



### Issue 27 October 2023

## Vice President of SJTU Prof Zhang Zhaoguo visits APGI&E2S2 on 8 Sep 2023



Shanghai Jiao Tong University Vice President Prof Zhang Zhaoguo visited SJTU-APGI, including the new site of classroom at One North and E2S2 programme on 8 September 2023. The Vice Dean, SJTU-APGI, Ms Meng Jia briefly introduced about the history, progresses and achievements of SJTU-APGI and CREATE-E2S2. E2S2 ES-2 project lead PI, the Vice Dean of SJTU China-UK Low Carbon College, Prof He Yiliang guided Prof Zhang and the delegation to visit E2S2 office and laboratory facilities. Prof Zhang communicated with PhD students from SJTU who came to Singapore for exchange/joint PhD programme. Students shared their living and study experiences in Singapore. Prof Zhang encouraged them to interact more with NUS and NTU students. During the lab tour, Prof He demonstrated the lab facilities currently being used for E2S2 programme and several intra-create projects. Prof Zhang affirmed the development of APGI and hoped that more E2S2 research technologies could be adopted and transferred to the industry.

The representative from SJTU International Affairs Division, Ms Wang Jin also attended the delegation.

## E2S2 Spin-off company: Aquashield Solutions Inc

**Aquashield Solutions Inc**, a NUS spin-off company, is dedicated to advancing digital water quality management through cutting-edge technologies. Our mission is to enhance digital water quality through integrated monitoring and modelling techniques. We offer a comprehensive, intelligent solution to proactively address the threat of water pollution. Our approach leverages advanced analytical technology, real-time sensors, and a cloud-based modelling platform. We have the capability to rapidly detect more than 250 chemical and microbiological contaminants with exceptional sensitivity and precision in our world-leading analytical laboratory. Our advanced water quality models, which incorporate bio-chemical markers, offer reliable and accurate early warning predictions and source tracking. With our innovative solutions, we are committed to safeguarding water quality and ensuring the well-being of our environment.

We are a team of environmental scientists from National University of Singapore with over 20 years of combined water quality management experience.



Dr Xuneng Tong Environmental modelling expert, Research fellow, NUS Email: xunengtong@aquashield.cc



COO Sing Hng Ng MBA NUS, Demand manager, Dow Chemical Email: singhng@aquashield.cc



CTO Dr Luhua You Environmental chemistry expert, Research fellow, NUS Email: luhuayou@aquashield.cc



Chief Microbiology Scientist Dr Shin Giel Goh Environmental microbiology expert, Senior Research Fellow, NUS Email: sggoh@aquashield.cc



Co-founder Prof Karina Yew-Hoong Gin Water Quality Management expert



Co-founder Prof Jingjie Zhang Environmental and Ecological Modelling expert

## E2S2 Spin-off company: Aquashield Solutions Inc





# SOLUTIONS

## Contact us:

## Website: www.aquashield.cc

LinkedIn:



## **Recent accepted/published papers from E2S2:**

#### Improving urban ecosystem holistic sustainability of municipal solid waste-to-energy strategy using extended exergy accounting analysis

#### Journal: Science of The Total Environment

Authors: Jianrui Liu, Harn Wei Kua, Chi-Hwa Wang, Yen Wah Tong, Jingxin Zhang, Yinghong Peng

Keywords: Extend exergy accounting; Municipal solid waste; Urban ecosystem; Waste-to-energy

#### Cost-benefit model; Sustainability indicator;

#### Author's words:

Waste-to-energy technologies play a crucial role in integrated waste management strategies to reduce waste mass and volume, disinfect the waste, and recover energy; different technologies have advantages and disadvantages in treating municipal solid waste under urban conditions. This paper applies the extended exergy accounting method to develop an analytical framework to identify the optimal waste-to-energy strategy from an urban ecosystem holistic sustainability perspective. In the analytical framework, urban ecosystem costs and revenues are formulated as a multicriteria cost-benefit quantitative model. The urban ecosystem cost is divided into five categories, and the urban ecosystem revenues consist of direct and indirect parts. The direct part is the chemical exergy of the waste-to-energy plants produced product, and the indirect part includes equivalent exergy content of power generation substitution, human health risk elimination, disamenity impact removal and environmental degradation avoidance. Proposing an indicator system to evaluate the waste-to-energy strategy impact on the sustainability of the urban ecosystems and social, economic and environmental sub-ecosystem. Detailed analysis of food waste treatment scenarios of a food center in Singapore was done as a case study to illustrate this analytical framework. Base scenario is current practice that food waste disposal in incineration plant. Anaerobic digestion and gasification are proposed as potential technological solutions for on-site food waste treatment in scenario I and II respectively. In different scenarios, the urban ecosystem costs are estimated to be 71,536.01, 61,854.87 and 74,190.34MJ/year respectively, and the urban ecosystem revenues are estimated to be 135,312.66, 405,442.53 and 298,426.81MJ/year respectively. We show that the scenario where food waste is treated by anaerobic digestion outperforms both the base scenario and scenario II in terms of urban ecosystem costs and revenues, technical energy conversion efficiency, contribution to urban ecosystem holistic sustainability, and natural, social, and economic subsystems improvement, making it the optimal municipal solid waste-to-energy strategy choice.



#### **Highlights**

- EEA method is to analyze MSWtE strategy sustainability.
- Input and output flows into MSWtE are categorized into five EEA categories.
- A sustainability indicator system measures MSWtE strategy performance.
- Case study of food waste treatment in Singapore was studied.
- The optimal scenario for UE sustainability is food waste anaerobic digestion.

#### http://e2s2-create.org/