



**WUN**  
WORLDWIDE  
UNIVERSITIES  
NETWORK



**NEHU**

  
WUN Global Research Group  
SDGs in Asia



# Shaping the Future Agenda of SDGs in Asia

The Innovative & Transformative Approach

2021-2022



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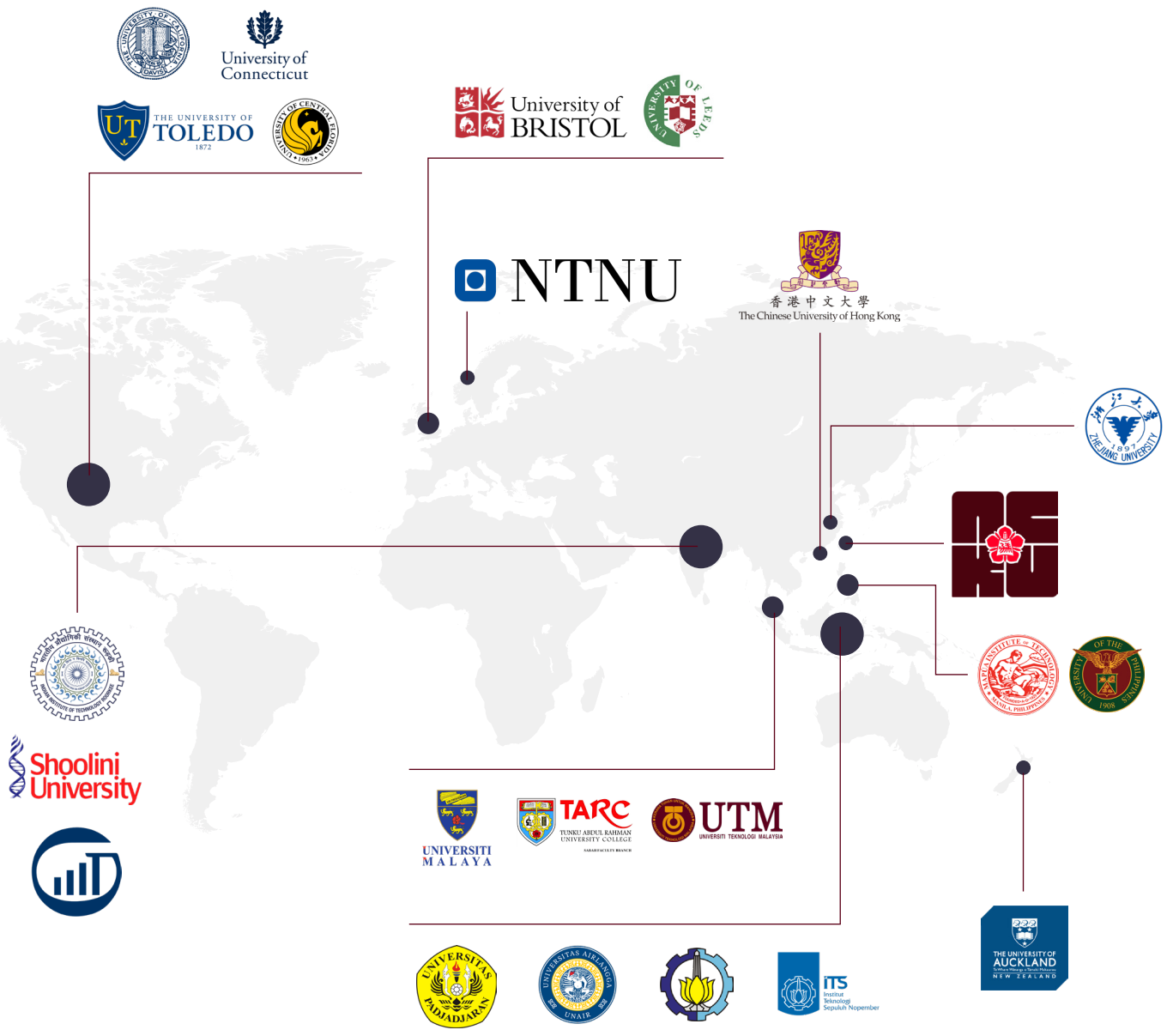
# ABOUT THE WUN GLOBAL RESEARCH GROUP—SDGS IN ASIA

Chaired by the National Cheng Kung University (NCKU) and supported by the Worldwide Universities Network (WUN), WUN Global Research Group—SDGs in Asia is a group that promotes research aimed at implementing the United Nations sustainable development goals (SDGs) in Asia.

2021-2022, the group runs 11 projects in collaboration with 20 institutions across the world, focusing on SDG 3 (Good Health and Well-Being), SDG 6 (Clean Water and Sanitation), and SDG 7 (Affordable and Clean Energy).

By providing seed funding and a supporting network of scholars and researchers from different regions, we aim to build a shared platform that can eventually produce thorough and comprehensive solutions to the SDG-related problems in Asia.





**11**

Research Projects

**54**

Researchers

**23**

Institutions

**11**

Countries

**4**

Continents



# GOOD HEALTH AND WELL-BEING



## Investigating psychological needs in Asian countries with varying severities of COVID-19 outbreak

The COVID-19 pandemic brought about many lifestyle changes, leading to psychosocial distress. However, did it impact the mental health of different population in the same way?

This project headed by Prof. Chung-Ying Lin from NCKU aimed to answer this question, and get a better perspective on the pandemic's effect on people's psychological needs. To do so, they assessed psychological distress and protection behaviors via online surveys between three different populations— Taiwanese outpatients, Taiwanese healthcare workers, and the general population in Hong Kong—who were subject to varying situations during the pandemic.

They found some interesting findings! The Taiwanese populations, which had greater COVID-19 severity, were more fearful of the disease, and yet, complied lesser with COVID-appropriate protection behaviors compared to the Hong Kong population. The latter, in turn, showed lower levels of psychological distress.

Principal investigator:  
Prof. Chung-Ying Lin



Co-investigator:  
Dr. Gary Ka-Ki Chung



Co-investigator:  
Prof. Nai-Ying Ko,  
Prof. Carol Strong



Co-investigator:  
Dr. Iqbal Pramukti





## Assessing the relationships among physical literacy, perceived health status, physical fitness, and aging

According to World Population Prospects 2019 (UN, 2019), 16% of the world's population will be over 65 years old in 2050, almost doubling from 2019. This could give rise to significant population challenges due to aging.

Hence, with the goal of promoting healthy aging, a two-part project led by Prof. Linda Lin of NCKU is assessing physical fitness in the elderly. They have built a survey instrument—Senior Perceived Physical Literacy Instrument (SPPLI)—to examine the relationships between physical literacy, fitness, exercise, and aging in the elderly. They now plan to use it in the elderly population and identify its association with the Senior Functional Fitness Test.

The Chinese version of this study has been completed and published in the journal and presented at the international conference—the 2022 World Congress on Exercise in Medicine— and the results of their empirical research among 341 Taiwanese seniors revealed that SPPLI possesses proper reliability and validity to assess physical literacy among older adults.





Principal Investigator: Prof. Linda Lin	Co-investigator: Dr. Raymond Kim-Wai Sum	Co-investigator: Prof. Jiunn-Jye Sheu
	 香港中文大學 The Chinese University of Hong Kong	



## Examining healthy aging among Taiwanese communities

The healthy aging concept which has been actively promoted by WHO encourages older adults to maintain their physical, social, and spiritual activities throughout a lifetime, in order to age better. The benefits of maintaining an active lifestyle and healthy social connections are manifold. They eventually enhance one's quality of life, which is what this project, headed by Prof. Li-Fan Liu of NCKU, aimed to prove.

Based on a preliminary study among 1032 elder adults from rural areas in Taiwan, the group reports that people who exercised regularly and maintained ties with their family and the community had better mental health and quality of life, apart from being more physically fit. Exercising was significantly associated with feeling less stress, less depressed, and more satisfied with life. This research proposes a multifaceted approach—extending from individual solutions to public policy efforts—in promoting healthier lifestyles.

Principal Investigator: Prof. Li-Fan Liu	Co-investigator: Prof. Su-I Hou	Co-investigator: Prof. Helene Hoi-Lam Fung	Co-investigator: Prof. Li-Chung Lin Prof. Shyhnan Liu
		 香港中文大學 The Chinese University of Hong Kong	



## Building comprehensive integrated care networks and digital solutions for older people and their caregivers

As discussed earlier, our world today has a large ageing population with many healthcare needs. Providing comprehensive integrated care services to meet these needs is proving to be a challenge worldwide, which is why this project led by Prof. Shan Yan-Shen of NCKU is trying to develop a sustainable care network for the elderly, leveraging technology to build a resilient healthcare system. The three-part project is expected to establish feasible, effective, sustainable, and scalable digital-health-facilitated models of integrated care for older people and their caregivers, within and beyond traditional healthcare systems. The team developed questionnaires to help identify frail older people and caregivers at risks, surveyed these people, established more than 10 integrated care units to cater to their

health needs, and designed a digital integrated care management protocol and portal based on the feedback received from the integrated care units.

This re-orientation of traditional healthcare systems could help link various information sources and support clinical decision-making while managing the healthcare needs of older people.






<p>Principal Investigator: Prof. Shan Yan-Shen</p> 	<p>Co-investigators: Prof. Ping-Yen Liu, Prof. Meng-Ru Shen, Prof. Yi-Ching Yang, Dr. Chieh-Hsiu Liu</p> 	<p>Co-investigator: Dr. Katherine Bloodfield</p> 
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### Applying computational modelling to study the nutritional aspect of millets

According to the WHO Global Nutrition Report (2018), South-East Asia, especially India, is dealing with a double burden of malnutrition and lifestyle disorders such as obesity, diabetes, osteoporosis, and hypertension. Many agencies have taken biofortification initiatives and the addition of mineral-enriched foods to combat malnutrition and age-related health disorders. In India, the superfood millets are at the forefront in the government initiatives to combat the malnutrition.



Millets are highly nutritious as they are packed with proteins and minerals. But research suggests that the amount of dietary fiber in these foods may hamper the absorption of other nutrients and minerals. More research on the interplay between dietary fiber and nutrients in fortified food was needed, and so, this project led by Dr. Apramita Devi from the University of California, Davis, is studying how dietary fiber affects the bioavailability of other minerals in millets using computational modelling. Their results revealed some interesting insights about the metabolism of potassium, calcium, and zinc present in millets. Prof. Tsair-Fuh Lin of NCKU is also part of the project; their pathbreaking research might help solve the problem of food security in many countries.

<p>Principal Investigator: Dr. Apramita Devi</p> 	<p>Co-investigator: Prof. Tsair-Fuh Lin</p> 	<p>Co-investigator: Dr. Helen Chappell</p> 	<p>Co-investigator: Dr. Shovan Barma</p> 	<p>Co-investigator: Dr. Sakshi Thukral</p> 
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### Assessing how Meals on Wheels influences the health of seniors

Supplying senior citizens with timely meals is imperative to ensure their health and well-being, which is a national priority in Indonesia. Meals on Wheels (MoWs), a meal delivery service, can help those with restricted access to healthy food. A project spearheaded by Dr. Angeliki Papadaki from the University of Bristol has now found that 85% of the seniors who avail of MoWs in Surabaya, Indonesia had good mental health and quality of life. The seniors were satisfied with the food and service, indicating its usefulness. Further in-depth surveys among participants also revealed how MoWs and other similar services can be improved upon.

<p>Prime Investigator: Dr Angeliki Papadaki</p> 	<p>Co-investigators: Bani Bacan Hacantya Yudanagara, Dr. Endang R. Surjaningrum, and Achmad Chusairi</p> 
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## Potential food safety risk from using online food delivery platforms during the COVID-19 pandemic in Taiwan

Access to nutritious and clean food is one of the cornerstones of good health. During the COVID-19 lockdowns, people commonly resorted to online food deliveries (OFDs) as a means of accessing food. In Taiwan, 55.9% of the population ordered food online at least once during COVID-19. While OFDs are very convenient, maintaining hygiene and food safety during preparation and delivery of the food is very important.

A project headed by Prof. Hsiu-Ling Chen of NCKU studied the food literacy of people in Taiwan. They found issues in food hygiene and delivery and suggested ways to improve these. For example, food servers can disclose proper delivery conditions to maintain the meal's quality. Consumers too needed to be better informed of hygienic and safe delivery conditions. OFD services who complied with relevant hygiene certifications should show transparent labels and records of cleaning the delivery box as well, the study suggests.

Prime Investigator:  
Prof. Hsiu-Ling Chen



Co-investigator:  
Dr. Angeliki Papadaki



Co-investigators:  
Dr. Trias Mahmudiono and Dr. Indria Wahyuni



## Contributing to SDG 3: Good Health and Well-Being

Good health means physical, mental, and social well-being

### Surveying mental health during COVID-19 in:



**192**  
Taiwanese  
outpatients

**500**  
Taiwanese  
healthcare workers

**1067**  
Hong Kong  
citizens

**1**  
publication (2021–2022)

**1**  
scholarly event

### Assessing physical literacy



Community exercise program to be eventually instituted

**2**  
publications  
(2021–2022)

**2**  
scholarly  
events

### Examining healthy aging among communities



Supported by grants from **2026 aging society with group partnerships**; won the **Excellent community model** award

**3**  
publications  
(2021–2022)

**4**  
conferences

**7**  
workshops

**3**  
community  
events held

### Ensuring better healthcare for the elderly



Through an integrated care service supported by innovative digital solutions

**10**  
publications  
(2021–2022)

**1**  
conference

**8**  
workshops

**3**  
industrial visits

### Studying the nutritional aspect of millets



Interactions between dietary fiber and minerals elucidated

**1** workshop

### Food safety for better health



Looking at the outcomes of Meals on Wheels in Indonesia and food safety among online food delivery chains

**1** workshop

**1** industrial visit



# CLEAN WATER AND SANITATION



## Drinking water quality: sharing the technologies and identifying the issues

Water conservation is a critical aspect in achieving the sustainable development goal (SDG) of clean water and sanitation. The world is witnessing a rising urban population and a demand for a good quality water supply, which puts a lot of pressure on the drinking water treatment plants (DWTPs). Treatment of raw water for drinking supply consumes a considerable amount of direct and indirect energy. Direct energy relates to onsite energy consumption, such as electricity and fuel. In contrast, indirect energy concerns offsite energy consumption, such as the energy cost associated with the water treatment material manufacturing, transport, chemicals, etc.

For the water treatment process, aeration is often the first major step. The efficiency of aeration depends on the amount of surface contact between air and water. There are various types of aeration systems employed by DWTPs globally. To achieve SDG, it is essential to study the energy demands and efficiency of different aeration systems to make the water treatment process cost-effective. Therefore, this proposed research aims to quantify and compare the direct and indirect energies of various aeration systems in the water treatment plants in Taiwan, Indonesia, New Zealand, and the Philippines.

Principal Investigator:  
Prof. Tsair-Fuh Lin



Co-investigator:  
Prof. IDAA Warmadewanthi

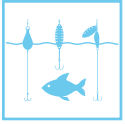


Co-investigator:  
Prof. Delia B. Senoro



Co-investigator:  
Dr. Alison Subiantoro





## Quantification of end-of-life fishing gear stocks to prevent marine litter

Every year, approximately 640 thousand tonnes of fishing gear are abandoned, lost or discarded into the ocean. This is problematic as it can entangle fish, suffocate corals, spread invasive species, break down into ingestible smaller pieces and possibly transport chemicals back into the human food chain. Taiwan is an East Asian Island state with one of the world's largest fishing fleets and a corresponding high marine litter pollution level. To develop better marine litter prevention policies in Taiwan, there is a need to quantify fishing gear stocks and flows, including the identification of important leakage points across the whole value chain.

This research addresses this issue by conducting a material flow analysis (MFA) of commercial fishing gears in Taiwan.

Principal Investigator:  
Dr. Falk Schneider



Co-investigator:  
Prof. Hsin-Tien Lin



Co-investigator:  
Dr. Aydin Nassehi



Co-investigator:  
Paritosh Deshpande



## Water Treatment and Prevention of Marine Pollution for Clean Water

### Treatment of drinking water



Water treatment plants (WTPs) studied in Taiwan, Indonesia, the Philippines, and New Zealand



Water quality analyzed to determine the effect of aeration process in improving water quality



Life cycle assessment (LCA) performed for determining environmental impact of aeration unit

### Prevention of marine littering



Material flow analysis (MFA) of commercial fishing gears in Taiwan



Maximum dissolved oxygen increments  $\sim 3.6 \text{ mg L}^{-1}$



Raw drinking water in Taiwan showed lower water quality than in Indonesia

### List of publications (2021-2022)



Emerging contaminants in Taiwan's Drinking Water Systems and their Regulations



An estimated 800 tonnes of commercial fishing gear discarded into the ocean every year



Reclaimed Water in Taiwan: Current status and future perspective



Systematic data collection needed to monitor and manage fishing gear waste



# AFFORDABLE AND CLEAN ENERGY



## Integration of renewable energy resources with energy-storage and control systems using microgrids

The power generated from renewable energy resources (RERs) can be integrated together by means of different microgrid (MG) systems. In this study, researchers established the required models for an MG with a common DC link connected to various models through equivalent power-electronics converters. In addition, they systematically utilized the frequency-domain eigenvalue analysis and time-domain dynamic and transient simulations to evaluate the stability of the whole studied system under various operating conditions.

Principal Investigator: Prof. Li Wang	Co-investigators:							
	Dehong Xu	Hazlie Mokhlis	Kein Huat Chua	Manoj Tripathy	Thi Ha Nguyen	Mohammed Mehdi Farid, Alison Subiantoro	Kang Li, Benjamin Chong, Sadegh Azizi, Amir Abiri Jahromi	



## High-capacity energy storage based on affordable and environmentally-friendly materials

This research involves three distinct yet related areas: (1) conductive electrode materials with minimum toxic metals, (2) polymeric porous materials based on environmentally-friendly components as battery electrodes, and (3) ionically conductive functional materials as high-performance solid-state electrolytes.

Principal Investigator: Prof. Watchareeya Kaveevitvachai	Co-investigator: Prof. Teng-Hao Chen
Co-investigator: Dr. Huan Doan	Co-investigator: Prof. Wei Gao, Dr. Shanghai Wei, Prof. Mohammed Farid



## New developments in synthesis of renewable fuels

This project aims to develop a holistic platform where renewable fuels are produced from lipid-based feedstock. A dual-fuel integrated bio-refinery (DFIB) approach, which produces biodiesel from inferior feedstock and uses green solvents is proposed. A small-scale laboratory unit has already been developed for the production of renewable diesel using a "homemade" catalyst by applying catalytic hydro-processing.

The production of hydro-processed renewable diesel (HRD) over a non-sulfide catalyst has been investigated. The catalyst's performance was studied under various operating conditions, HRD fuel properties were also tested and compared to conventional diesel standard.

Principal Investigator:  
Prof. Mohammed Farid



Co-investigator:  
Prof. Wei-Cheng Wang



Co-investigator:  
Prof. Rex Demafelis



Co-investigator:  
Prof. Haslenda Hashim



## Towards Clean Energy with High-capacity Energy Storage, Renewable Energy Sources, and Fuels

### Integration of RERs with MGs



Establish required models for DC MG



Frequency-domain eigenvalue analysis and time-domain simulations are utilized

### High-capacity energy storage



Conductive electrodes with non-toxic metals



Battery electrodes made of eco-friendly porous polymers



Ionically conductive functional materials as solid-state electrolytes

### Renewable fuel synthesis



Biodiesel production through glycerolises/transesterification



Renewable diesel production through hydrocracking

### Number of publications (2021-2022)

12

### Number of publications (2021-2022)

21

### Number of publications (2021-2022)

6



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