Water-Adaptive Design & Innovation
The WADI Lab 2017

WADI backgrounds - WADI, the Water-Adaptive Design & Innovation lab, is a new interdisciplinary and international-driven initiative, adopted as a human-water-oriented atelier for creation, promoted in the core of the running NIBH lab (former PUB/IAHS initiative*), and co-inspired from the Panta Rhei initiative ("everything flows")**. With WADI, practitioners, scholars, students, community, and the wide public can co-create and participate in new solutions related to water resources with great skill and imagination, using the best design and innovative disruption procedures.

WADI features - WADI is a vibrant, collaborative, close-knit community bound by respect, friendship, and a commitment to the University institution, its values and mission, under the Anthropocene.

WADI Core Values and Principles - Core Values, Interdisciplinary, Innovation, International Diversity, Design-based Solutions and Water Engineering Resilience; Principles: Original water D&I solutions, worthy artisanal creation adapted to water extremes, high-impact water projects, human-water D&I approach, low-cost water-adaptive D&I process

WADI Motto - Inclusive climate is valued at WADI because we know that diversity in experiences and perspectives is vital to advancing innovation, critical thinking, solving complex problems, and creating an inclusive academic community. In WADI, we translate these values into action by seeking individuals who have experience and expertise working with diverse students, colleagues and constituencies.

WADI Vision - with the emerging field of Socio-Hydrology in the Antropocene, inspired by Panta Rhei initiative, WADI prepares the next generation of water leaders and entrepreneurs to address complex real-world problems through disruptive innovation, solutions and design on water engineering & science.

WADI Mission - as a multi-disciplinary and research-engaged environment of Socio-Hydrology, WADI is dedicated to incubating innovation, excellence and success, with mentored teaching, research and alliances, as daring as transformative, to contribute significantly to a sustainable intellectual and economic development of communities, connecting ideas with people and redefining a unique experience for our changing Society of the Anthropocene

WADI Targeted Areas:

Solutions of Socio-Hydrology for the Changing Anthropocene

Innovative Coupled Human-Water Systems for Smart Cities

Resilient Water Engineering to Cope with Water Insecurity

'Human-in-the-Loop' (HITL) Design for Hybrid Water Models

Protective-based risk management VS adaptive-based resilience (AbR)

Synthovation** and Design for Environment (DfE)**

(*) With architect Chris Brasier, Prof. Vallero coined the term "synthovation," as a new design process for green engineering and green architecture. A combination of synthesis and innovation, sustainable design does not consider innovation to be an interruption (feedback loop) to the design process as in traditional "concept to completion" design. Rather, innovations are to be expected and integrated. Differing from the traditional step-wise process, synthovation is a spiral, dynamic, and continuously moving process toward completion of the design and throughout the life of the project, including end-of life recycling and design for disassembly, a component of design for environment(DfE), with innovations added along the way that will increase the sustainabilityof the project over its entire life cycle

WADI Tools and Strategies: Water Resources Sustainability, Climate-Resilient Water Utilities, Human-Water Sensing and Participatory Information Systems, Adaptive Water Decision Systems, Water Security &

Insurance, Water Footprinting and Multidimensional Water Balance, Socio-Eco-Hydrology, Secure Freshwater with Water Funds and Public Engagement, Water Livable Communities

Global Initiatives for WADI:

Sustainable Development Goals(SDG), Disaster Risk Reduction (DRR), Ecosystem-based Adaptation (EbA) and Panta Rhei

Examples of WADI Engineering Solutions:

Urban Water Conservation & Efficiency, Stormwater Management, Water Restoration & Remediation, Alternative Water Sources and Harvesting, WaterSSR* (*Sustainable, Smart, and Resilient) Infrastructure, Water, Sanitation, and Hygiene (WASH) and Humanitarian Engineering, Resource recovery from anthropogenic-water born wastes, Life-cycle water systems linked to the Water-Energy-Food nexus.

Some WADI Actions:

- Develop a new generation of spatially distributed hydrologic models that integrate biological, water quality, and physical processes across natural, built, and agricultural landscapes,
- Data and information systems that integrate information from multiple sources to advance data-based and data-intensive approaches to solving water problems,
- Quantify and forecast water uses in food, energy, transportation, and other resource systems and predict how uses will change as population grows and land use changes,
- Model urban, agricultural, and environmental water requirements, use behaviors, and expected changes as a result of climate change and urban growth,
- Characterize impacts of changing infrastructure and its operation on water quantity and quality in surface and groundwater systems,
- Develop strategies to remove, modernize, or leapfrog aging infrastructure in the face of urbanization and changing user preferences for environmental amenities and services,
- Develop flexible modeling, visualization, and engagement tools that will help competing water users better meet their water needs in the face of rapid population growth, urbanization, climate change, aging infrastructure, and shifting societal values for water
- Train a cohort of outstanding science and engineering master, doctoral students and postdocs with world-class skills who combine engineering rigour with understanding of natural processes and ecosystem functions to manage water in all its forms and so deliver water sustainability and resiliently.
- Engineering understanding of pollutants in wastewater reuse
- Working with nature: The role of ‘ecosystem engineers’
- Sensing technologies for intelligent water resource use in human-impacted systems

- Integrating ecosystem function with water hazard alleviation
- Agricultural sustainability in urban floodplains of mega-cities
- Water Resources Sustainability (to address sustainable water solutions in areas such as water supply, storm water, resilient water systems, system impacts from global warming, and/or green engineering)
- Water Resources Resilience (integrated, resilient solutions to water problems across natural, built, and agricultural environments and develop ways to better manage water in these environments in the face of anticipated short- and long-term changes at local, regional, or larger scales)
- Resilient and Sustainable Infrastructure Systems (areas of civil and environmental coastal systems, including interdependent critical infrastructures and lifeline resilience, design of complex civil engineering systems in the face of global climate challenges, multi-hazard risk assessment of infrastructure systems, network topology optimization and modeling, and sustainable energy solutions)
- Water Sustainable, Smart, and Resilient Infrastructure (WSSRI) (sustainable design of built environment, sustainable materials and systems, and resilient infrastructure, 1- reliability analysis of civil infrastructure, 2- performance-based design, sensing, and analysis to promote safe, durable, sustainable, and reliable infrastructure, 3- development of multifunctional materials and members for smart and green infrastructure, 4-multiscale infrastructure interactions and computational modeling, 5- civil infrastructure risk assessment, 6- low impact development design, and 7- life cycle analysis and assessment

WADI's contributions to education:
integrating gender/culture issues into water science and engineering curriculum, teaching methods student observation and mentoring strategies, preparing graduates for academia and for industry, learning models and learning from mistakes, experiences and good practices, student recruitment and retention methods, promoting multi-disciplinary initiatives - impact on curriculum, innovative uses of technology in the classroom, collaborative learning, co-evaluation & co-learning strategies between professor and students

WADI's contributions to research:
STEM (Science, Technology, Engineering & Mathematics) initiatives, partnerships with industry and government, virtual laboratories, capstone research projects: examples and case studies, profits from former undergraduate research experiences, balance between course-work and research, advising methods

WADI's contributions to outreach and extension:
ethics in water science and engineering, visualization, communication and delivery of high-impact solutions, computer and web-based instruction, distance training & learning; methods, technologies and assessment, team projects and case studies, re-engineering projects and laboratory practices

WADI Participants and Collaborators (under progress):

Altair Rosa – PUC-PR & EESC-USP, Brazil
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Associated WADI Support Projects (2017):

2016-2017, UK-EPSRC, Eng. & Physical Sciences Research Council, UK-Brazil Collaboration for Urban Resilience, Coord.: Prof. J. P. de Albuquerque, The Univ of Warwick, UK.
2014-2019, CAPES 24/2014 - Pró-Alertas, Alerta CEPED-USP, Coord. Geral: Prof. C. Morales, IAG/USP.
2013-2019, USP 2013.1.14234.1.1 - CEPED–USP/NAP – Centro de Estudos e de Pesquisas de Desastres, Coord. Geral: Prof. H. Yoshizaki EP/USP
2013-2019, INCLINE - USP/NapMC – Fase II (INterdisciplinary CLimate INvEstigation Center)/NAP Mudanças Climáticas, Coord: Prof. T. Ambrizzi, IAG/USP e Prof. P. Artaxo, IF/USP
2016-2017, FAPESP - 2016/18487-1 Escola São Paulo de Ciência Avançada, Coord. Geral: Prof. T. Ambrizzi, IAG/USP
2016-2020, CNPq 465501/2014-1+ FAPESP 2014/50848-9 INCT-II Mudanças Climáticas, Coord Geral: Dr. J. Marengo, CEMADEN/MCTIC & Prof. T. Ambrizzi, IAG/USP

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WADI Photos (in progress)

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