Biosolids Management.** *Project manager.* Evaluation of alternative solids treatment processes for this 90,000 m^3/d WWTP in Ontario, Canada. The results from this evaluation resulted in a 20% reduction of solids generation through a more efficient volatile solids destruction in anaerobic digesters. The efficiency improvement was achieved through an analysis of current digester cleaning strategies. Lithium Chloride (LiCl) was used to perform tracer studies in existing digesters, thereby determining dead zones, reactor active volumes, and hydraulic short-circuiting in cleaned and un-cleaned digesters. The improvement in biosolids quality facilitated its agricultural use as fertilizer, reducing landfill costs. *Ontario (1999)*

- ***Industry Canada***: **Promotion of Canadian Wastewater Technologies.** *Technology Specialist.* Invited by Industry Canada (Ministry of Industry) in a trade mission to Mercosur to present wastewater treatment advances and develop collaboration projects. *Brazil, Argentina and Chile (1997).*

- ***Environment Canada and Ontario Ministry of the Environment (MOE):*** **Capital and Operational Cost Reduction in Wastewater Treatment through Process Optimization.** Development and delivery of process optimization courses for engineers and managers of wastewater treatment plants. *Canada (1996 al 2000)*

- ***Region of York and Ontario Ministry of the Environment (MOE):*** **Evaluation and Selection of Wastewater Treatment Plant Processes for Small Communities.** Evaluation of intermittent sand filters combined with lagoon or septic tank treatment as an alternative to activated sludge treatment. Field and desk-top technical and economical assessment. *Ontario (1999)*

- **Process Selection, Conceptual Design, Dynamic Modeling, Biological Nutrient Removal, Optimization, Troubleshooting, Planning and Evaluation of Industrial Wastewater Treatment Plants*:***

  TEMBEC (pulp and paper industry, Quebec). Included also operator training.
  DOW Chemical (USA)
  Union Carbide (USA)
  Kurita Industries (Japan)
  LG (Korea)
  General Electric Plastics (Canada y USA): Included also installation and operation or respirometers for determination of kinetic parameters for modeling removal of hydrocarbon species. Operator training.

CH2M HILL Inc., Canada & USA 1989-1997

Senior Project Manager *for this leading environmental consulting firm (15,000 strong). Water & Wastewater Specialist in planning, design, modeling, optimization, and operation of municipal and industrial wastewater treatment systems. Business and project management, technical support services.*

Designed, upgraded, optimized, modeled, and/or troubleshooted over 100 industrial and municipal wastewater and water treatment plants. Examples of typical projects:

- ***Environment Canada and Ontario Ministry of the Environment:*** **Optimization of Toronto WWTP**
  Project manager of this **national award-winning project**. Two-year, $1 million evaluation project of the main wastewater utility servicing the **City of Toronto**. Application of capacity evaluation, operation optimization, and automation methodologies for wastewater treatment retrofit to nitrification and biosolids treatment resulted in capital expenditure savings of over US$180 million (from an initial budget of US$220 M) for the City of Toronto. This project helped develop the methodology for plant upgrade and optimization condensed in the manual entitled "**Guidance Manual for Sewage Treatment Plant Audits"** (Ontario Ministry of the Environment, 1996) Project nominated for the **1994 Governor General of Canada Award** and recipient of the **Canadian Consulting Engineer Award of Merit**. *(1992 to 1994)*

- ***City of Lethbridge:*** **Invention & implementation - New Biological Nutrient Removal Process**
  Developed and implemented an innovative biological nutrient removal process using dynamic modeling techniques. Pilot-tested various UV disinfection technologies. Achieved nutrient target removals without plant expansion, resulting in approx. US$10M in savings from an original infrastructure budget of US$18M. In 2001, this project received the **Consulting Engineers of Alberta Award of Merit**. The Step-Bio P process was patented and later implemented it in Austin, TX and other municipalities. *Alberta, Canada (1992 to 1995)*

- ***Environment Canada:*** **Facility Planning and Optimization**
  Developed a methodology for plant optimization and capacity assessment (plant audits). The

application of this methodology has resulted in US$400M saved in multiple infrastructure projects throughout Canada and the US. Environment Canada now requires the implementation of this methodology prior to approving loans or funding for any capital expenditure in utilities. Environment Canada selected us to develop the **Guidance Manual for Sewage Treatment Plant Audits**, (Ontario Ministry of the Environment, March, 1996) with these plant optimization techniques. *Canada (1992-1999)*.

- ***New York State Energy Research and Development Authority (NYSERDA):*** **Energy Audits**
  Senior technical advisor for this two-year pilot program to assess energy consumption, evaluate **environmentally-friendly technologies to reduce energy use** in water utilities. In-plant evaluation at six utilities using Canadian technologies. NYSERDA used results to help public and private utilities improve their energy and environmental performance. *New York State (1995)*

- ***Ontario Hydro, Regional Municipality of Halton, IJC, and Environment Canada:*** **Remedial Action Plans (Sanitation)**
  This project was part of the **Hamilton Harbor Cleanup Program**, coordinated by the International Joint Commission (IJC) for the Cleanup of the Great Lakes. Our team developed strategies for effluent loading reduction at regional utilities, which help meet discharge criteria set IJC. *Canada (1991)*

- ***Mathematical Modeling with Dynamic Simulators, Optimization, and Process Design of Wastewater Treatment Plants:***
  - Allegheny County Sanitary District (ALCOSAN), Pittsburg, PA, USA;
  - South Austin Region and Walnut Creek, Texas, USA;
  - Greater Vancouver Regional District, British Columbia, Canada;
  - Irvine Ranch, Orange County, California, USA;
  - Lower Potomac, Fairfax, Virginia, USA, (Chesapeake Bay Cleanup Program)
  - FIDCO/NESTLE, USA y Canada
  - Kraft Foods, USA y Canada
  - Philip Morris, Costa Rica.

Sanitary Works & Services Co., Tierra del Fuego, Argentina 1987

Managing Director of Engineering *for this government organization, providing potable water and wastewater services to Tierra del Fuego (70,000 people). Managed engineering staff and supervised operation of 3 water treatment facilities. Provided technical and management support to the Minister of Public Works. Directed the 20-year Master Plan for the Territory. Developed water & sanitation programs for remote communities.*

EXXON Argentina, Uruguay, and Paraguay 1986-1987

Environment, Health & Safety Engineer: *Managed environmental, health, & safety projects for over US$25 million in petroleum product terminals. Determined environmental improvements required and prepared financial analysis (IRR, NPV, and options) for projects.*

EDUCATION

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT) – Cambridge, MA, USA 2001

Master of Science in Management of Technology. MBA with emphasis on project finance, marketing, technology strategy, risk management, and planning of public & private infrastructure.
Thesis: *Risk Management Framework for Project Finance of Network Utilities in Emerging Markets*

McMASTER UNIVERSITY, Hamilton, Ontario, Canada, September 1989

Master of Engineering in Water & Sanitation

In May 2006, **the International Water Association (IWA) distinguished the paper published from this thesis:** Takács, I., Patry, G.G., and Nolasco, D. (1991). A generalized dynamic model for the

thickening/clarification process. Water Research, Vol. 25, No. 10, pp.1263-1271, **as one of the "*10 most significant groundbreaking papers during the [past] 40 years*" in Water Research**.

UNIVERSIDAD DE BUENOS AIRES, Buenos Aires, Argentina, May 1983

Civil Engineer.

HARVARD UNIVERSITY – HARVARD BUSINESS SCHOOL – Cambridge, MA, 2001

Large Scale Investments: Graduate course on Project Finance and Risk Management.

INTER-AMERICAN DEVELOPMENT BANK and WORLD HEALTH ORGANIZATION, Buenos Aires, Argentina, 1987

Sector Planning for Sanitary Sector Projects. International development graduate program.

WATER RESEARCH CENTRE (WRc), Swindon, England, 1998

Benchmarking Strategies for Regulation of Water & Sanitation Companies. Study sponsored through *Travel Fellowship Award* - WRc and WEF.

AWARDS & DISTINCTIONS

2024: **International Member** of the **United States National Academy of Engineering** (NAE). In recognition of "*distinguished contributions to engineering, to advance wastewater treatment technologies and adapt treatment processes to climate change*." Election to the National Academy of Engineering is one of the highest professional honors bestowed on an engineer. NAE members are elected by their peers (current members of the Academy)".

2022: **Vice-President** of the **International Water Association** for the period 2022-2024.

2017: **Delegate invited by Pope Francis** to participate, with other 70 world water experts, at the Pontificia Academia Scientiarum to discuss *"Human Right to Water"*. With Pope Francis present, the delegates from various creeds, developed and signed the "***Declaration of Rome on the Human Right to Water and Sanitation"***. Casina Pio IV, Vatican City, 23 and 24 February 2017.

2016: **IWA Fellow**: The International Water Association's Fellows program recognizes a unique group of individuals who have contributed in a sustained manner to the advancement of the profession. IWA Fellows are chosen based on their contribution as engineers, educators, managers, regulators, researchers, scientists, or technical leaders. http://www.iwa-network.org/iwa-fellows/

2015: **WEF Fellow** granted by the Water Environment Federation (WEF). The WEF Fellows Recognition Program recognizes distinguished accomplishments and contributions of individuals who have made an impact in the global water environment in a variety of disciplines. http://www.wef.org/Members/page_awards.aspx?id=12884906330

2014: **Visiting Scholar and Fellow** of the Water-Energy Nexus Center (WEX), University of California, Irvine (wex.uci.edu). The UCI WEX Center is an applied research unit working on the water-energy nexus: Field work on resource recovery, energy efficiency, and carbon neutrality at existing full-scale facilities. Teaching two official UCI courses: "*Water-Energy-Carbon Footprinting of Water Utilities*" and "*Applied Dynamic Modeling for Wastewater Treatment Plant Efficiency and Resource Recovery*". October 2014-Present

2008: **Engelbrecht Award** by the Water Environment Federation (www.wef.org) in recognition of international work in water and environment sector.

2006: **International Water Association (IWA) distinguished the paper by** Takács, I., Patry, G.G., and Nolasco, D. (1991). "*A generalized dynamic model for the thickening/clarification process", Water Research*, Vol. 25, No. 10, pp.1263-1271, **as One of the "*10 Most Significant Groundbreaking Papers in the Past 40 years*" in Water Research**.[1]

[1] *Currently, this paper has over 1400 citations, making it one of the most cited papers in water.*

*2001: Lead Process Engineer for the City of Lethbridge WWTP Upgrade to BNR. CH2M HILL received for this project the **Consulting Engineers of Alberta Award of Merit**.*

*1998: **WRc Travel Fellowship Award** given by UK Water Research Centre, WRc. To study benchmarking & regulation of water utilities.*

*1994: Project Manager "Evaluation and Optimization of Toronto's Ashbridges Bay WWTP". Project nominated for the **Governor General of Canada Award** and received the **Canadian Consulting Engineering Award of Merit** from Consulting Engineers of Canada.*

PATENT

Step Bio-P process for biological nutrient removal from residual waters. **U.S. Patent No. 08/174,350**.

PROFESSIONAL ASSOCIATIONS

- **Water Environment Federation**:
  Fellow (2015-present)
  Member of the Board of Directors (2003-2007),
  Member of the House of Delegates (2008-2016),
  Member of Board of Trustees (2005-2008),
  Member of and the Industrial Wastewater Treatment Committee (2002-2016).
  Member of the International Coordination Committee (1993-2016)
  Member of the Global Committee (2014-present) advising the BoT on global strategies.
  Founder and First President of Operations Challenge (Olimpíadas Sanitarias, Argentina 2001-2005)

- **International Water Association (IWA):**
  Vice-President (Sep.2022 – present)
  Fellow (2016-present)
  Member of the Board of Directors (Trustee, 2012-present)
  Chair of the Strategic Council (2016-2021)
  Technical Lead Technologies for Water-Energy Optimization – Water-Climate-Energy Program;
  Member of the Modeling Expert Group of the Americas (MEGA, 2002-present).
  Member of the Editorial Board of IWA's *Journal of Water and Climate Change*.
  http://www.iwaponline.com/jwc/edboard.htm
  Member of the Editorial Board of the *Journal of Water and Sanitation for Development*:
  http://www.iwaponline.com/washdev/edboard.htm
  Member of the Editorial Board of *Revista Ingenieria del Agua*:
  http://polipapers.upv.es/index.php/IA/about/editorialTeam

- **Professional Engineers of Ontario**:
  Registered Professional Engineer, P.Eng. (1992-present)

- **Asociación Interamericana de Ingeniería Sanitaria (AIDIS Argentina):**
  Member of Board of Directors (2003-2008);
  Founder and First President of the Olimpíadas Sanitarias (Operations Challenge, 2001-2005)
  Member of Olimpíadas Sanitarias – Operations Challenge Liaison Committee (2001-present)

ACADEMIC ACTIVITY

Adjunct Professor, School of Environmental Engineering, **Pontificia Universidad Católica Argentina** (2005-2011). In charge of Course "Design of Industrial Wastewater Treatment Plants".

Fellow and Visiting Scholar, Water-Energy Nexus Center (WEX), University of California, Irvine, wex.uci.edu, (2014-present, Irvine)

SEMINARS, COURSES AND PRESENTATIONS GIVEN by Daniel Nolasco (partial list)

- Keynote Speaker, Asociación de Ingeniería Sanitaria Argentina, Rosario, June 2024 – https://www.linkedin.com/posts/danolasco_congresos-aidis-conferencia-magistral-les-activity-7207509741902741504-nGAb?utm_source=share&utm_medium=member_desktop
- Keynote Speaker (with Dr. Diego Rosso), Master Class organized by Asociación de Ingeniería Sanitaria Argentina, Buenos Aires, May 2024 – Also presented at ACODAL (IWA Governing Member) in Cartagena de Indias, May 2024 - https://www.linkedin.com/posts/danolasco_congreso-agua-saneamiento-activity-7204839916663402496-5Frk?utm_source=share&utm_medium=member_desktop
- Speaker at Brazil Water Week, June 2024 - https://www.linkedin.com/posts/abes-dn_brazil-water-week-2024-semana-da-%C3%A1gua-ugcPost-7201678281085988864-_TDN?utm_source=share&utm_medium=member_desktop
- Keynote Speaker, WEF /IWA Joint Conference on Innovations in Process Engineering. Portland, Oregon, USA, June 2023. https://www.linkedin.com/posts/danolasco_water-mentoring-youngprofessionals-activity-7072274338598559744-SLVj?utm_source=share&utm_medium=member_desktop
- *Keynote Speaker*, Annual Convention of the National Association of Water Utilities (ANEAS, Monterrey, Mexico) - https://www.linkedin.com/posts/danolasco_aneas-mexico-waterutilities-activity-7134514195227717634-YWXR?utm_source=share&utm_medium=member_desktop
- Keynote Speaker, Young Water Professionals IWA-LAC anual meeting, Buenos Aires, Nov.2013 - https://www.linkedin.com/posts/danolasco_economaedacircular-ivsimposioderesiduos-activity-7125918624426450944-_0ki?utm_source=share&utm_medium=member_desktop
- *Keynote Speaker*, Water Environment Federation (WEF) / International Water Association (IWA) Joint Conference on Innovations in Process Engineering. Portland, Oregon, USA, June 2023.
- *Guest Speaker, "Descarbonización y Economía Circular en Plantas de Tratamiento de Aguas Residuales".* Bi-Annual Congress of the Asociación Interamericana de Ingeniería Sanitaria (AIDIS). Punta Cana, Dominican Republic, Nov. 14th, 2022.
- *Guest Speaker (with Dr. Diego Rosso), "Aplicación de Economía Circular en Plantas de Tratamiento de Aguas Residuales - Caso de SABESP, São Paulo, Brasil".* Bi-Annual Congress of the Asociación Interamericana de Ingeniería Sanitaria (AIDIS). Punta Cana, Dominican Republic, Nov. 15th, 2022.
- *Guest Speaker, "Process Audits: tools to implement Circular Economy in Wastewater Treatment Plants (Auditorías de processo: ferramentas para implementar a Economía Circular nas ETEs).* Brazil Water Week 2022, May 25th, 2022.
- *Guest Speaker, "Wastewater Treatment Sustaintability Panel: from theory to practice (Painel Sustentabilidade no tratamento de esgoto: de teoria para a prática)".* 31º Congreso da Brasileiro de Engenharia Sanitaria e Ambiental (ABES, Brazil), October 19, 2021.
- *Speaker, "Inteligent Cities and the Challenges to Implement Circular BioEconomy (Painel Cidades inteligentes e os desafios para implementação da bioeconomia circular e sustentavel)".* 31º Congreso da Brasileiro de Engenharia Sanitaria e Ambiental (ABES, Brazil), October 19, 2021.
- *Speaker, "Webinar: The New Coronavirus and Wastewater Treatment Systems (O Novo Coronavirus e os Sistemas de Esgotamento Sanitario)".* Câmara Temática da ABES de Tratamento de Esgotos, Brazil, 2020.
- *Moderator and Speaker, "Wastewater to Resources – Circular approaches to sustainability of utilities".* Presented at Brazil Water Week – São Paulo, Brazil, October 2020. (350 attendees)
- *Speaker, "Challenges and advantages of implementing Circular Economy approaches to wastewater treatment plants in Latin America".* Webinar organized by ABES (Associação Brasileira de

Engenharia Sanitária e Ambiental), the International Water Association, and the World Bank. October 2020 (over 1100 attendees).

- *Speaker, "Circular Economy – Maximizing the Use of Existing Wastewater Treatment Plants*". Webinar organized by ACODAL (Asociación Colombiana de Ingeniería Sanitaria y Ambiental). Septiembre 2020 (900 attendees).
- *Moderator* "Innovation: A Continuous Transformation Process in Support of the Sustainable Development Objectives*".* Latinosan 2019, San José de Costa Rica.
- *Speaker "From Waste to Resource: Shifting paradigms for smarter wastewater interventions in Latin America and the Caribbean*". Seminar organized by World Bank and Development Bank of Latin America (CAF), Buenos Aires, Argentina, 2018.
- *Chair and Speaker, "Energy Savings and Co-Generation in Wastewater Treatment Plants" –* Workshop organized by the International Water Association (IWA) and the Water Environment Federation (WEF)", 60th Congress ACODAL (Asociación Colombiana de Ingeniería Sanitaria y Ambiental), Cartagena de Indias, Colombia, May 2017.
- *Main Speaker*, "*Workshop on Aeration, Mixing, and Energy*". Presented at the Asociación Nacional de Empresas de Agua y Saneamiento (ANEAS) Annual Convention – Chihuahua, Mexico, November 2015.
- *Main Speaker*, "*Workshop on Aeration, Mixing, and Energy*". Presented at the Asociación Nacional de Empresas de Agua y Saneamiento (ANEAS) Annual Convention – Chihuahua, Mexico, November 2015.
- *Moderator, "Water Environment Federation / Water Environment Research Foundation – Workshop on Aeration, Mixing, and Energy" –* Water Environment Federation Annual Conference and Exhibition (WEFTEC 2015), Chicago, IL, September 26-30, 2015.
- *Speaker, "Energy and Carbon Footprint Prediction and Reduction at Wastewater Treatment Plants" Presented at* 1st Workshop on Energy Management for Water & Sanitation Utilities in Latin America. Event sponsored by World Bank, ESMAP, WPP and the Water Environment Research Foundation (WERF) at the *58th International Congress on Water, Sanitation, Environment, and Renewable Energy*, organized by Asociación Colombiana de Ingeniería Sanitaria y Ambiental (ACODAL), Santa Marta, Colombia, September 10th and 11th, 2015.
- *Speaker*, "*Wastewater Aeration: Performance and Energy*" Workshop at Water Environment Federation's Water & Energy 2015 Conference June 8-10, 2015 | Washington, DC.
- *Speaker*, "*World Bank Assessment Tool for Preliminary Assessment of Wastewater to Energy Options*". Presented at the GMI-Environmental Protection Agency Workshop at Water Environment Federation's Water & Energy 2015 Conference June 8-10, 2015 | Washington, DC.
- *Keynote Speaker*, "Water-Energy-Carbon Nexus in Water Reclamation, Reuse, and Wastewater Treatment" (with Dr. Diego Rosso), presented at the Plenary Session of IWA's ECO STP - Technical, Environmental, & Economic Challenges Seminar. Organized by the International Water Association, the University of Verona (Universita degli studi di Verona) and Polytechnic of Milan (Politecnico Milano). Verona, Italy, 23-25 June 2014.
- "Aeration and Energy Optimization" (with Dr. Diego Rosso), Workshop presented at IWA's ECO STP at Technical, Environmental, & Economic Challenges Seminar, organized by the International Water Association, the University of Verona (Universita degli studi di Verona) and Polytechnic of Milan (Politecnico Milano). Verona, Italy, 23-25 June 2014.
- *Keynote Speaker*, "Water Energy Climate current challenges, approaches, and vision". Presented at the IWA Water, Energy and Climate Conference, organized by the International Water Association (IWA), the Asociación Nacional de Empresas de Agua y Saneamiento (ANEAS) and the National Commission for Water (CONAGUA) - Mexico City, May 21st-23rd – 2014.

- *Keynote Speaker*, "Dynamic modeling from a practitioner stand-point – Where do we come from and where could we go". Presented at WWTMod 2014, 4th IWA/WEF Wastewater Treatment Modelling Seminar, organized by International Water Association and the Water Environment Federation; Spa, Belgium, March 30 – April 2nd , 2014
- *Guest Speaker*, "Water and Energy" at Japan Water Works Association. Seminar organized by International Water Association, Japan Water Works Association, Japan Society on Water Environment, Japan Sewage Works Association , Federation of Japan Water Industries, Japan Water Research Center, JICA (Japan International Cooperation Agency), Japan Institute of Wastewater Engineering and Technology (JIWET), Japan Sewage Treatment Plant Constructors Association, Association of Water and Sewage Works Consultant. Tokyo, April 8th, 2014.
- *Guest Speaker*, "Can Energy Neutrality be Achieved at Water Utilities" at IWA Utility Leaders Forum. Seminar organized by the International Water Association and Mexico's Association of Water Utilities (ANEAS). November 6th, 2013, Acapulco, Mexico.
- *Guest Speaker*, Workshop on "Designing and Implementing Successful Utility Reform in Water Supply and Sanitation", organized by the World Bank in collaboration with the Water Partnership Program, September 9 to 12, 2013, Cantabria (Spain).
- *Chair and Moderator*, International Water Association Sustainable Urban Development and Climate Change Adaptation Seminar. Held at ACODAL (Asociación Colombiana de Ingeniería Sanitaria y Ambiental) 56vo Internacional Congress,- Santa Marta, Colombia, July 2013.
- "*Determination of Real Treatment Capacity and Operational Improvement at Wastewater Treatment Plants using Field Tests*", presented at Water Environment Federation Seminar, ACODAL (Asociación Colombiana de Ingeniería Sanitaria y Ambiental) 56th Internacional Conference - Santa Marta, Colombia, July 2013.
- "*Introduction to Wastewater Treatment Plant Simulation – Case Studies*", presented at Water Environment Federation Seminar, ACODAL (Asociación Colombiana de Ingeniería Sanitaria y Ambiental) 56th Internacional Conference - Santa Marta, Colombia, July 2013.
- National Association of Water and Sanitation Companies in Mexico (ANEAS): "*Optimization of Design and Operation of Wastewater Treatment Plants using Dynamic Simulation Models*", one-day course at XXVI Annual Conference of ANEAS, Querétaro, México, October 2012.
- Guest Speaker at V Latin American Carbon Forum. Presentation "Development of a new CDM Methodology for Plastics Recycling". Santo Domingo, Dominican Republic, October 2010.
- *Guest Speaker* at 2010 IWA World Water Congress. Presentation "Climate Change Mitigation in Water Utilities: The current state of play - A snapshot of current targets" by D. A. Nolasco, A. Lovell, P. Bloomfield, S. A. Deslauriers, J. P. van der Hoek, G. Macdonald, J. van den Broeck, and E. Rose. Mitigation Working Group - IWA Climate Change Specialty Group. Montreal, Canada, September 2009.
- Guest Speaker at 2010 IWA World Water Congress. Presentation "Argentina – Country Report", presented at Latin American Water Forum" Montreal, Canada, September 2010.
- *Guest Speaker* at Workshop for Media Reporters – Urban Water Resources Adaptation to Climate Change. UN-Water Decade Programme on Capacity Development (UNW-DPC), United Nations Human Settlements Programme (UN-Habitat), and UNESCO – International Hydrology Program (PHI). Montevideo, Uruguay, 10-11 December 2009.
- *Member* of the Organizing Committee of "Water & Energy – Climate change mitigation in the water sector & potential synergies with the energy sector" Conference, Copenhagen, 29-31 October 2009.

- *Chairman* of Session "*Efficient Operation of Water Systems"* - International Water Association (IWA) Conference on "*Water & Energy*", Copenhagen, 29-31 October 2009.

- *Organizer and Speaker – Membrane Bioreactor (MBR) Life-Cycle Workshop*. Water Environment Federation Annual Conference and Exhibition (WEFTEC), Orlando, Florida, USA (October 2009).

- *Guest Speaker* at "*4º Simposio y Exhibición Internacional Sobre Producción Más Limpia* (Cleaner Production International Symposium and Exhibition) - "*Aguas Residuales y Manejo de Desechos*" (Wastewater and Waste Management), Panama City, Panama, March 26 & 27, 2009.

- *Co-Organizer and Speaker* at Workshop on Modeling of Wastewater Treatment Plants. Water Environment Federation Annual Conference and Exhibition (WEFTEC), Chicago, Illinois, USA (October 2008).

- *Chair* Seminar on "Wastewater Treatment Plant Design and Operation Using Simulation Software" WOP-LAC Kick-Off Meeting in Santiago de Chile, AIDIS International Bi-Annual Conference, 12-15 October 2008.
- *Chair* Wastewater Treatment Plant Design and O&M Course. WOP-LAC. Caribbean Water & Wastewater Association Conference, Montego Bay, Jamaica, 5-6 October 2008.
- Co-Chair of Water Environment Federation Specialty Conference: "*Sustainability 2008: Green Practices for the Water Environment*", National Harbor, Maryland. June 22 - 25, 2008.
- Member of the Organizing Committee of "*Risks of climate change to water management and utilities – from impact analysis to adaptation*" International Water Association (IWA) Seminar, 5 October 2007, Amsterdam, the Netherlands
- Chair of *International Session on Green House Gas Emission Reduction Opportunities in Water and Wastewater Treatment Facilities*. WEFTEC - Water Environment Federation Annual Conference and Exhibition, USA 2003 through 2013.
- National Association of Water and Sanitation Companies in Mexico (ANEAS): "*Use of benchmarking strategies for efficient management of water utilities*", XX Annual Conference of ANEAS, Monterrey, México, September 2006.
- Aguas Andinas, Santiago de Chile: *Mathematical Modelling of Wastewater Treatment Plants*. December 2005.
- Superintendencia de Servicios Sanitarios (Chile's Regulator of Water Utilities). *Mathematical Modelling for Auditing and Control of Wastewater Treatment Plants.* November 2005
- Universidade Federal do Rio de Janeiro, Brasil – *Mathematical Modelling of Wastewater Treatment Processes*. September 2005.
- Aguas Argentinas – *Course of Environmental and Sanitary Engineering for High Management*. Organized by Sanitary Engineering School of the University of Buenos Aires, 2004.
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