Name: Mashor Housh **Date:** April 24, 2022

CURRICULUM VITAE

1. Personal Details

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2. Higher Education

a. Undergraduate and Graduate Studies

Period of Study	Name of Institution and Department	Degree
2002-2007	Civil and Environmental Engineering, Technion	B.Sc., Cum Laude
2007-2011	Civil and Environmental Engineering, Technion	Ph.D. (direct Ph.D. program)

b. Post-Doctoral Studies

Period of Study	Name of Institution and Department/Lab	Name of Host
2011-2013	CEE, University of Illinois at Urbana-Champaign	Prof. Ximing Cai

3. Academic Ranks and Tenure in Institutes of Higher Education

Years	Name of Institution and Department	Rank/Position
2013-2017	University of Haifa, Department of natural resources and environmental management	Lecturer
2018-2022	University of Haifa, Department of natural resources and environmental management	Senior Lecturer (with tenure)
2022-Present	University of Haifa, Department of natural	Associate Professor

	resources and environmental management	

4. Offices in Academic Administration

Years	Name of Institution and Department	Role
2017-2021	Global Green MBA, University of Haifa	Head
2021-Present	Steering Committee for Accessibility of Minorities	Member

5. Scholarly Positions and Activities outside the University

Years	Editorial Positions in Scientific Journals
*2021-Present	Associate Editor: *The Journal of Water Resources Planning &Management*, IF 2019= 2.406, R 2019= Water Resources: 36/94 (Q2). Noteworthy that it is a leading journal in the field of water resources management, it was 13/91(Q1) in 2018 and before it was ranked in top 10 (see publications list).
*2021-Present	Member of Editorial Board: *Water*, IF 2019= 2.544, R 2019= Water Resources: 31/94 (Q2)
*2021-Present	Member of Editorial Board: *Sustainability*, IF 2019= 2.592, R 2019= Environmental Studies: 53/123 (Q2)
*2021-Present	Member of Editorial Board: *Urban Water*, IF 2019= 1.888, R 2019= Water Resources: 56/94 (Q3)
*2021-Present	Member of Editorial Board: *Civil Engineering and Environmental Systems*, IF 2019= 1.04, R 2019= Civil Engineering: 104/134 (Q4)
*2021-Present	Section Board Member: *Water*, IF 2019= 2.544, R 2019= Water Resources: 31/94 (Q2)

Years	Memberships in Academic Professional Associations
2011-Present	American Society of Civil Engineers (ASCE)
2011-Present	The Operations Research Society of Israel (ORSIS).
2011-Present	Environmental and Water Research Institute (EWRI).
2012-Present	Standing Committee on Environmental and Water Resources systems, ASCE
2014-Present	The Institute for Operations Research and the Management Sciences (INFORMS).
2014-Present	Grand Water Research Institute (GWRI).
2014-Present	Standing Committee on Water Distribution Systems Analysis, ASCE
2014-Present	Task Committee on "Using Hydroclimatic Prediction for Water Systems Operations and Management", EWRI-ASCE
2017-Present	Member of COST Action (EU), CA16209: Natural Flood Retention on Private Land. http://www.land4flood.eu/
*2021-Present	Member of the Grant Evaluation Committee in the Israeli Smart Transportation Research Center (ISTRC)
*2021-Present	Technical committee member for the EIGHTH INTERNATIONAL ENGINEERING SYSTEMS SYMPOSIUM, Charlottesville, Virginia, USA.

Years	Reviewing for Refereed Journals
2011-Present	*The Journal of Water Resources Planning &Management*, IF 2019= 2.406, R 2019= Engineering, Civil: 44/134 (Q2)
2012-Present	*Water Resources Research*, IF 2019= 4.309, R 2019= Limnology: 2/22 (Q1)
2012-Present	*Water Research*, IF 2019= 9.130, R 2019= Water Resources: 1/94 (Q1)
2012-Present	*Journal of Environmental Modeling and Software*, IF 2019= 4.807, R 2019= Computer Science, Interdisciplinary Applications: 14/109 (Q1)
2012-Present	*Advances in Water Resources*, IF 2019= 4.016, R 2019= Water Resources: 11/94 (Q1)
2014-Present	*Urban Water Journal*, IF 2019= 1.888, R 2019= Water Resources: 56/94 (Q3)
2015-Present	*Journal of Hydrology*, IF 2019= 4.5, R 2019= Water Resources: 6/94 (Q1)
*2020-Present	*Water*, IF 2019= 2.544, R 2019= Water Resources: 31/94 (Q2)
*2020-Present	*Sustainability*, IF 2019= 2.592, R 2019= Environmental Studies: 53/123 (Q2)

Years	Non-Academic Professional Activities
2014-Present	Consulter for the Israeli Water Authority: Development and implementation of a suite of models for optimal operation of the National Water System
*2019-Present	Board member of Albyader Foundation for Higher Education
*2019-Present	Member of the Advisory Expert Committee in Albyader Foundation for Higher Education
*2019-Present	Board member of Almaram Association for Science Education

6. Active Participation in Scholarly Conferences

a1. International Conferences - Held Abroad

Notes: presenter is underlined; #students under my supervision

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
Dec. 3-7, 2009	The American Geophysical Union (AGU) Annual Meeting	San Francisco, California, USA	Management of the Israeli National Water System under Uncertainty	Presentation With Shamir U. Ostfeld A., Zaide M., (2009),
May 20-26, 2011	World Environmental and Water Resources Congress	Palm Springs, California, USA.	1. Optimal management of a water supply system under uncertainty: stochastic approach 2. Optimal multi-year management of a water supply system under uncertainty: Robust counterpart approach 3. Search method for box-constrained optimization 4. Limited multi-stage programming: a case study for multiyear management of water supply system 5. Optimal management of a water supply system under uncertainty: the Info-Gap approach	Presentation 1. Housh M., Ostfeld A., and Shamir U. 2. Housh M., Ostfeld A., and Shamir U. 3. Housh M., Ostfeld A., and Shamir U. 4. Housh M., Ostfeld A., and Shamir U. 5. Housh M., Ostfeld A., and Shamir U.

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
			6. Housh M., Ostfeld A., and Shamir U., (2011), Multi-year optimal management of quantities and salinities in water supply systems	6. Housh M., Ostfeld A., and Shamir U.
May 20-24, 2012	World Environmental and Water Resources Congress	Albuquerque, New Mexico, USA.	Optimal multi-year management of a regional water supply system under uncertainty: the affine adjustable robust counterpart approach	Presentation Housh M., Ostfeld A., and Shamir, U.
Sep. 24-27, 2012	14th Water Distribution Systems Analysis Conference	Adelaide, South Australia	1. Contamination event detection utilizing Genetic Algorithm 2. Non-probabilistic approach for the optimal design of water distribution systems under demand uncertainty 3. Comparison between Fixed thresholds and Genetic algorithm methods for water quality event detection	Presentation 1. Arad J., Housh M., Perelman L., and Ostfeld A., 2. Perelman L., Housh M., Oliker N., and Ostfeld A. 3. Arad J., Housh M., Perelman L., and Ostfeld A.
Oct. 14-17, 2012	The Institute of Operations Research and Management Science (INFORMS) Annual Meeting	Phoenix, Arizona, USA.	Smoothing Algorithm to Solve a Complex Model for Regional Biofuel Development	Presentation Housh M., and Cai X.
Dec. 3-7, 2012	The American Geophysical Union (AGU) Annual Meeting	San Francisco, California, USA	1. Integrated systems optimization model for biofuel development: The influence of environmental constraints	Presentation 1. Housh M., Ng T.L., and Cai X.

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
			2. Water for Food, Energy, and the Environment: Assessing Streamflow Impacts of Increasing Cellulosic Biofuel Crop Production in the Corn Belt 3. Strategic Planning for Drought Mitigation under Climate Change	2. Yaeger M., Housh M., Ng T.L., Cai X., and Sivapalan M. 3. Cai X., Zeng R., Valocchi A., Song J., and Housh M.,
April 7-12, 2013	The European Geophysical Union (EGU) General Assembly	Vienna, Austria	Catchments Under Change: Assessing Impacts and Feedbacks from New Biomass Crops in the Agricultural Midwestern USA	Presentation Yaeger M., Housh M., Ng T.L., Cai X., and Sivapalan M.
May 19-23, 2013	World Environmental and Water Resources Congress	Cincinnati, Ohio, USA.	Explicit Demand Uncertainty Formulation for Robust Design of Water Distribution Systems	Presentation Perelman L., Housh M., and Ostfeld A.,
Dec. 3-7, 2013	The American Geophysical Union (AGU) Annual Meeting	San Francisco, California, USA	Understanding and Quantifying Hydrological Alteration Caused by Biofuels-Related Land Use Change in the Midwestern US	Poster Yaeger M., Housh M., Noël P., Cai X., and Sivapalan M.,
Apr. 23-26, 2014	Dooge Nash International Symposium	Dublin, Ireland	Management of Water Systems under Hydrological Uncertainty	Presentation Housh M., Ostfeld A., and Shamir U.
May 21-23, 2014	International Symposium on Communications, Control, and Signal Processing	Athens, Greece	Distributed Estimation and Control of Water Distribution Networks by Logical consensus	Presentation Fagiolini A., Housh M., Ostfeld, A., and Bicchi, A.
June 1-5, 2014	World Environmental and Water Resources Congress	Portland, Oregon, USA.	1. Non-probabilistic approach for flood control system design	Presentation 1. Housh M., Yazidi J.

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
			2. SoS – Biofuel: System of Systems Model for Biofuel Development Analysis	2. Housh M., Cai X.
May 17-21, 2015	World Environmental and Water Resources Congress	Austin, Texas, USA.	Utilizing discrete choice models for fusing alarms from multiple water quality indicators	Presentation Housh M., and Ostfeld A.
Apr. 17-22, 2016	European Geophysical Union (EGU) General Assembly	Vienna, Austria	An integrated modeling framework for real-time irrigation scheduling: the benefit of spectroscopy and weather forecasts	Presentation Polinova M., Brook A., Housh M.
May 22-26, 2016	World Environmental and Water Resources Congress	Palm Beach, Florida, USA.	1. Simulating Water Distribution Systems using Differenial Algebric Equations 2. The Effect of Water Demand Uncertainty on Management of Regional Water Systems	Poster 1. Housh M., Ohar, Z. 2. Avni, N., Fishbain, B., Housh, M., Shamir, U.
July 25, 2016	WSEN 2016: World Student Environmental Network	Keele University, UK	1. Optimal regional management of reclaimed water system with different qualities 2. Developing a negotiation support system for environmental-Economics conflicts resolution	Presentation 1. #Egbariah M., Housh M., Shamir U., 2. #Shapira N., Housh M.,
May 22-26, 2017	World Environmental and Water Resources Congress	Sacramento, California, USA.	1. Model based approach for Cyber-Physical Attacks Detection in Water Distribution Systems	Presentation 1. Housh M., Ohar Z.,

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
			2. Regional Water Supply System Management Under Demand Uncertainty: Using Aggregation Rules to Derive an Operation Policy from Implicit Stochastic Programming Models 3. Models for management of Israel's national and regional water systems	2. Avni N., Fishbain B., Housh M., Shamir U. 3. Housh M., Kronaveter L., Shamir U., Achipaz Z., Hadad A.
*June 2-7, 2018	World Environmental and Water Resources Congress	Minneapolis, Minnesota, USA	1. Optimal dynamic pumps triggers for cost saving and robust operation in WDSs 2. Utilizing probabilistic weather forecasting for optimal irrigation scheduling 3. Meeting Environmental Objectives in Biofuel Development: A Hierarchical Decision Modeling Framework 4. Integrating multi-time scale forecasts in farmers' decision making	Presentation 1. Housh M., #Salomons E. 2. #Jamal A., Linker R., Housh M. 3. Shafiee-Jood M., Housh M., Cai X. 4. Shafiee-Jood M., Housh M., Cai X.,

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
*April 24-26, 2019	4th Open Science Meeting of the Global Land Programme	Bern, Switzerland	The decision-maker matters: An operational Multi-Objective Game Theoretic Model for environmental-economic conflict resolution	Presentation Broitman D., #Shapira N., Housh M.
*May 19-23, 2019	World Environmental and Water Resources Congress	Pittsburgh, Pennsylvania, USA	A practical optimization scheme for real time operation of water distribution systems	Presentation #Salomons E., Housh M.
*Aug 27-30, 2019	The 59th Congress of European Regional Science Association (ERSA)	Lyon, France	Decision-makers' characteristics matter: An operational model for environmental-economic conflict resolution	Presentation Broitman D., Housh M., and #Shapira N.,
*Sep 1-4, 2019	17th International Computing & Control for the Water Industry Conference	University of Exeter, UK	1. WDSLib 1.1: A Demand- and Pressure-Dependent Simulation Testbed for Water Distribution Systems 2. Distributed Micro-Storage Tanks for Pressure Management in Water Distribution System	Presentation 1. Qiu M., Housh M., Ostfeld A., 2. Qiu M., Housh M., Ostfeld A.,
*May 4-8, 2020	EGU General Assembly Conference	Online	Water Energy Nexus as Manifested in Desalination based Water Sector: the case of Israel	Presentation #Salomons E., Housh M.

a2. **International Conferences - Held in Israel**

None

a3. Local Conferences

Date	Name of Conference	Place of Conference	Subject of Lecture	Role
June 1, 2008	Annual Operations Research Society of Israel (ORSIS)	Jerusalem, Israel	Optimal multi-year management of a water supply system under uncertainty	Presentation Housh M., Ostfeld A., and Shamir U.
June 3, 2011	Annual Operations Research Society of Israel (ORSIS)	Akko, Israel	Robust Optimization for optimal management of a water supply system under uncertainty	Presentation Housh M., Ostfeld A., and Shamir U.
Dec. 21, 2014	The national graduate students conference on water research	Haifa, Israel	Optimal regional management of reclaimed water system with different qualities	Presentation Egbariah M., Housh M., Shamir U.
Feb. 24, 2015	Natural Resources and Environmental Research Center: Workshop on Securing Food Using Non-Conventional Water Sources	Haifa, Israel	A model for optimal desalination purchase in the Israeli National Water Supply System	Presentation Housh M., Kronaveter L., Shamir U., Shoval R., Hadad A., Achipaz Z.
Apr. 5, 2016	Israeli Association of Water Resources Conference	Haspin, Israel	Optimal Management for the freshwater supply system: natural and desalinated water	Presentation Housh M., Kronaveter L., Shamir U., Shoval R., Hadad A., Achipaz Z.
June 21-23, 2016	Israel Society of Ecology and Environmental Sciences	Tel-Aviv, Israel	Space-time dynamic model for analyzing lake Kinneret fishery	Poster (**first place poster award**) #Silver T., Housh M., Gal G.
Dec. 25, 2016	Israeli Geographical Association	Tel-Aviv, Israel	Benefits of common use UAV and portable spectrometer in agriculture	Presentation Polinova M., Brook A., Housh M.
Dec. 28, 2016	The national graduate students conference on water research	Haifa, Israel	Regional Water Supply System management under demand uncertainty	Poster Avni, N., Fishbain, B., Housh, M., Shamir, U.

Date	Name of Conference	Place of Conference	Subject of Lecture	Role
*Dec. 6, 2018	The national graduate students conference on water research	Haifa, Israel	Detecting Cyber-Physical Attacks in Water Distribution Systems: A Data Driven Approach	Poster #Kadosh N., Frid A., Housh M.
*March 27, 2019	Israeli Association of Water Resources conference	Hatsva, Israel	DSS for the planning and management of Kinneret watershed's water system.	Presentation Housh M., Kronaveter L., Shamir U., , Hadad A., Achipaz Z.
*May 22, 2019	Israeli Association of Water	Tel Aviv, Israel	One Class Classifiers for Detecting Cyber-Physical Attacks in Water Distribution Systems	Presentation #Kadosh N., Frid A., Housh M.
*Feb 4, 2020	Regional Science Association International	Hertzelya, Israel	Characterization of Localities with a High Likelihood of Illicit Connections between Runoff and Sewage Systems	Presentation #Levin R., Housh M., Portnov B.
*March 25, 2020	Israeli Association of Water Resources conference	Ma'le Hmisha, Israel	Using water quality models for streams reservation and reclamation.	Presentation #Bornstein Y., Housh M.

b. Organization of Conferences or Sessions

Year	Name of Conference	Place of Conference	Subject of Conference	Role
2015	World Environmental and Water Resources Congress	Florida, USA	Chair for water resources management track	[1]Track Chair (20 sessions)
2016	World Environmental and Water Resources Congress	California, USA	Chair for water resources management track	[1]Track Chair (20 sessions)

[1] As a track chair, I was responsible for organizing a set of sessions (e.g. 20 sessions) in specific topic within a conference. I organized the planning and management track in the annual congress of the environmental water research institute.

Year	Name of Conference	Place of Conference	Subject of Conference	Role
2016	World Environmental and Water Resources Congress	Florida, USA	Session: Using Hydro-climatic Predictions for Water Resources Systems Planning and Management II	Moderator
2017	World Environmental and Water Resources Congress	California, USA	Session: Water Resources Management under Uncertainty	Moderator
2017	World Environmental and Water Resources Congress	Minnesota, USA	Chair for water resources management track	[1]Track Chair (20 sessions)
*2018	World Environmental and Water Resources Congress	Minnesota, USA	Session: Systems Thinking and Modeling Complex Adaptive Systems	Moderator
*2018	World Environmental and Water Resources Congress	Pennsylvania, USA	Chair for water resources management track	[1]Track Chair (20 sessions)
*2019	World Environmental and Water Resources Congress	Pennsylvania, USA	Session 1: Systems Analysis of the Urban Water Sector Session 2: Systems Thinking and Modeling Complex Adaptive Systems	Moderator (2 sessions)
*2019	World Environmental and Water Resources Congress	Nevada, USA	Chair for water resources management track	[1]Track Chair (20 sessions)
*2019	Stakeholders workshop: cyber-attacks in the water sector	Technion, Haifa	Initiator and Organizer	Stakeholders workshop for water- and cyber-aspects. Invited stakeholders ~50 participants.
*2020	World Environmental and Water Resources Congress	Online	Chair for water resources management track	[1]Track Chair (20 sessions)

Year	Name of Conference	Place of Conference	Subject of Conference	Role
*2021	World Environmental and Water Resources Congress	Online	Chair for water resources management track	[1]Track Chair (20 sessions)
*2022	World Environmental and Water Resources Congress	Georgia, USA	Chair for water resources management track	[1]Track Chair (20 sessions)

7. Invited Lectures (Others than in Scholarly Conferences)

Year	Name of Forum	Place of Lecture	Presentation
*2022	The center for agricultural economics research, Hebrew University: A Memorial Conference Honoring the Legacy of Prof. Yoav Kislev	Online	Optimal management of the Kinneret watershed

8. Colloquium Talks

Year	Name of Forum	Place of Lecture	Presentation
2014	Department of Geography and Environmental Studies,	University of Haifa, Israel	Optimal management of natural resources and environmental systems
2014	Grand Water Research Institute (GWRI)	Technion, Israel	Management of interdependent infrastructure systems
*2019	Short course for international students	International School, Haifa University	Smart Infrastructure Systems (~8 hours course)

9. **Research Grants**

a. **Grants Awarded**

Note: **V**= Vatat Fund (council of higher education); **C**= Other Competitive Fund

Role in Research	**Other Researchers (Name & Role)**	**Title**	**Funded by**	**Amount**	**Years**	**Relevant Publications**
PI	Co-PI: Anna Brook, Andrea Ghermandi, David Katz: *UoH* , Avi Shaviv, *Technion*	An integrated modeling framework for real-time irrigation scheduling: the benefit of imaging spectroscopy and weather forecasts	Water Authority (C)	366,390 NIS	2014-2017	D25, D29
PI		Development of multi-sensor system for hydraulic and contamination events detection	USAID (C)	12,190 $	2015-2016	D20, D21
PI		Optimal management of multisource water supply systems under uncertainty: Novel Approaches and Methods	Water Authority (C)	359,950 NIS	2017-2020	D28, D30, D32, D34
*PI		Disaster Resilient Urban Water Systems: measures and tools	Water Authority (C)	353,000 NIS	2019-2022	D35, D36, D39
*PI	Co-PI: Uri Shamir, *Technion*	Advanced methods for online control of water distribution systems	Water Authority (C)	320,000 NIS	2019-2022	D38, D41

Role in Research	Other Researchers (Name & Role)	Title	Funded by	Amount	Years	Relevant Publications
*PI	Industrial Partner: ProCom	Transforming digital content to actionable content: a practical approach for the water sector	MOST-BMBF (V)	145,000 Euro	2020-2023[2]	NA[2]
*PI	Co-PI: Jack Haddad, *Technion*	Cyberattacks detection in water distribution systems based on stochastic hydraulic model	Technion Hiroshi Fujiwara Cyber Security Research Center (C)	415,000 NIS	2020-2022	

b. Internal Funds

Note: **V**= Vatat Fund (council of higher education); **C**= Other Competitive Fund

Role in Research	Other Researchers (Name & Role)	Title	Funded by	Amount	Years	Relevant Publications
PI	Co-PI: Ofira Ayalon, *UoH*	Cyber-Security of Water Distribution Systems: Attacks' Detection Algorithms	The center of cyber law and policy (C)	40,000 NIS	2017-2019	D26, D27
*PI	Co-PI: Ofira Ayalon, *UoH*	Policy Implications of Cyber-Security in Water Distribution Systems	The center of cyber law and policy (C)	40,000 NIS	2019	D40

[2] Due to the impact of Covid-19 pandemic on the business of our industrial partner, they withdrawal from the project after it was awarded, as a result the project was cancelled. The awarding letter could be provided upon request.

Role in Research	Other Researchers (Name & Role)	Title	Funded by	Amount	Years	Relevant Publications
*PI		Hydraulic-based modeling for cyber-attacks detection in water distribution systems	The center of cyber law and policy (C)	100,000 NIS	2020	D37
*PI	Co-PIs: Alan Hartman, Bracha Nir: *UoH*, Meira Levy, *Shankar*	Climate Change Readiness in the Israeli Water Sector	Rector's call for SDG related research	15,000 NIS	2022	

c. <u>Submission of Research Proposals – Pending</u>

Role in Research	**Other Researchers** **(Name & Role)**	**Title**	**Funded by** (**C**= Competitive Fund) (**V**= Vatat Fund)	**Years**
*PI		Managing water distribution systems under combination of long-term and spot market power contracts	ISF (V)	2023-2027
*PI	Co-PIs: Alan Hartman, Bracha Nir, Irit Hadar: *UoH*, Meira Levy, *Shankar*	Adapting and Adopting Technology for the Israeli Water System: Avoiding the Abyss	MOST (V)	2023-2027
*PI		Transforming digital content to actionable content: a practical approach for the water sector	MOST (V)	2023-2027

d. Submission of Research Proposals – Not Funded

Role in Research	**Other Researchers** (Name & Role)	**Title**	**Funded by** (**C**= Competitive Fund) (**V**= Vatat Fund)	**Years**
PI		Multi-station analysis for detecting water contamination in water supply systems	Water Authority (C)	2014-2017
Co-PI	PI: Andrea Ghermandi, *UoH*	An agent-based hydro-economic modeling approach for sustainable water management through NF desalination in the Arava Valley	Ministry of Agriculture (C)	2014-2017
PI		SWAT in the Cloud: an Automatic Calibration Framework for the Soil, Water Assessment Tool (SWAT) on Amazon Elastic Compute Cloud	GIF (V)	2014-2017
PI		Optimization of regional water supply systems under uncertainty	ISF (V) **Judged as very good**	2017-2021
PI	Co-PIs: Georgakakos Konstantine Biggs Trent Rimmer Alon, Reichmann Oren	The Value of Seasonal Hydrologic Forecasts for the Management of Lake Kinneret	BSF (V)	2017-2021
*PI	Co-PI: Lina Sela, *U. Texas, Austin*	Multi-criteria scalable operation of regional water systems with nonconventional water resources	BSF (V) **Judged as very good**	2022-2026

10. **Scholarships, Awards and Prizes**

- Excellence in teaching award (Technion)……..2011
- Outstanding Reviewer for the Journal of Water Resources P&M….2012
- Maof scholarship for young academic researchers…….....2013-2016
- Excellence in Refereeing award for Water Resources Research……2015
- First place award in the Battle of Cyber-Attacks Detection Algorithms organized by EWRI-ASCE…….....2017
- *Outstanding Reviewer for the Journal of Water Resources P&M….2018

11. **Teaching**

a. **Courses Taught in Recent Years**

Years	**Name of Course**	**Type of Course**	**Level**	**Number of Students**
2007-2011	Introduction to Numerical Methods (TA)	Introduction Course (Mandatory)	B.Sc.	20
2007-2011	Water Waves Mechanics (TA)	Lecture	M.Sc.	20
2007-2011	Drainage Engineering (TA)	Lecture	M.Sc.	20
2011-2013	Environmental Systems (partly)	Lecture	B.Sc.	40
2011-2013	River Basin Management (partly)	Lecture	M.Sc.	20
2013-Present	Environmental project management and green entrepreneurship	Lecture	M.A.	15
2013-Present	Application of Matlab for environmental studies	Lecture	M.A.	15
2013-Present	Statistics	Lecture	M.A.	15
2014-Present	Environmental Systems Analysis	Lecture	M.A.	15
2014-Present	Fluid Mechanics and Hydraulics	Lecture	B.Sc.	50
2017-Present	Surface Hydrology	Lecture	B.Sc.	50

Years	Name of Course	Type of Course	Level	Number of Students
2017-Present	Green Entrepreneurship	Lecture	M.A.	15
2017-Present	Introduction to Economics	Lecture	M.A.	20
2017-Present	Quantitative Methods	Lecture	M.A.	20
2017-Present	Advanced Quantitative Methods	Lecture	M.A.	20
2017-Present	Research Methods	Lecture	M.A.	20

b. **Supervision of Graduate Students**

Name of Student	Name of Other Mentors	Title of Thesis	Degree	Year of Completion	Students' Achievements
M.A. Students					
Mariam Egbariah	Uri Shamir, Technion	Optimal regional management of reclaimed water system with different qualities	M.A.	2017	Presentation in conference
Naama Shapira		Developing a negotiation support system for environmental-Economics conflicts resolution	M.A.	2017	**D31**
Tal Silver	Gideon Gal, Kinneret Laboratory	Developing space-time dynamic model for analyzing lake Kinneret fishery	M.A.	2017	Presentation in conference**,** Poster (first place poster award)
Alaa Jamal	Raphael Linker, Technion	Optimal irrigation scheduling incorporating probabilistic weather forecasts	M.A.	2017	**D25, D29**
*Merav Tal-maon	Dani Broitman, Technion	Quantifying the Interdependency, Resiliency, Reliability and Vulnerability of Interdependent Systems	M.A.	2019	**D43**

Name of Student	Name of Other Mentors	Title of Thesis	Degree	Year of Completion	Students' Achievements
*Noy Kadosh	Alex Frid	Detecting Cyber-attacks in water distribution systems	M.A.	2019	**D35**
*Tomer Aharon		Management of water supply systems under uncertainty: an info-gap approach	M.A.	2020	**D42**
*Riky Levin	Boris Portnov	Characterization of Localities with High Likelihood of Illicit Connections between Runoff and Sewage Systems	M.A.	2019	**D33**
*Alex Webb		Applications of Game Theory for water resources problems	M.A. Exchange students from McGill University, Canada (1 Semester)	2020	
*Yoav Bornstein		Reducing implementation cost of wetlands water quality decision support systems	M.A.	2021	**D49**
Ph.D. Students					
*Elad Salomons		Practical Methods for WDSs operation	Ph.D.	2022	**D32, D34, D37, D38, D41, D46, D47**
*Ziv Ohar		Disaster Resilient Urban Water Systems: measures and tools	Ph.D.	In Progress	
Post-Docs					
***Alaa Jamal		Analysis of Water Distribution Systems		2020	**D45**

PUBLICATIONS

Note:
For joint publications with colleagues, the order of the listed authors is according to their relative contribution. For papers with my students, last author and/or corresponding author is a sign of leading the study.

Index:
IF=Impact Factor *(from JCR-web of science, by year of publication)*
R= Rank *(from JCR-web of science, by year of publication)*
Q=Quartile *(from JCR-web of science, by year of publication)*
SJR=SCImago Journal Rank Indicator
V=Included in VATAT list of journals (The Council for Higher Education list)
#=Student
$=Research Assistant
C=Corresponding Author

A. Ph.D. Dissertation

Title: Optimal Multi-year Management of Regional Water Resources Systems under Uncertainty
Date of submission: August, 15th, 2011
Number of pages: 215
Language: English
Name of supervisors: Prof. Avi Ostfeld and Prof. Uri Shamir
University: Technion
Publications: D1-3, D5-6.

B. Scientific Books (Refereed)

None

C. Monographs

None

D. Articles in Refereed Journals

Published

1. **Housh, M.**, Ostfeld A., and Shamir U., (2011), Optimal multiyear management of a water supply system under uncertainty: Robust counterpart approach, *Water Resources Research*, 47(10), 1-15.

   IF 2011= 2.957
   R 2011= Limnology: 2/19; Water Resources: 3/78 (Q1)
   V

2. **Housh, M.**, Ostfeld, A., & Shamir, U. (2012). Box-constrained optimization methodology and its application for a water supply system model. *Journal of Water Resources Planning and Management*, 138(6), 651-659.

   IF 2012 = 1.709
   R 2012= Engineering, Civil: 19/122 (Q1)
   V

3. **Housh, M.**, Ostfeld, A., & Shamir, U. (2012). Seasonal multi-year optimal management of quantities and salinities in regional water supply systems. *Environmental modelling & software*, 37, 55-67.

   IF 2012= 3.476
   R 2012= Computer Science, Interdisciplinary Applications: 8/100 (Q1)
   V

4. Perelman, L., Arad, J., **Housh, M.**, & Ostfeld, A. (2012). Event detection in water distribution systems from multivariate water quality time series. *Environmental science & technology*, 46(15), 8212-8219.

   IF 2012= 5.257
   R 2012= Engineering, Environmental: 2/42 (Q1)
   V

5. **Housh, M.**, Ostfeld, A., & Shamir, U. (2012). Implicit mean-variance approach for optimal management of a water supply system under uncertainty. *Journal of Water Resources Planning and Management*, 139(6), 634-643.

   IF 2013= 1.760
   R 2013= Engineering, Civil: 21/124 (Q1)
   V

6. **Housh, M.**, Ostfeld, A., & Shamir, U. (2013). Limited multi-stage stochastic programming for managing water supply systems. *Environmental modelling & software*, 41, 53-64.

   IF 2013= 4.538
   R 2013= Computer Science, Interdisciplinary Applications: 5/102 (Q1)
   V

7. Perelman, L., **Housh, M.**, & Ostfeld, A. (2013). Least-cost design of water distribution systems under demand uncertainty: the robust counterpart approach. *Journal of Hydroinformatics*, 15(3), 737-750.

   IF 2013= 1.336
   R 2013= Engineering, Civil: 21/124 (Q1)
   V

8. Arad, J., **Housh, M.**, Perelman, L., & Ostfeld, A. (2013). A dynamic thresholds scheme for contaminant event detection in water distribution systems. *Water research*, 47(5), 1899-1908.

   IF 2013= 5.323
   R 2013= Water Resources: 1/81 (Q1)
   V

9. Perelman, L., **Housh, M.**, & Ostfeld, A. (2013). Robust optimization for water distribution systems least cost design. *Water Resources Research*, 49(10), 6795-6809.

   IF 2013= 3.709
   R 2013= Limnology: 1/20 (Q1); Water Resources: 3/81 (Q1)
   V

10. **Housh, M.**, Cai X., Ng T., McIsaac G., Ouyang Y., Khanna M., Sivapalan M., Jain A., Eckhoff S., Gasteyer S., Al-Qadi I., Bai Y., Yaeger M., Ma S., Song Y., (2014), System of Systems Model for Analysis of Biofuel Development, *Journal of Infrastructure Systems*, 21(3), 1-14.

    IF 2014= 1.049
    R 2014= Engineering, Civil: 55/125 (Q2)
    V

11. Yaeger, M.A., **Housh, M.**, Cai, X., & Sivapalan, M. (2014). An integrated modeling framework for exploring flow regime and water quality changes with increasing biofuel crop production in the US Corn Belt, *Water Resources Research*, 50 (12), 9385–9404.

    IF 2014= 3.549
    R 2014= Limnology: 2/20 (Q1); Water Resources: 3/83 (Q1)
    V

12. Pan, L., **Housh, M.**, Liu, P., Cai, X., & Chen, X. (2015). Robust stochastic optimization for reservoir operation. *Water Resources Research*, 51(1), 409-429.

    IF 2015= 3.792
    R 2015= Limnology: 1/20 (Q1); Water Resources: 5/85 (Q1)
    V

13. **Housh, M.**, & Cai, X. (2015). Successive smoothing algorithm for solving large-scale optimization models with fixed cost. *Annals of Operations Research*, 229(1), 475-500.

    IF 2015= 1.406
    R 2015= Operations Research /Management Science: 32/82 (Q2)
    V

14. **Housh, M.**, & Ostfeld, A. (2015). An integrated logit model for contamination event detection in water distribution systems. *Water Research*, 75, 210-223.

    IF 2015= 5.991
    R 2015= Water Resources: 1/85 (Q1)
    V

15. **Housh, M.**, Khanna, M., & Cai, X. (2015). Mix of first-and second-generation biofuels to meet multiple environmental objectives: Implications for policy at a watershed scale. *Water Economics and Policy*, 1(3), 1-26.

    N/A

16. **Housh M.**, Yaeger M., Cai X., Khanna M., McIsaac G., Sivapalan M., Ouyang Y., Jain, A., (2015), Managing Multiple Mandates: A System of Systems Model to Analyze Strategies for Producing Cellulosic Ethanol and Reducing Riverine Nitrate Loads in the Upper Mississippi River Basin, *Environmental Science and Technology*, 49 (19), 11932–11940.

    IF 2015= 5.393
    R 2015= Engineering, Environmental: 3/50 (Q1)
    V

17. Schwartz, R., **Housh, M.**, & Ostfeld, A. (2016). Least-Cost Robust Design Optimization of Water Distribution Systems under Multiple Loading. *Journal of Water Resources Planning and Management*, 142(9), 1-11.

    IF 2016= 3.537
    R 2016= Water Resources: 5/88 (Q1)
    V

18. Nguyen, T. D., Cai, X., Ouyang, Y., & **Housh, M.** (2016). Modelling infrastructure interdependencies, resiliency and sustainability. *International Journal of Critical Infrastructures*, 12(1-2), 4-36.

    IF 2016= N/A
    SJR 2016= 0.373
    R 2016= Safety, Risk, Reliability and Quality: 70/344 (Q2)

19. Schwartz, R., **Housh, M.**, & Ostfeld, A. (2016). Limited multistage stochastic programming for water distribution systems optimal operation. *Journal of Water Resources Planning and Management*, 142(10), 1-6.

    IF 2016= 3.537
    R 2016= Water Resources: 5/88 (Q1)
    V

20. **Housh, M.**, [$]Ohar, Z. (2017). Integrating Physically based Simulators with Event Detection Systems: Multi-Site Detection Approach. *Water Research*, 110, 180-191.

    IF 2017= 7.051
    R 2017= Water Resources: 1/90 (Q1)
    V

21. **Housh, M.**, [$]Ohar, Z. (2017). Multiobjective Calibration of Event-Detection Systems. *Journal of Water Resources Planning and Management Division*, 143(8), 1-5.

    IF 2017= 3.197
    R 2017= Water Resources: 11/90 (Q1)
    V

22. **Housh, M.** (2017). Non-probabilistic robust optimization approach for flood control system design. *Environmental Modelling & Software*, 95, 48-60.

    IF 2017= 4.177
    R 2017= Computer Science, Interdisciplinary Applications: 9/105 (Q1)
    V

23. Givati A., **Housh M.**, Levi Y., Paz D., Carmona I., Becker E., (2017), The advantage of using international multi-model ensemble for seasonal precipitation forecast in Israel, *Advances in Meteorology*, https://doi.org/10.1155/2017/9204081. (about 13 pages)

    IF 2017: 1.645
    R 2017= METEOROLOGY & ATMOSPHERIC SCIENCES: 58/86 (Q3)
    V

24. Shafiee-Jood, M., **Housh, M.**, & Cai, X. (2018). Hierarchical Decision-Modeling Framework to Meet Environmental Objectives in Biofuel Development. *Journal of Water Resources Planning and Management*, 144(7), 1-15.

    IF 2018= 3.404
    R 2018= Water Resources: 13/91 (Q1)
    V

25. [#]Jamal, A., Linker, R., & **Housh, M.** (2018). Comparison of Various Stochastic Approaches for Irrigation Scheduling Using Seasonal Climate Forecasts. *Journal of Water Resources Planning and Management*, 144(7), 1-10.

    IF 2018= 3.404
    R 2018= Water Resources: 13/91 (Q1)
    V

26. **Housh, M.**, [$]Ohar, Z. (2018). Model-based approach for Cyber-Physical Attacks Detection in Water Distribution Systems. *Water Research*, 139, 132-143.

    IF 2018= 7.913
    R 2018= Water Resources: 1/91 (Q1)
    V

27. Taormina, R., et al., **Housh, M.**, [$]Ohar, Z., (31 co-authors) (2018). The battle of the attack detection algorithms: disclosing cyber-attacks on water distribution networks. *Journal of Water Resources Planning and Management Division*, 144(8), 1-11.
    IF 2018= 3.404
    R 2018= Water Resources: 13/91 (Q1)
    V

28. ***Housh M.**, [$]Salomons E., (2018). Optimal dynamic pump triggers for cost saving and robust water distribution system operations. *Journal of Water Resources Planning and Management*, 145(2), 1-9.

    IF 2018= 3.404
    R 2018= Water Resources: 13/91 (Q1)
    V

29. *[#]Jamal A., Linker R., **Housh M.**, (2019). Optimal Irrigation with Perfect Weekly Forecasts versus Imperfect Seasonal Forecasts. *Journal of Water Resources Planning and Management*[3], 145(5), 1-6.

    IF 2019= 2.406[3]
    R 2019= Water Resources: 36/94 (Q2, was 13/91, Q1, when submitted the paper)
    V

30. *Sela L., **Housh M.**, (2019). Increasing Usability of Water Distribution Analysis Tools through Plug-In Development in EPANET. *Journal of Hydraulic Engineering*, 145(5), 1-4.
    IF 2019= 1.993
    R 2019= Civil Engineering: 58/134 (Q2)
    V

31. *[#]Shapira N., **Housh M.**[C], Broitman D., (2019). Decision-makers matter: An operational model for environmental-economic conflict resolution. *Environmental Science & Policy*, 98, 77-87.
    IF 2019= 4.767
    R 2019= ENVIRONMENTAL SCIENCES: 48/265 (Q1)
    V

32. *Sela L., [#]Salomons E., **Housh M.**, (2019). Plugin prototyping for the EPANET software. *Environmental Modelling & Software*, 119, 49-56.

    IF 2019= 4.807
    R 2019= Computer Science, Interdisciplinary Applications: 14/109 (Q1)
    V

[3] Noteworthy that it is a leading journal in the field of water resources management, it was 13/91(Q1) in 2018 and before it was ranked in top 10 (see publications list).

33. *[#]Levin R., **Housh M.**[C], Portnov B., (2020). Characterization of Localities with a High Likelihood of Illicit Connections between Runoff and Sewage Systems, *Environmental Management*, 65(6), 748-757.

    IF 2019= 2.561
    R 2019= ENVIRONMENTAL SCIENCES: 123/265 (Q2)
    V

34. *[#]Salomons E., **Housh M.**, (2020). A Practical Optimization Scheme for Real-Time Operation of Water Distribution Systems. *Journal of Water Resources Planning and Management*[4], 146(4), 1-12.

    IF 2019= 2.406[4]
    R 2019= Water Resources: 36/94 (Q2, was 13/91, Q1, when submitted the paper)
    V

35. *[#]Kadosh N., Frid A., **Housh M.**, (2020). Detecting Cyber-Physical Attacks in Water Distribution Systems: One-class Classifier Approach. *Journal of Water Resources Planning and Management*[4], 146(8). 1-13.

    IF 2019= 2.406[4]
    R 2019= Water Resources: 36/94 (Q2, was 13/91, Q1, when submitted the paper)
    V

36. *Qiu M., **Housh M.**, Ostfeld A., (2020), A Two-Stage LP-NLP Methodology for the Least-Cost Design and Operation of Water Distribution Systems. *Water*, 12(5), 1-21.

    IF 2019= 2.544
    R 2019= Water Resources: 31/94 (Q2)
    V

37. *[#]Salomons E., Sela L., **Housh M.** (2020). Hedging for Privacy in Smart Water Meters. *Water Resources Research*, 56(9), 1-16. (**Paper was selected as Editor's Highlight**)

    IF 2020= 5.24
    R 2020= water resources: 11/98 (Q1)
    V

38. *[#]Salomons E., **Housh M.** (2020). Practical real-time optimization for energy efficient water distribution systems operation. *Journal of Cleaner Production*, 275, 1-14.

    IF 2019= 7.10
    R 2019= Green sustainable science and technology: 6/41 (Q1)
    V

39. *Qiu M., **Housh M.**, Ostfeld A., (2021), Analytical Optimization Approach for Simultaneous Design and Operation of Water Distribution–Systems Optimization. *Journal of Water Resources Planning and Management*[4], 147(3), 1-8.

    IF 2019= 2.406[4]
    R 2019= Water Resources: 36/94 (Q2)
    V

[4] Noteworthy that it is a leading journal in the field of water resources management, it was 13/91(Q1) in 2018 and before it was ranked in top 10 (see publications list).

40. *[$]Shapira N., Ayalon O., Ostfeld A., Farber Y., **Housh M.**, (2021), Cyber-security in the water sector – a stakeholders' perspective. *Journal of Water Resources Planning and Management*[4], 147(8), 1-15.

    IF 2019= 2.406[4]
    R 2019= Water Resources: 36/94 (Q2)
    V

41. *[#]Salomons E., Shamir U., **Housh M.**, (2021), Optimization methodology for estimating pump curves using SCADA data. *Water*, 13(5), 1-14.

    IF 2019= 2.544
    R 2019= Water Resources: 36/94 (Q2)
    V

42. ***Housh M.**, [#]Aharon T., (2021), Info-Gap models for Optimal Multi-Year Management of Regional Water Resources Systems under Uncertainty. *Sustainability*, 13(6), 1-27.

    IF 2019= 2.592
    R 2019= Environmental Studies: 53/123 (Q2)
    V

43. *[#]Tal-maon, M., Broitman, D., & **Housh, M.** (2021). Nonlinear Interdependency Measures for Infrastructure Systems: Case Study of Biofuel Infrastructure Development. *Journal of Infrastructure Systems*, 27(4), 1-14.

    IF 2019= 1.825
    R 2019= Civil Engineering: 67/134 (Q2)
    V

44. ***Housh, M.** (2021). Optimization of Multi-Quality Water Networks: Can Simple Optimization Heuristics Compete with Nonlinear Solvers?. *Water*, 13(16), 1-18.

    IF 2019= 2.406
    R 2019= Water Resources: 36/94 (Q2)
    V

45. ***Housh M.** and [$]Jamal Alaa, (2021), Utilizing Matrix Completion for Simulation and Optimization of Water Distribution Networks, *Water Resources Management*. (about 16 pages)

    IF 2019= 2.924
    R 2019= Civil Engineering: 28/134 (Q1)
    V

46. ***Housh, M.**, [#]Salomons, E., Sela, L., & Simpson, A. R. (2022). Water Distribution Systems on the Spot: Energy Market Opportunities for Water Utilities. *Journal of Water Resources Planning and Management*[4], 148(3), 1-5.

    IF 2019= 2.406[4]
    R 2019= Water Resources: 36/94 (Q2)
    V

47. *[#]Salomons E., **Housh M.**, (2022),Smart Water Meters Can Save Lives during the Covid-19 Pandemic, *Journal of Water Resources Planning and Management*[4], 148(4), 1-6.

IF 2019= 2.406[4]
R 2019= Water Resources: 36/94 (Q2)
V

48. *Raška P, Bezak N, Ferreira CSS, Kalantari Z, Banasik K, Bertola M, Bourke M, Cerdà A, Davids P, Madruga de Brito M, Evans R, Finger DC, Halbac-Cotoara-Zamfir R, **Housh M**, Hysa A, Jakubínský J, Solomun MK, Kaufmann M, Keesstra S, et al., (2022), Identifying barriers for nature-based solutions in flood risk management: An interdisciplinary overview using expert community approach. *J Environ Manage*, (1), 1-10.

IF 2019= 2.561
R 2019= ENVIRONMENTAL SCIENCES: 123/265 (Q2)
V

49. *[#]Bornstein Y., Dayan B., Cahn, A., Wells C., **Housh M.**, (2021), Environmental Decision Support Systems as a Service: Demonstration on CE-QUAL-W2 model. *Water*, *14*(6), 1-16.

IF 2019= 2.406
R 2019= Water Resources: 36/94 (Q2)
V

E. Articles or Chapters in Scientific Books (Refereed)

None

F. Articles in Conference Proceedings

Published

1. **Housh M.**, Ostfeld A., and Shamir U., (2011), Multi-year optimal management of quantities and salinities in water supply systems, Bearing Knowledge for Sustainability - Proceedings of the 2011 World Environmental and Water Resources Congress, Palm Springs, California, USA, pp. 4267-4277.
2. **Housh M.**, Ostfeld A., and Shamir U., (2011), Optimal multi-year management of a water supply system under uncertainty: Robust counterpart approach, Bearing Knowledge for Sustainability - Proceedings of the 2011 World Environmental and Water Resources Congress, Palm Springs, California, USA, pp. 3075-3085.
3. **Housh M.**, Ostfeld A., and Shamir U., (2011), Search method for box-constrained optimization, Bearing Knowledge for Sustainability - Proceedings of the 2011 World Environmental and Water Resources Congress, Palm Springs, California, USA, pp. 2901-2910.
4. **Housh M.**, Ostfeld A., and Shamir U., (2011), Optimal multi-year operation of a water supply system under uncertainty: robust methods. Risk in Water Resources

Management - Proceedings of Symposium H03 held during IUGG2011in Melbourne, Australia, July 2011. IAHS Publ. 347, 2011, pp. 183-190.

5. **Housh M.**, Ostfeld A., and Shamir, U., (2012),Optimal multi-year management of a regional water supply system under uncertainty: the affine adjustable robust counterpart approach, Crossing Boundaries - Proceedings of the 2012 World Environmental and Water Resources Congress, Albuquerque, New Mexico, USA, pp. 793-807.
6. Arad J., **Housh M.**, Perelman L., and Ostfeld A., (2012), Contamination event detection utilizing Genetic Algorithm, Proceedings of the 14th Water Distribution Systems Analysis Conference, Adelaide, South Australia.
7. Perelman L., **Housh M.**, Oliker N., and Ostfeld A., (2012), Non-probabilistic approach for the optimal design of water distribution systems under demand uncertainty, Proceedings of the 14th Water Distribution Systems Analysis Conference, Adelaide, South Australia.
8. Arad J., **Housh M.**, Perelman L., and Ostfeld A., (2012), Comparison between Fixed thresholds and Genetic algorithm methods for water quality event detection, Proceedings of the 14th Water Distribution Systems Analysis Conference, Adelaide, South Australia.
9. Perelman L., **Housh M.**, and Ostfeld A., (2013), Explicit Demand Uncertainty Formulation for Robust Design of Water Distribution Systems, Showcasing the future - Proceedings of the 2013 World Environmental and Water Resources Congress, Cincinnati, Ohio, USA, pp. 684-695.
10. Fagiolini, A., **Housh M.**, Ostfeld, A., and Bicchi, A., (2014), Distributed Estimation and Control of Water Distribution Networks by Logical consensus", International Symposium on Communications, Control, and Signal Processing: Special Session on Wireless Sensor and Actuator Network Applications, Athens, Greece.
11. **Housh M.**, Ostfeld A., and Shamir U., (2014), Management of Water Systems under Hydrological Uncertainty, Proceedings of the Dooge Nash International Symposium, 23-26 April 2014, Dublin, Ireland, pp. 355-364.
12. **Housh M.**, and Ostfeld A., (2015), Utilizing discrete choice models for fusing alarms from multiple water quality indicators, Proceedings of the 2015 World Environmental and Water Resources Congress, Austin, Texas, USA, pp. 652-657
13. **Housh M.**, [$]Ohar Z., (2017), Model based approach for Cyber-Physical Attacks Detection in Water Distribution Systems, Proceedings of the 2017 World Environmental and Water Resources Congress, Sacramento, CA, USA, pp. 727-736

G. Entries in Encyclopedias

None

H. Other Scientific Publications

None

I. Other Works and Publications

None

J. Submitted Publications

50. *[#]Salomons E., **Housh M.**, Sela L., (2021), Water-Energy Nexus in a Desalination-Based Water Sector: The Impact of Electricity Load Shedding Programs. *Water Research*. (about 14 pages)

    IF 2019= 7.1
    R 2019= Civil Engineering: 1/134 (Q1)
    V

51. ***Housh M.**, [#]Kadosh N., Haddad J., (2021), Detecting and Localizing Cyber-Physical Attack in Water Distribution Systems without Records of Labeled Attacks, *Water Resources Management.* (about 16 pages)

    IF 2019= 2.924
    R 2019= Civil Engineering: 28/134 (Q1)
    V

52. ***Housh M.**, (2021), Mixed-Integer Linear Programs for Optimizing Multi-Source Water Supply Systems, *Water Resources Management.* (about 14 pages)

    IF 2019= 2.924
    R 2019= Civil Engineering: 28/134 (Q1)
    V

K. Summary of my Activities and Future Plans

Summary of my Activities

My publications cover modeling methodologies and their implementation in water resources planning and management. Specifically, my studies in the field of water distribution systems cyber-security are pioneers in the topic, and my papers are among the first to develop detection systems for identifying cyber-attacks (e.g., D26, D27). My group has also contributed the first paper on smart water meters privacy (D37). For its innovative nature, this paper was selected as Editor's Highlight in the Water Resources Research journal of the AGU. Furthermore, a major effort of my previous research focused on bridging the gap between theoretical optimization models and practical operational problems in the water sector. As such, my research group is recognized for its contribution to closing this gap by developing practical methods for designing and operating water systems (e.g., D28, 34, 38, 41, 44, 45).

Future Research Plans

My future research will focus on two themes: (1) Water and Energy Nexus; (2) Planning and Management of "Smart" Water Infrastructure.

Theme 1: Water and Energy Nexus

Water and energy system are inextricably interlinked; here, I will focus on two different scales of water-energy nexus: (a) The micro-scale, which focuses on the urban water distribution system, and (b) The macro-scale, which focuses on the regional and national level of water resources management that involves non-conventional water resources such as seawater desalination.

Micro-Level: Water Distribution Systems

Water Distribution Systems (WDSs) use a significant part of a country's energy consumption and thus contribute to the water-energy nexus. Energy costs and consumption could be reduced by considering the joint management of the water and energy sectors. In recent years, the energy sector has changed in two major aspects. The first is attributed to the growing share of diverse energy sources, mainly renewable sources (e.g., wind and solar), and the second is attributed to the interconnectivity of large power grids across countries and continents. As a result, an advanced energy market has emerged. Nowadays, energy has become a tradable commodity with diverse spot prices and future contracts. On the other hand, WDSs are characterized by their ability to use water storage facilities for shifting energy use patterns through strategic pumping. Thus, water utilities can take advantage of the competitive energy market to reduce operational costs and increase profitability and energy saving. In doing so, water utilities are looking for a delicate balance between the strategic purchase of long-term (e.g., monthly, yearly) energy contracts and real-time scheduling of spot market energy purchases (e.g., the inter-day and day-ahead). Despite these competitive markets, decision-makers and operators in water utilities lack practical tools to support their actions for energy demand response. Therefore, there is an immediate need for practical tools for the real-time operation of WDSs that account for energy contracts and the energy spot market in operation. My future research will focus on developing Decision Support Systems (DSSs) for strategic power contract procurement optimization and real-time pump scheduling optimization given the energy spot market. The significance of this line of research is twofold. Practically, there is an immediate need for tools to manage the water-

energy nexus in the era of energy contracts and spot energy markets. Academically, novel modeling and solution methodologies for solving the WDS operation problem in the face of various uncertainty factors will be developed.

Macro-Level: Regional Water Systems

Conventional water resources are becoming increasingly scarce and are prone to climate variability and uncertainty, thus posing an immediate threat to current and future water sustainability. Alternative nonconventional water sources introduce new opportunities to secure water provision and are beginning to play a key role in regional water supply systems (WSSs) planning and management. However, these new sources further highlight the water-energy nexus and the need for holistic management of interconnected systems. My future research will focus on developing innovative optimization models, and solution approaches for the joint management of conventional and non-conventional water sources under normal and emergency conditions, including natural disasters, environmental pollution, and contamination. The developed approaches will balance the challenges associated with managing multi-quality water sources, variable energy requirements, economic, regulatory, and environmental constraints, as well as uncertainties in population growth and climate variability. The intellectual merit of this line of research includes: (1) Integrating new dimensions for sustainable water management, including environmental, regulatory, and sustainability, and designing relevant multi-criteria performance metrics; (2) Creating new optimization formulations for incorporating uncertainty in model decisions through a hybrid approach, which balances between data availability and uncertainty modeling; (3) Generating scalable solution algorithms through model reduction and variable transformation, which enables controlling model complexity; (4) Developing holistic DSSs for routine and emergency management of WSSs, including natural and manmade disasters.

Theme 2: Smart Water Infrastructures

The advancement and availability of sensor technology for water infrastructure systems have increased significantly in recent years. Modern WDSs, often called smart WDSs, are Cyber-Physical Systems (CPSs) built on the interaction between physical components and networked devices, which are programmed to monitor, operate and control the WDS. The sophisticated design of CPSs allows for efficient operation and monitoring of the system, which is manifested in lower operation costs,

higher supply reliability, and a higher level of service. For example, we are currently working on a DSS for managing smart WDSs under emergency fire events. This DSS will derive the optimal operation mechanism to help in mitigating the fire event. Other research direction focuses on utilizing automatic water demand metering to enhance the operation of the WDSs by better assessing the system's state.

Despite the advantages of smart WDSs, these systems are vulnerable to cyber-attacks. Sabotaging the WDS operation with cyber-attacks can trigger a disastrous effect on the security, economy and even health of metropolitan areas. In recent years, I worked on developing model-based and machine learning methodologies for detecting cyber-attacks in WDSs. My future research will focus on enhancing the developed tools by adding localization capabilities to identify the attacked devices in the WDS.