**Name:** Mashor Housh **Date:** June 14, 2021

**CURRICULUM VITAE**

1. **Personal Details**

Permanent Home Address: 15 Almar St., Kfar-Manda, Israel 17907

Home Telephone Number: 04-9863717

Office Telephone Number: 04-8288541

Cellular Phone: 052-3237099

Email Address: [mhoush@univ.haifa.ac.il](mailto:mhoush@univ.haifa.ac.il)

1. **Higher Education**

##### Undergraduate and Graduate Studies

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

##### Post-Doctoral Studies

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

1. **Academic Ranks and Tenure in Institutes of Higher Education**

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

**Notes:** \*represents activities and publications since last promotion (February 2018).

1. **Offices in Academic Administration**

|  |  |  |
| --- | --- | --- |
| **Role** | **Name of Institution and Department** | **Years** |
| Head | Global Green MBA, University of Haifa | 2017-Present |

1. **Scholarly Positions and Activities outside the University**

|  |  |
| --- | --- |
| **Editorial Positions in Scientific Journals** | **Years** |
| Associate Editor: *The Journal of Water Resources Planning &Management,* IF 2019= 2.406, R 2019= Water Resources: 36/94 (Q2). Noteworthy that 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) | \*2021-Present |

| **Memberships in Academic Professional Associations** | **Years** |
| --- | --- |
| American Society of Civil Engineers (ASCE) | 2011-Present |
| The Operations Research Society of Israel (ORSIS). | 2011-Present |
| Environmental and Water Research Institute (EWRI). | 2011-Present |
| Standing Committee on Environmental and Water Resources systems, ASCE | 2012-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 | 2014-Present |
| Member of COST Action (EU), CA16209: Natural Flood Retention on Private Land. http://www.land4flood.eu/ | 2017-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. | \*2021-Present |

|  |  |
| --- | --- |
| **Reviewing for Refereed Journals** | **Years** |
| *The Journal of Water Resources Planning &Management,* IF 2019= 2.406, R 2019= Engineering, Civil: 44/134 (Q2) | 2011-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) | 2012-Present |
| *Urban Water Journal,* IF 2019= 1.888, R 2019= Water Resources: 56/94 (Q3) | 2014-Present |
| *Journal of Hydrology,* IF 2019= 4.5, R 2019= Water Resources: 6/94 (Q1) | 2015-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) | \*2020-Present |

|  |  |
| --- | --- |
| **Non-Academic Professional Activities** | **Years** |
| Consulter for the Israeli Water Authority: Development and implementation of a suite of models for optimal operation of the National Water System | 2014-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 | \*2019-Present |

1. **Active Participation in Scholarly Conferences**

**a1**. **International Conferences - Held Abroad**

Notes: presenter is underlined; #students under my supervision

| **Role** | **Subject of Lecture/Discussion** | **Place of Conference** | **Name of Conference** | **Date** |
| --- | --- | --- | --- | --- |
| Presentation | Shamir U., Housh M., Ostfeld A., Zaide M., (2009), [Management of the Israeli National Water System under Uncertainty](http://adsabs.harvard.edu/abs/2009AGUFM.H34B..03S) | San Francisco, California, USA | The American Geophysical Union (AGU) Annual Meeting | Dec.  3-7, 2009 |
| Presentation | 1. Housh M., Ostfeld A., and Shamir U., (2011), Optimal management of a water supply system under uncertainty: stochastic approach  2. Housh M., Ostfeld A., and Shamir U., (2011), Optimal multi-year management of a water supply system under uncertainty: Robust counterpart approach  3. Housh M., Ostfeld A., and Shamir U., (2011), Search method for box-constrained optimization  4. Housh M., Ostfeld A., and Shamir U., (2011), Limited multi-stage programming: a case study for multiyear management of water supply system  5. Housh M., Ostfeld A., and Shamir U., (2011), Optimal management of a water supply system under uncertainty: the Info-Gap approach  6. Housh M., Ostfeld A., and Shamir U., (2011), Multi-year optimal management of quantities and salinities in water supply systems | Palm Springs, California, USA. | World Environmental and Water Resources Congress | May 20-26, 2011 |
| Presentation | 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 | Albuquerque, New Mexico, USA. | World Environmental and Water Resources Congress | May 20-24, 2012 |
| Presentation | 1. Arad J., Housh M., Perelman L., and Ostfeld A., (2012), Contamination event detection utilizing Genetic Algorithm  2. Perelman L., Housh M., Oliker N., and Ostfeld A., (2012), Non-probabilistic approach for the optimal design of water distribution systems under demand uncertainty  3. Arad J., Housh M., Perelman L., and Ostfeld A., (2012), Comparison between Fixed thresholds and Genetic algorithm methods for water quality event detection | Adelaide, South Australia | 14th Water Distribution Systems Analysis Conference | Sep. 24-27, 2012 |
| Presentation | Housh M., and Cai X., (2012), Smoothing Algorithm to Solve a Complex Model for Regional Biofuel Development | Phoenix, Arizona, USA. | The Institute of Operations Research and Management Science (INFORMS) Annual Meeting | Oct. 14-17, 2012 |
| Presentation | 1. Housh M., Ng T.L., and Cai X., (2012), Integrated systems optimization model for biofuel development: The influence of environmental constraints  2. Yaeger M., Housh M., Ng T.L., Cai X., and Sivapalan M., (2012), Water for Food, Energy, and the Environment: Assessing Streamflow Impacts of Increasing Cellulosic Biofuel Crop Production in the Corn Belt  3. Cai X., Zeng R., Valocchi A., Song J., and Housh M., (2012), Strategic Planning for Drought Mitigation under Climate Change | San Francisco, California, USA | The American Geophysical Union (AGU) Annual Meeting | Dec.  3-7, 2012 |
| Presentation | Yaeger M., Housh M., Ng T.L., Cai X., and Sivapalan M., (2013), Catchments Under Change: Assessing Impacts and Feedbacks from New Biomass Crops in the Agricultural Midwestern USA | Vienna, Austria | The European Geophysical Union (EGU) General Assembly | April 7-12, 2013 |
| Presentation | Perelman L., Housh M., and Ostfeld A., (2013), Explicit Demand Uncertainty Formulation for Robust Design of Water Distribution Systems | Cincinnati, Ohio,  USA. | World Environmental and Water Resources Congress | May 19-23, 2013 |
| Poster | Yaeger M., Housh M., Noël P., Cai X., and Sivapalan M., (2013), Understanding and Quantifying Hydrological Alteration Caused by Biofuels-Related Land Use Change in the Midwestern US | San Francisco, California, USA | The American Geophysical Union (AGU) Annual Meeting | Dec.  3-7, 2013 |
| Presentation | Housh M., Ostfeld A., and Shamir U., (2014), Management of Water Systems under Hydrological Uncertainty | Dublin, Ireland | Dooge Nash International Symposium | Apr. 23-26, 2014 |
| Presentation | Fagiolini A., Housh M., Ostfeld, A., and Bicchi, A., (2014), Distributed Estimation and Control of Water Distribution Networks by Logical consensus | Athens, Greece | International Symposium on Communications, Control, and Signal Processing | May 21-23, 2014 |
| Presentation | 1. Housh M., Yazidi J., (2014), Non-probabilistic approach for flood control system design  2. Housh M., Cai X., (2014), SoS – Biofuel: System of Systems Model for Biofuel Development Analysis | Portland, Oregon, USA. | World Environmental and Water Resources Congress | June  1-5, 2014 |
| Presentation | Housh M., and Ostfeld A., (2015), Utilizing discrete choice models for fusing alarms from multiple water quality indicators | Austin, Texas,  USA. | World Environmental and Water Resources Congress | May 17-21, 2015 |
| Presentation | Polinova M., Brook A., Housh M., (2016), An integrated modeling framework for real-time irrigation scheduling: the benefit of spectroscopy and weather forecasts | Vienna, Austria | European Geophysical Union (EGU) General Assembly | Apr. 17-22, 2016 |
| Poster | 1. Housh M., Ohar, Z., (2016), Simulating Water Distribution Systems using Differenial Algebric Equations  2. Avni, N., Fishbain, B., Housh, M., Shamir, U., (2016), The Effect of Water Demand Uncertainty on Management of Regional Water Systems | Palm Beach,  Florida,  USA. | World Environmental and Water Resources Congress | May 22-26, 2016 |
| Presentation | 1. #Egbariah M., Housh M., Shamir U., Optimal regional management of reclaimed water system with different qualities  2. #Shapira N., Housh M., Developing a negotiation support system for environmental-Economics conflicts resolution | Keele University, UK | WSEN 2016: World Student Environmental Network | July 25, 2016 |
| Presentation | 1. Housh M., Ohar Z., Model based approach for Cyber-Physical Attacks Detection in Water Distribution Systems  2. Avni N., Fishbain B., Housh M., Shamir U., Regional Water Supply System Management Under Demand Uncertainty: Using Aggregation Rules to Derive an Operation Policy from Implicit Stochastic Programming Models  3. Housh M., Kronaveter L., Shamir U., Achipaz Z., Hadad A., Models for management of Israel's national and regional water systems | Sacramento, California, USA. | World Environmental and Water Resources Congress | May 22-26, 2017 |
| Presentation | 1. Housh M., #Salomons E., Optimal dynamic pumps triggers for cost saving and robust operation in WDSs  2. #Jamal A., Linker R., Housh M., Utilizing probabilistic weather forecasting for optimal irrigation scheduling  3. Shafiee-Jood M., Housh M., Cai X., Meeting Environmental Objectives in Biofuel Development: A Hierarchical Decision Modeling Framework  4. Shafiee-Jood M., Housh M., Cai X., Integrating multi-time scale forecasts in farmers’ decision making | Minneapolis, Minnesota, USA | World Environmental and Water Resources Congress | \*June 2-7, 2018 |
| Presentation | Broitman D., #Shapira N., Housh M., The decision-maker matters: An operational Multi-Objective Game Theoretic Model for environmental-economic conflict resolution | Bern, Switzerland | 4th Open Science Meeting of the Global Land Programme | \*April 24-26, 2019 |
| Presentation | #Salomons E., Housh M. A practical optimization scheme for real time operation of water distribution systems | Pittsburgh, Pennsylvania,  USA | World Environmental and Water Resources Congress | \*May 19-23, 2019 |
| Presentation | Broitman D., Housh M., and #Shapira N., Decision-makers’ characteristics matter: An operational model for environmental-economic conflict resolution | Lyon, France | The 59th Congress of European Regional Science Association (ERSA) | \*Aug 27-30, 2019 |
| Presentation | 1. Qiu M., Housh M., Ostfeld A., WDSLib 1.1: A Demand- and Pressure-Dependent Simulation Testbed for Water Distribution Systems  2. Qiu M., Housh M., Ostfeld A., Distributed Micro-Storage Tanks for Pressure Management in Water Distribution System | University of Exeter, UK | 17th International Computing & Control for the Water Industry Conference | \*Sep  1-4, 2019 |
| Presentation | #Salomons E., Housh M. , Water Energy Nexus as Manifested in Desalination based Water Sector: the case of Israel | Online | EGU General Assembly Conference | \*May 4-8, 2020 |

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

None

**a3. Local Conferences**

| **Role** | **Subject of Lecture** | **Place of Conference** | **Name of Conference** | **Date** |
| --- | --- | --- | --- | --- |
| Presentation | Housh M., Ostfeld A., and Shamir U., (2008), Optimal multi-year management of a water supply system under uncertainty | Jerusalem, Israel | Annual Operations Research Society of Israel (ORSIS) | June  1,  2008 |
| Presentation | Housh M., Ostfeld A., and Shamir U., (2011), Robust Optimization for optimal management of a water supply system under uncertainty | Akko,  Israel | Annual Operations Research Society of Israel (ORSIS) | June  3,  2011 |
| Presentation | Egbariah M., Housh M., Shamir U., Optimal regional management of reclaimed water system with different qualities | Haifa,  Israel | The national graduate students conference on water research | Dec. 21, 2014 |
| Presentation | Housh M., Kronaveter L., Shamir U., Shoval R., Hadad A., Achipaz Z., (2015), A model for optimal desalination purchase in the Israeli National Water Supply System | Haifa,  Israel | Natural Resources and Environmental Research Center:  Workshop on Securing Food Using Non-Conventional Water Sources | Feb. 24, 2015 |
| Presentation | Housh M., Kronaveter L., Shamir U., Shoval R., Hadad A., Achipaz Z., (2016), Optimal Management for the freshwater supply system: natural and desalinated water | Haspin, Israel | Israeli Association of Water Resources Conference | Apr.  5,  2016 |
| Poster (**first place poster award**) | #Silver T., Housh M., Gal G., Space-time dynamic model for analyzing lake Kinneret fishery | Tel-Aviv, Israel | Israel Society of Ecology and Environmental Sciences | June 21-23, 2016 |
| Presentation | Polinova M., Brook A., Housh M., (2016), Benefits of common use UAV and portable spectrometer in agriculture | Tel-Aviv, Israel | Israeli Geographical Association | Dec. 25, 2016 |
| Poster | Avni, N., Fishbain, B., Housh, M., Shamir, U., Regional Water Supply System management under demand uncertainty | Haifa,  Israel | The national graduate students conference on water research | Dec. 28, 2016 |
| Poster | #Kadosh N., Frid A., Housh M., Detecting Cyber-Physical Attacks in  Water Distribution Systems: A Data Driven Approach | Haifa,  Israel | The national graduate students conference on water research | \*Dec. 6,  2018 |
| Presentation | Housh M., Kronaveter L., Shamir U., , Hadad A., Achipaz Z., (2019), DSS for the planning and management of Kinneret watershed's water system. | Hatsva, Israel | Israeli Association of Water Resources conference | \*March  27, 2019 |
| Presentation | #Kadosh N., Frid A., Housh M., One Class Classifiers for Detecting Cyber-Physical Attacks in  Water Distribution Systems | Tel Aviv, Israel | Israeli Association of Water | \*May 22, 2019 |
| Presentation | #Levin R., Housh M., Portnov B., Characterization of Localities with a High Likelihood of Illicit  Connections between Runoff and Sewage Systems | Hertzelya, Israel | Regional Science Association International | \*Feb  4,  2020 |
| Presentation | #Bornstein Y., Housh M., Using water quality models for streams reservation and reclamation. | Ma'le Hmisha, Israel | Israeli Association of Water Resources conference | \*March 25, 2020 |

**b. Organization of Conferences or Sessions**

| **Role** | **Subject of Conference** | **Place of**  **Conference** | **Name of**  **Conference** | **Year** |
| --- | --- | --- | --- | --- |
| [[1]](#footnote-1)Track Chair (20 sessions) | Chair for water resources management track | Florida,  USA | World Environmental and Water Resources Congress | 2015 |
| 1Track Chair (20 sessions) | Chair for water resources management track | California, USA | World Environmental and Water Resources Congress | 2016 |
| Moderator | Session: Using Hydro-climatic Predictions for Water Resources Systems Planning and Management II | Florida,  USA | World Environmental and Water Resources Congress | 2016 |
| Moderator | Session: Water Resources Management under Uncertainty | California, USA | World Environmental and Water Resources Congress | 2017 |
| 1Track Chair (20 sessions) | Chair for water resources management track | Minnesota, USA | World Environmental and Water Resources Congress | 2017 |
| Moderator | Session: Systems Thinking and Modeling Complex Adaptive Systems | Minnesota, USA | World Environmental and Water Resources Congress | \*2018 |
| 1Track Chair (20 sessions) | Chair for water resources management track | Pennsylvania, USA | World Environmental and Water Resources Congress | \*2018 |
| Moderator  (2 sessions) | Session 1: Systems Analysis of the Urban Water Sector  Session 2: Systems Thinking and Modeling Complex Adaptive Systems | Pennsylvania, USA | World Environmental and Water Resources Congress | \*2019 |
| 1Track Chair (20 sessions) | Chair for water resources management track | Nevada,  USA | World Environmental and Water Resources Congress | \*2019 |
| Stakeholders workshop for water- and cyber-aspects. Invited stakeholders ~50 participants. | Initiator and Organizer | Technion,  Haifa | Stakeholders workshop: cyber-attacks in the water sector | \*2019 |
| 1Track Chair (20 sessions) | Chair for water resources management track | Online | World Environmental and Water Resources Congress | \*2020 |

1. **Invited Lectures (Others than in Scholarly Conferences)**

None

1. **Colloquium Talks**

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

1. **Research Grants**
2. **Grants Awarded**

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

| **Relevant Publications** | **Years** | **Amount** | **Funded by** | **Title** | **Other Researchers**  **(Name & Role)** | **Role in Research** |
| --- | --- | --- | --- | --- | --- | --- |
| D25, D29 | 2014-2017 | 366,390 NIS | Water Authority (C) | An integrated modeling framework for real-time irrigation scheduling: the benefit of imaging spectroscopy and weather forecasts | Co-PI:  Anna Brook  CIs:  Avi Shaviv,  Andrea Ghermandi,  David Katz | PI |
| D20, D21 | 2015-2016 | 12,190  $ | USAID (C) | Development of multi-sensor system for hydraulic and contamination events detection |  | PI |
| D28, D30, D32, D34 | 2017-2020 | 359,950 NIS | Water Authority (C) | Optimal management of multisource water supply systems under uncertainty: Novel Approaches and Methods |  | PI |
| D35, D36, D39 | 2019-2022 | 353,000 NIS | Water Authority (C) | Disaster Resilient Urban Water Systems: measures and tools |  | \*PI |
| D38, D41 | 2019-2022 | 320,000 NIS | Water Authority (C) | Advanced methods for online control of water distribution systems | Co-PI: Uri Shamir | \*PI |
| NA2 | 2020-2023[[2]](#footnote-2) | 145,000  Euro | MOST-BMBF (V) | Transforming digital content to actionable content: a practical approach for the water sector | Industrial Partner:  ProCom | \*PI |
|  | 2020-2022 | 415,000  NIS | Technion Hiroshi Fujiwara Cyber Security Research Center (C) | Cyberattacks detection in water distribution systems based on stochastic hydraulic model | Co-PI: Jack Haddad | \*PI |

1. **Internal Funds**

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Relevant Publications** | **Years** | **Amount** | **Funded by** | **Title** | **Other Researchers**  **(Name & Role)** | **Role in Research** |
| D26, D27 | 2017-2019 | 40,000 NIS | The center of cyber law and policy (C) | Cyber-Security of Water Distribution Systems: Attacks’ Detection Algorithms | Co-PI: Ofira Ayalon | PI |
| D40 | 2019 | 40,000 NIS | The center of cyber law and policy (C) | Policy Implications of Cyber-Security in Water Distribution Systems | Co-PI: Ofira Ayalon | \*PI |
| D37 | 2020 | 100,000 NIS | The center of cyber law and policy (C) | Hydraulic-based modeling for cyber-attacks detection in water distribution systems |  | \*PI |

1. **Submission of Research Proposals – Pending**

| **Years** | **Funded by**  (**C**= Competitive Fund)  (**V**= Vatat Fund) | **Title** | **Other Researchers**  **(Name & Role)** | **Role in Research** |
| --- | --- | --- | --- | --- |
| 2022-2026 | ISF (V) | Managing water distribution systems under combination of long-term and spot market power contracts |  | \*PI |
| 2022-2026 | BSF (V) | Multi-criteria scalable operation of regional water systems with nonconventional water resources | Co-PI: Lina Sela | \*PI |
| 2022 | GIF (V) | An Integrative Framework for Sustainable Configuration, Operation and Monitoring of Water Distribution Systems | Co-PI: Martin Wagner | \*PI |

1. **Submission of Research Proposals – Not Funded**

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

1. **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

1. **Teaching**

###### Courses Taught in Recent Years

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

###### 

###### Supervision of Graduate Students

| **Students' Achievements** | **Year of Completion** | **Degree** | **Title of Thesis** | **Name of**  **Other Mentors** | **Name of Student** |
| --- | --- | --- | --- | --- | --- |
| **M.A. Students** | | | | | |
| * Presentation in international conference * Presentation in local conference | 2017 | M.A. | Optimal regional management of reclaimed water system with different qualities | Uri Shamir, Technion | Mariam  Egbariah |
| * **One journal paper published: D31** * Presentation in international conference | 2017 | M.A. | Developing a negotiation support system for environmental-Economics conflicts resolution |  | Naama  Shapira |
| * Presentation in local conference | 2017 | M.A. | Developing space-time dynamic model for analyzing lake Kinneret fishery | Gideon Gal,  Kinneret Laboratory | Tal  Silver |
| * **Two journal papers published: D25, D29** * Presentation in international conference * Presentation in local conference | 2017 | M.A. | Optimal irrigation scheduling incorporating probabilistic weather forecasts | Raphael Linker, Technion | Alaa Jamal |
| * **One journal paper accepted: D43** | 2019 | M.A. | Quantifying the Interdependency, Resiliency, Reliability and Vulnerability of Interdependent Systems | Dani Broitman, Technion | \*Merav Tal-maon |
| * **One journal paper published: D35** * Presentation in local conference | 2019 | M.A. | Detecting Cyber-attacks in water distribution systems | Alex Frid | \*Noy Kadosh |
| * **One journal paper published: D42** | 2020 | M.A. | Management of water supply systems under uncertainty: an info-gap approach |  | \*Tomer Aharon |
| * **One journal paper published: D33** * Presentation in local conference | 2019 | M.A. | Characterization of Localities with High Likelihood of Illicit Connections between Runoff and Sewage Systems | Boris Portnov | \*Riky Levin |
|  | 2020 | M.A. Exchange students from McGill University, Canada (1 Semester) | Applications of Game Theory for water resources problems |  | \*Alex Webb |
| * **One journal paper under review: J1** * Presentation in local conference | In Progress | M.A. | Reducing implementation cost of wetlands water quality decision support systems |  | \*Yoav Bornstein |
| **Ph.D. Students** | | | | | |
| * **Five journal papers published: D32, D34, D37, D38, D41** * Two Presentations in International Conferences | In Progress | Ph.D. | Practical Methods for WDSs operation |  | \*Elad Salomons |
|  | In Progress | Ph.D. | Disaster Resilient Urban Water Systems: measures and tools |  | \*Ziv Ohar |
| **Post-Doc**s | | | | | |
| * **One journal paper submitted: J4** | 2020 |  | Analysis of Water Distribution Systems |  | **\***Alaa Jamal |

# PUBLICATIONS

**Note:**

**For joint publications the order of the listed authors is according to their relative contribution (unless otherwise specified).**

**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

1. **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.

1. **Scientific Books (Refereed)**

None

1. **Monographs**

None

1. **Articles in Refereed Journals**

**Published**

**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**

**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**

**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**

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**

**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**

**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**

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**

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**

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**

**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)](http://ascelibrary.org/doi/abs/10.1061/%28ASCE%29IS.1943-555X.0000238), 1-14.

**IF 2014= 1.049**

**R 2014= Engineering, Civil: 55/125 (Q2)**

**V**

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**

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**

**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**

**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**

**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**

**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**

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**

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)**

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**

**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**

**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**

**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**

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**

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**

#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**

**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**

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**

**\*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**

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

**IF 2019= 2.406**

**R 2019= Water Resources: 36/94 (Q2, was 13/91, Q1, when submitted the paper)**

**V**

\*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**

\*#Shapira N., **Housh M.**, 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**

\*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**

\*#Levin R., **Housh M.**, 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**

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

**IF 2019= 2.406**

**R 2019= Water Resources: 36/94 (Q2, was 13/91, Q1, when submitted the paper)**

**V**

\*#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*, 146(8). 1-13.

**IF 2019= 2.406**

**R 2019= Water Resources: 36/94 (Q2, was 13/91, Q1, when submitted the paper)**

**V**

\*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**

\*#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 2019= 4.27**

**R 2019= water resources: 9/94 (Q1)**

**V**

\*#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**

\*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*, 147(3), 1-8.

**IF 2019= 2.406**

**R 2019= Water Resources: 36/94 (Q2)**

**V**

\*$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*, 147(8), 1-15.

**IF 2019= 2.406**

**R 2019= Water Resources: 36/94 (Q2)**

**V**

\*#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**

**\*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**

**Accepted for Publication**

\*#Tal-maon M., Broitman D., **Housh M**., (2021), Nonlinear Interdependency Measures for Infrastructure Systems: Case Study of Biofuel Infrastructure Development. *Journal of Infrastructure Systems*. (about 14 pages)

**IF 2019= 1.825**

**R 2019= Civil Engineering:** **67/134 (Q2)**

**V**

1. **Articles or Chapters in Scientific Books (Refereed)**

None

1. **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
14. **Entries in Encyclopedias**

None

1. **Other Scientific Publications**

None

1. **Other Works and Publications**

None

1. **Submitted Publications**

\*#Bornstein Y., Dayan B., Wells C., **Housh M.**, (2021), Environmental Decision Support Systems as a Service: Demonstration on CE-QUAL-W2 model. *Sustainability*. (about 14 pages)

**IF 2019= 2.592**

**R 2019= Environmental Studies: 53/123 (Q2)**

**V**

\*#Salomons E., **Housh M.**, (2021), Smart Water Meters Can Save Lives during the Covid-19 Pandemic. *Water Resources Research*. (about 10 pages)

**IF 2019= 4.27**

**R 2019= Water Resources: 9/94 (Q1)**

**V**

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

**IF 2019= 30.289**

**R 2019= Environmental Sciences: 1/265 (Q1)**

**V**

\*$Jamal Alaa, **Housh M.**, (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**

1. **Summary of my Activities and Future Plans**

**Summary of my Activities**

I study how to model complex systems incorporating environmental, economic and sustainability aspects while focusing on how to guide the design and management of such systems to address uncertainty and extreme events. I also study the design and the management of “smart” infrastructure systems (so called cyber-infrastructure systems) where I use mathematical modeling and uncertainty analysis to best utilize automated sensing technologies and the vast computational capacity to design “smarter” infrastructure systems in general and water infrastructure systems in particular. My publications cover modeling methodologies and their implementation to water resources planning and management.

**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 sea water 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 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 became 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 their operational cost and increase profitability and energy saving. In doing so, water utilities are looking for a delicate balance between strategic purchase of long-term (e.g., monthly, yearly) energy contracts and real-time scheduling of spot market energy purchase (e.g., the inter-day and day-ahead). In spite of these competitive markets, decision-makers and operators in water utilities lack practical tools to support their actions for energy demand response. There is an immediate need for practical tools for 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 pumps 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 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 a holistic management for the interconnected systems. My future research will focus on developing innovative optimization models and solution approaches for the joint management of conventional and nonconventional 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 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 the 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.

**In Preparation**

* 1. #Salomons E., **Housh M.**, Optimization of variable speed pumps for efficient energy utilization
  2. $Kadosh N., **Housh M.**, Semi-supervised approach for detecting and localizing cyber-attacks in water distribution systems
  3. **Housh M.**, Mixed integer linear models for optimization of multi-quality regional water systems

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. [↑](#footnote-ref-1)
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. [↑](#footnote-ref-2)