

**Sustainable Water Management  
Doctoral Programme (Water4All)**



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<b>Title of the PhD Project</b>	Prioritizing mitigation measures for minimizing water pollution in river basin management
<b>Acronym</b>	PMM4MWP
<b>Research Fields of the Project</b>	Environmental modeling, Water pollution, River basin management
<b>Keywords</b>	Mathematical modeling, prioritization, surface water quality modeling, optimization, artificial intelligence
<b>Host Institution, Department and Campus Location</b>	Izmir Institute of Technology Department of Environmental Engineering Gülbahçe Campus, İzmir, Türkiye
<b>PhD Awarding Institution and Graduate Programme</b>	Izmir Institute of Technology Graduate School PhD in Environmental Engineering
<b>Name and Affiliation of Main Supervisor</b>	Prof. Dr. Orhan GÜNDÜZ Izmir Institute of Technology Department of Environmental Engineering and Department of International Water Resources
<b>Name and Affiliation of Co-Supervisors</b>	Assoc. Prof. Dr. Hatice Eser ÖKTEN, Izmir Institute of Technology Prof. Dr. Alper BABA, Izmir Institute of Technology
<b>Research Environment and Infrastructure</b>	The selected candidate will have access to the research infrastructure available at Izmir Institute of Technology.
<b>Scientific Context of the Project</b>	Mathematical modeling is a fundamental tool in river basin management plans. Surface water quality models are developed to simulate the conditions along the river system and to test the consequences of numerous mitigation measures planned to reduce pollution loads to the water bodies. The prioritization of alternative mitigation options is a major problem to be solved. Optimization techniques are valuable tools to prioritize and rank these measures and choose among many alternatives on a quantitative basis. The use of artificial intelligence techniques can serve as a viable method and be incorporated into classical optimization algorithms. The results of optimization will help the decision making procedures in river basin management to be done on a more unprejudiced basis.

<p><b>Brief Workplan</b></p>	<p>The main aim of this research is to develop a simulation-optimization model for water quality modeling in a river system to prioritize mitigation measures. The developed model is expected to overcome major mathematical difficulties associated with not only simulation model but also optimization model by incorporating AI tools. A tentative work plan is given as follows:</p> <ol style="list-style-type: none"> <li>1. Conceptualizing the water quality simulation model in a river basin</li> <li>2. Conceptualizing the optimization model</li> <li>3. Mathematical formulation of the simulation-optimization model</li> <li>4. Incorporating AI tools</li> <li>5. Model testing and implementation</li> </ol>
<p><b>Innovative Aspects of the Project</b></p>	<p>Mathematical modeling of water quality in rivers, optimization in a highly non-linear environment, utilization of AI tools to improve optimization performance</p>
<p><b>Training Opportunities of the Project</b></p>	<p>The doctoral candidate will have a chance for training on subjects such as river basin management, water quality modeling, basin planning, field applications, optimization and artificial intelligence tools in renown government and private organizations as well as academic institutions. The training program will be custom designed for the selected candidate according to his/her needs and interests.</p>
<p><b>Interdisciplinary Aspects</b></p>	<p>This research involves topics on mathematics, hydrology, hydraulics, optimization and management.</p>
<p><b>Intersectoral Mobility</b></p> <p><input type="checkbox"/> Short Visit</p> <p><input checked="" type="checkbox"/> Secondment</p>	<p>General Directorate of Water Management</p>
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<p><b>International Academic Secondment</b></p>	<p>Villanova University</p>

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<b>Brief CV</b>	<p><b>Prof. Dr. Orhan GÜNDÜZ</b></p> <p>E-mail: <a href="mailto:orhangunduz@iyte.edu.tr">orhangunduz@iyte.edu.tr</a></p> <p><b>Academic Degrees</b></p> <table><tr><td>Ph.D.</td><td>Environmental Engineering, Georgia Institute of Technology, USA</td><td>2004</td></tr><tr><td>M.Sc.</td><td>Civil Engineering, Georgia Institute of Technology, USA</td><td>2000</td></tr><tr><td>M.Sc.</td><td>Environmental Engineering, Middle East Technical University, Türkiye</td><td>1997</td></tr><tr><td>B.Sc.</td><td>Environmental Engineering, Middle East Technical University, Türkiye</td><td>1994</td></tr></table> <p><b>Professional Networks</b></p> <p>Google Scholar: <a href="https://scholar.google.com/citations?user=zmlGAlsAAAAJ&amp;hl=en">https://scholar.google.com/citations?user=zmlGAlsAAAAJ&amp;hl=en</a></p> <p>ResearchGate: <a href="https://www.researchgate.net/profile/Orhan-Gunduz">https://www.researchgate.net/profile/Orhan-Gunduz</a></p> <p>Scopus: <a href="https://www.scopus.com/authid/detail.uri?authorId=9743239900">https://www.scopus.com/authid/detail.uri?authorId=9743239900</a></p> <p>ORCID: <a href="https://orcid.org/0000-0001-6302-0277">https://orcid.org/0000-0001-6302-0277</a></p>	Ph.D.	Environmental Engineering, Georgia Institute of Technology, USA	2004	M.Sc.	Civil Engineering, Georgia Institute of Technology, USA	2000	M.Sc.	Environmental Engineering, Middle East Technical University, Türkiye	1997	B.Sc.	Environmental Engineering, Middle East Technical University, Türkiye	1994
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<b>Brief CV</b>	<p><b>Assoc. Prof. Dr. Hatice Eser ÖKTEN</b></p> <p>Email: <a href="mailto:haticeokten@iyte.edu.tr">haticeokten@iyte.edu.tr</a></p> <p><b>Academic Degrees:</b></p> <table><tr><td>Ph.D.</td><td>University of Wisconsin-Madison, Madison, Wisconsin, USA</td><td>2008</td></tr><tr><td>M.Sc.</td><td>İstanbul Technical University, Türkiye</td><td>2002</td></tr><tr><td>B.Sc.</td><td>İstanbul University, Türkiye</td><td>1999</td></tr></table> <p><b>Professional Networks</b></p> <p>Google Scholar:</p>	Ph.D.	University of Wisconsin-Madison, Madison, Wisconsin, USA	2008	M.Sc.	İstanbul Technical University, Türkiye	2002	B.Sc.	İstanbul University, Türkiye	1999			
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<b>Brief CV</b>	<p><b>Prof. Dr. Alper BABA</b></p> <p>E-mail: <a href="mailto:alperbaba@iyte.edu.tr">alperbaba@iyte.edu.tr</a></p> <p><b>Academic Degrees</b></p> <table><tr><td>Ph.D. Hydrogeology, Dokuz Eylül University, Türkiye</td><td>2000</td></tr><tr><td>M.Sc. Geological Engineering, Dokuz Eylül University, Türkiye</td><td>1995</td></tr><tr><td>B.Sc. Geological Engineering, Dokuz Eylül University, Türkiye</td><td>1992</td></tr></table> <p><b>Professional Networks</b></p> <p>Google Scholar: <a href="https://scholar.google.com.tr/citations?user=QVgCMkEAAAAJ&amp;hl=en">https://scholar.google.com.tr/citations?user=QVgCMkEAAAAJ&amp;hl=en</a></p> <p>ResearchGate: <a href="https://www.researchgate.net/profile/Alper-Baba">https://www.researchgate.net/profile/Alper-Baba</a></p> <p>Scopus: <a href="https://www.scopus.com/authid/detail.uri?authorId=7201982375">https://www.scopus.com/authid/detail.uri?authorId=7201982375</a></p> <p>ORCID: <a href="https://orcid.org/0000-0001-5307-3156">https://orcid.org/0000-0001-5307-3156</a></p>	Ph.D. Hydrogeology, Dokuz Eylül University, Türkiye	2000	M.Sc. Geological Engineering, Dokuz Eylül University, Türkiye	1995	B.Sc. Geological Engineering, Dokuz Eylül University, Türkiye	1992
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