TITLE:

Kyoto University International Symposium 2022 on Education and Research in Global Environmental Studies in Asia --20 Years of GSGES Achievements and Future Opportunities--

AUTHOR(S):

Poster Presentations

Kyoto University International Symposium 2022

on Education and Research in Global Environmental Studies in Asia

- 20 Years of GSGES Achievements and Future Opportunities -

Graduate School of Global Environment Studies

Kyoto University

2022

KYOTO UNIVERSITY INTERNATIONAL SYMPOSIUM 2022

on Education and Research
in Global Environmental Studies in Asia
- 20 Years of GSGES Achievements and Future Opportunities -

**ONLINE +
KYOTO UNIVERSITY, YOSHIDA CAMPUS**

NOV 24 - 25 , 2022

Extended to NOV.17

Registration Period : ~~OCT.14~~ >>> Check the URL or QR code on the right

No Participation Fee
FREE
of Charge

DAY 1
NOV 24, Thu

14:00 - 14:05	**Opening Speech**
	Prof. Takeshi KATSUMI Dean of GSGES, Kyoto University
14:05 - 14:15	**Keynote Speech**
	Prof. Nagahiro MINATO President of Kyoto University
14:15 - 14:45	**Presentation** - The Past and Present of GSGES
	Prof. Makoto USAMI Vice Dean of GSGES, Kyoto University
14:45 - 14:55	**Video Congratulatory Addresses**
	from partner universities
14:55 - 15:00	**Photo Shooting**

PART 1

BREAK

PART 2

15:20 - 15:50	**Presentation** - Toward International Collaboration in Vietnam
	Emeritus Prof. Shigeo FUJII GSGES, Kyoto University
15:50 - 16:20	**Presentation** - Toward International Collaboration in Thailand
	Prof. Shinya ECHIGO GSGES, Kyoto University
16:20 - 17:00	**Panel Discussion** Coordinator **Assoc. Prof. Gregory TRENCHER**
	Representatives from GSGES and alumni

LANGUAGE
Japanese/ English
Simultaneous Interpretation

PLACE
Online + Maskawa Hall*
* By Invitation Only

DAY 2
NOV 25, Fri

13:30 - 14:45	**Poster Presentations Time**
	14:45-16:30 Online Q&A

BREAK

15:00 - 16:30	**Oral Presentations**

Study Field 1	Study Field 2	Study Field 3
Global Ecology	**Environmental Technology**	**Natural Resources**

16:30 - 16:55	**Ceremony for Best Posters**
16:55 - 17:00	**Closing Remarks**
	Prof. Shinya FUNAKAWA Former Dean of GSGES, Kyoto University

LANGUAGE
English

PLACE
Online

Time is JPT

CALL
for Poster Presentations

All students and young researchers are welcome to participate in online poster presentations. Please find the details on the following website.

>>> https://www2.eip.ges.kyoto-u.ac.jp/symposium2022/

THEMES

All study fields are welcome to submit to the poster sessions. Please choose one of three categories below. You can find the related keywords on the following website.

>>> https://www2.eip.ges.kyoto-u.ac.jp/symposium2022/wp-content/themes/ku-sympo2022/common/data/keyword.pdf

1. **Global Ecology**
2. **Environmental Technology**
3. **Natural Resources**

DEADLINES

Extended to **Oct. 21**

❶ **Registration for Poster Presentation** (Title and Abstract)   October ~~14~~

❷ **Poster Submission Period**   October 28

POSTER DISPLAY PERIOD

November 17 - 28

Best poster presentation will be selected by the selection committee, and awarded in the Closing Session.

NOTE

1. Submitted posters will be released on the website from **November 17**.
2. Posters will be published on Kyoto University Research Information Repository, *KURENAI* with the permission of the presenter.
3. The selection committee may check all posters for consistency with the purpose of this symposium.

KYOTO UNIVERSITY   125th ANNIVERSARY KYOTO UNIVERSITY   GSGES

KYOTO UNIVERSITY INTERNATIONAL SYMPOSIUM 2022
on Education and Research in Global Environmental Studies in Asia
- 20 Years of GSGES Achievements and Future Opportunities -

PRESENTERS

Keynote Speech

Nagahiro MINATO

President of Kyoto University

President Nagahiro Minato will present a congratulatory speech on the 20th aniversary of GSGES, and share his expectations to the future of GSGES.

Opening Speech

Takeshi KATSUMI

Dean of GSGES, Kyoto University

Professor Takeshi Katsumi, the dean of GSGES will provide an opening address to welcome participants and explain the purpose of the symposium.

Presentation
The Past and Present of GSGES: Achievements, Challenges, and Prospects

Makoto USAMI

Vice Dean of GSGES, Kyoto University

Professor Makoto Usami, the vice dean of GSGES will present the progress and prospects of GSGES activities including international collaborations.

Presentation
Toward Long-Term International Collaboration in Education and Research 1

Shigeo FUJII

Emeritus Professor, GSGES, Kyoto University

Emeritus professor Shigeo Fujii will present about various long-term international collaborations with researchers in partner universities, and introduce the publication of collaborative research achievements in Vietnam.

Presentation
Toward Long-Term International Collaboration in Education and Research 2

Shinya ECHIGO

Professor, GSGES, Kyoto University

Professor Shinya Echigo will present the efforts of collaborative research and education with the case of the On-site Laboratory project and the double degree program with Mahidol University in Thailand.

Closing Remarks

Shinya FUNAKAWA

Professor, GSGES, Kyoto University

Professor Shinya Funakawa, the former dean of GSGES, will conduct the ceremony for the best poster award and give a closing speech.

Panel Discussion — Long-Term Prospects for International Collaboration over the Next 20 Years

Coordinator

Greogory TRENCHER
Associate Professor
GSGES, Kyoto University

Panelists

Minori TOKITO
Assistant Professor
GSGES, Kyoto University
- Graduated GSGES in 2018

Suwanna BOONTANON
Associate Professor
Mahidol University
- Program-Specific Associate Professor (Cross Appointment)

Ayako FUJIEDA
Lecturer
Kyoto Seika University
- 1st GSGES Graduate
- Former GSGES Asst. Professor

Shigeo FUJII
Emeritus Professor, GEGES, Kyoto University

Shinya ECHIGO
Professor, GEGES, Kyoto University

GEGES alumni and professors at Kyoto University will discuss their long-term international collaborations for education and research in the field of global environmental studies in Asia and exchange ideas for future opportunities.

ORAL RESEARCH SESSIONS

Study Field 1
Global Ecology

Global Environmental Challenges – A Multi-Disciplinary Perspective

Coordinator
Roger BAARS
Senior Lecturer, GSGES, Kyoto University

Presenters
- **Kumie HATTORI** / Researcher, GSGES, Kyoto University
- **Khalifatulloh (Aldi) FIEL'ARDH** / Asst. Research Professor, Education for Sustainable Development Promotion Center, Okayama University
- **Junko KONDO** / Ph.D. Candidate, GSGES, Kyoto University

Study Field 2
Environmental Technology

Plastics Management and Microplastics Issues in Asia

Coordinator
Shuhei TANAKA
Associate Professor, GSGES, Kyoto University

Presenters
- **Jira KONGPRAN** / Assistant Professor, Walailak University
- **Yuji SUZUKI** / Associate Professor, Gifu University
- **Sachithra IMBULANA** / Ph.D. Candidate, GSGES, Kyoto University

Study Field 3
Natural Resources

Natural Resources Utilization for Urban/Rural Development

Coordinator
Izuru SAIZEN
Professor, GSGES, Kyoto University

Presenters
- **Ernan RUSTIADI** / Head of Research Institutions and Community Service, IPB University
- **Sanara HOR** / Dean of Faculty of Land Management and Land Administration, Royal University of Agriculture
- **Le Minh DUC** / Lecturer, Hue University of Agriculture and Forestry
- **Analyn CODILAN** / Assoc. Professor, University of the Philippines, Los Baños

Table of Contents

Poster Presentations – Global Ecology

A multidimensional energy poverty measurement in China - Based on the entropy method

LIANG Qidi, ASUKA Jusen
Graduate School of Environmental Studies, Tohoku University

Introduction

The energy issue is one of the most significant challenges facing human society today, 'affordable and clean energy' has been listed as one of the UN 2030 sustainable development goals. Although energy poverty has obtained wide focus in recent years, there is no consensus on the measurement of energy poverty. As the world's largest developing country, China faces a more serious and complex problem of energy poverty. Given that China is experiencing socio-economic transformation as well as energy transition, a measurement system that takes the actual situation and policy factors in China into account needs to be established.

Methodology and Data

Entropy weighting method, an objective weighting method, is widely used in comprehensive evaluation. The main steps are as follows:

- Normalization. Since the dimensions and properties of the 35 indicators are different, this research uses the min-max method to process the data to dimensionless measurements: $x'_{ij} = \frac{x_{ij} - \min x_j}{\max x_j - \min x_j}$ if indicators are positive relative; $x'_{ij} = \frac{\max x_j - x_{ij}}{\max x_j - \min x_j}$ if indicators are negative relative (i: evaluation province, i=1, 2…n; j: evaluation indicator, j=1, 2…n)

- Calculate the proportion of the jth indicator of the ith province: $y_{ij} = \frac{x'_{ij}}{\sum_{i=1}^{n} x'_{ij}}$

- Calculate the entropy value of the jth indicator: $e_j = -K \sum_{i=1}^{n} y_{ij} ln y_{ij}$, where $K = \frac{1}{lnn} > 0$

- Calculate the coefficient of variation of the jth indicator d_j: $d_j = 1 - e_j$

- Calculate the weight of the jth indicator: $w_j = \frac{d_j}{\sum_j d_j}$

- According to the above formulae, the energy poverty index is calculated as follows: Energy Poverty Index $= \sum_j y_{ij} w_j$

Tier 1	Tier 2	Indicators	Unit
Energy Service Availability	Residential energy consumption	Urban electricity consumption	kWh per capita
		Rural electricity consumption	kWh per capita
		Urban natural gas consumption	m³ per capita
		Rural natural gas consumption	m³ per capita
		Rural residential central heating area	m² per household
		Urban residential central heating area	m² per household
	Energy Supply	Urban gas coverage rate	%
		Rural gas coverage rate	%
	Residential Energy structure	Urban non-solid commercial fuel ratio	%
		Rural non-solid commercial fuel ratio	%
		Ratio of rural household taking straw as main cooking fuel in poor area	%
Energy consumption and generation cleanliness		Clean winter heating renovation ratio	%
	Energy generation structure	Biogas production in rural area	m³ per household
		Rural solar heater area	m² per household
		Hydro power ratio	%
		Wind power ratio	%
		Solar power ratio	%
	Air pollutants from residential energy consumption	Residential SO₂ emissions	kg per capita
		Residential particulate matter emissions	kg per capita
		Residential NOx emissions	kg per capita
Residential energy affordability	Household energy-consuming facilities	Urban Kitchen hood	count/hundred rural household
		Urban Water heater	count/hundred rural household
		Urban Refrigerator	count/hundred rural household
		Urban Air conditioner	count/hundred urban household
		Rural Kitchen hood	count/hundred rural household
		Rural Water heater	count/hundred rural household
		Rural Refrigerator	count/hundred rural household
		Rural Air conditioner	count/hundred urban household
	Residential energy affordability	Urban Consumer price index for bills (water, electricity & fuel)	/
		Urban Educational Attainment	%
		Rural Consumer price index for bills (water, electricity & fuel)	/
		Rural Educational Attainment	%
		Urban disposable income	RMB per capita
		Rural disposable income per capita	RMB per capita
		Incidence of rural poor	%

Corresponding to the basic concept of energy poverty, this research developed a new energy poverty measuring index with three main categories. Data of 30 provinces (municipality) of China from 2014-2020 are analyzed for this research.

Results
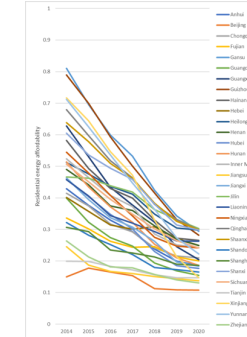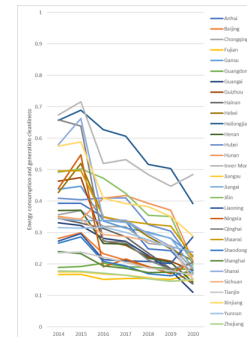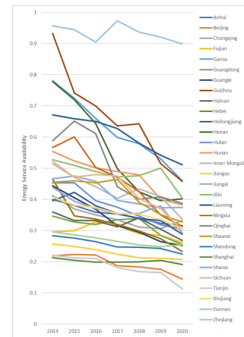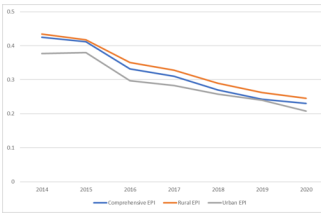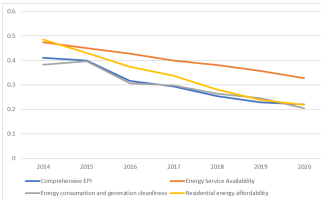
- The overall descending trend in the national composite energy poverty index from 2014-2020 indicates that energy poverty level in China is improving over time. Comparing the three categories of energy poverty indices, though all downward trends, the household energy affordability and efficiency index shows the most decreasing trend.
- The energy poverty levels have been improved in both urban and rural areas during the past few years, but rural areas are still less energy secure compared with urban areas.
- Generally, the northern area shows higher energy poverty index than the southern area of China; western regions are more energy-deprived compared with eastern regions. Despite the overall downward trend, huge differences exist between the three categories of indices across provinces.
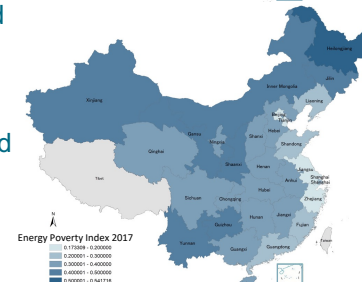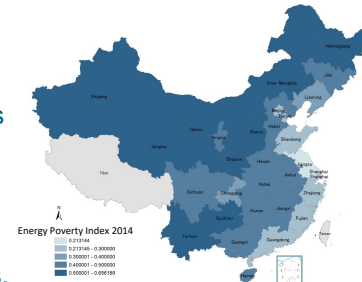
Conclusion

A multi-dimensional energy poverty index that is applicable to China's features as well as considering policy factors was built to measure provincial energy poverty level in China. The result shows: (1) The energy poverty index shows a descending tendency in China from 2014-2020; (2) There are significant differences in energy poverty levels across regions; (3) The rapid development of China's economy and the implementation of poverty alleviation policies significantly contribute to household energy affordability and efficiency. Various air pollutants reduction measures and national energy transition strategies have made energy consumption and cleaner generation structures. Energy supply infrastructure's development has increased energy service availability, but residents' utilization of modern energy is still relatively insufficient.

A novel classification for air quality during Covid-19 pandemic based on the abundance of SARS-CoV-2 and Particulate matter

Authors: Muhammad Fauzan*, Pingkan Aditiawati*, Intan Taufik*, Azzania Fibriani*, Sparisoma Viridi**, Armi Susandi***, Kamarisima*

*School of Life Science and Technology, Bandung Institute of Technology; **Faculty of Mathematics and Natural Sciences, Bandung Institute of Technology; ***Faculty of Earth Sciences and Technology, Bandung Institute of Technology

Background

The exposure of COVID-19 presents a new challenge in determining the safety level of outdoor air in addition to existing air quality parameters. There is no established parameter for the presence of SARS-CoV-2 in the established air quality standard index. Therefore, this study was conducted to elaborate on the existing air quality parameters with the abundance of SARS-CoV-2.

Methodology

- Airborne bacteria and virus sample
- Culturable bacteria data; NGS data on bacteria; Viral copies number data
- Air quality classification model

Results and Discussion
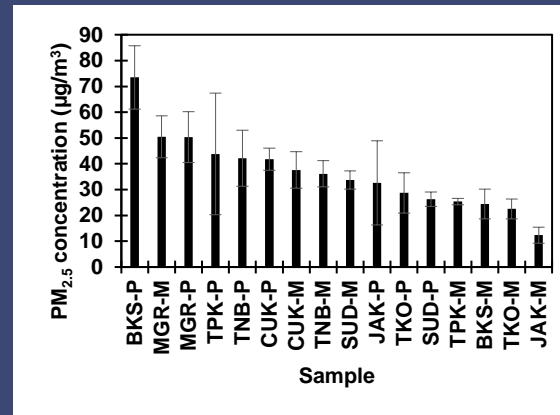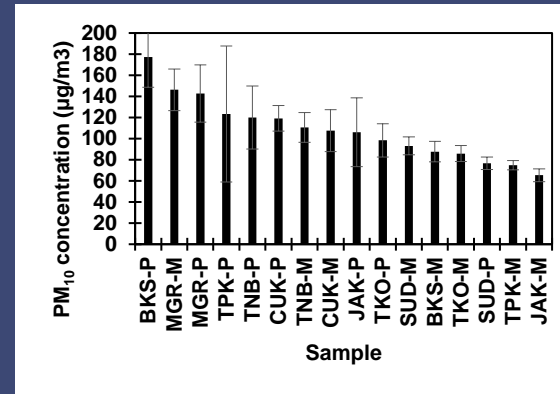
Fig 1. The $PM_{2.5}$ and PM_{10} abundance at eight commuter stations in Jakarta during daytime and evening
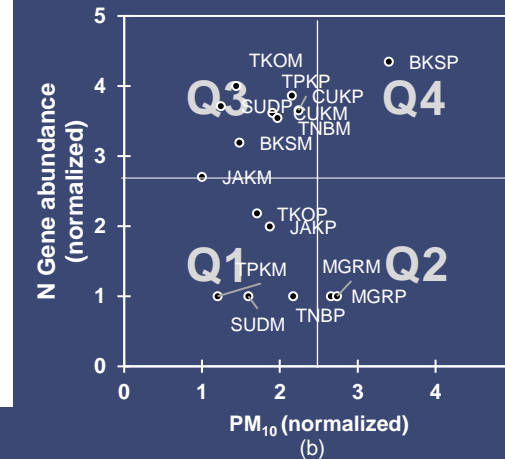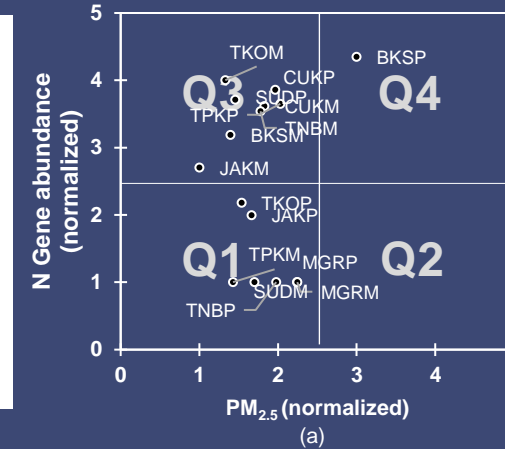
Fig 2. The air quality classification diagram based on the abundance of SARS-CoV-2 vs $PM_{2.5}$ (a) and PM_{10} (b)

Based on this air classification, there are four categories of air quality based on SARS-CoV-2 and PM abundance:
Q1: clean-low risk infection
Q2: dirty-low risk infection
Q3: clean-high risk infection
Q4: dirty-high risk infection

Interestingly, there is an evidence in Q3, which the air quality measured as clean, however, has potentially high risk in COVID-19 infection (Q3)

Acknowledgement

A Study on the Influencing Factors of Shrinking Cities in China: Exploring the Differences between cities from 2000 to 2020

Authors: ZHANG Yuqi*, OCHIAI Chiho*
* Graduate School of Global Environmental Studies, Kyoto University

INTRODUCTION

Background

• In recent decades, urban shrinkage has become a global phenomenon.
• Urban shrinkage is influenced by both global trends and local context.
• Factors contributing to urban shrinkage have been widely discussed; however, these factors' spatial heterogeneity and temporal variation have received little attention, especially in China.

Methodology

This study takes all prefecture-level cities in mainland China as the research subject.
1) Analyze the spatial distribution of shrinking cities and measure the degree of urban shrinkage: consider the changes in resident population and GDP
2) Determine the impact factors by using panel data regression
(Ten variables can be grouped into three categories: demographic factors, economic factors, and urban environmental and public facility factors.)
3) Analyze the spatial heterogeneity of impact factors by using geographically weighted regression (GWR).

RESULTS

Influence factors of shrinking cities

The results of the panel regression show that there are four significant influence factors:
1) population migration; 2) aging rate; 3) the index of the advanced industrial structure; and 4) general public budget revenue

Spatial heterogeneity analysis of influencing factors
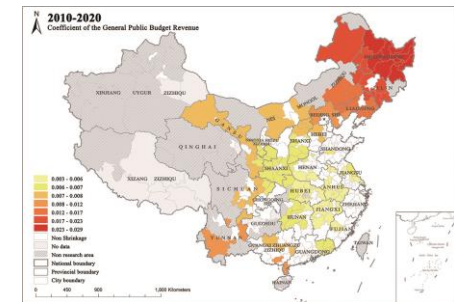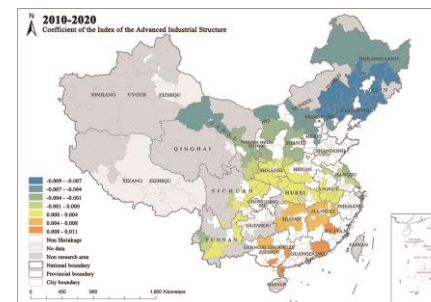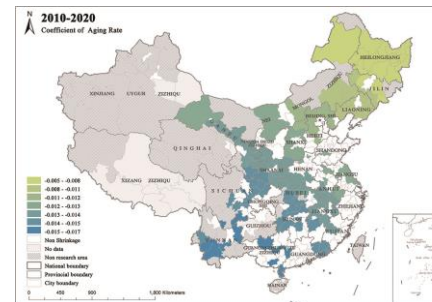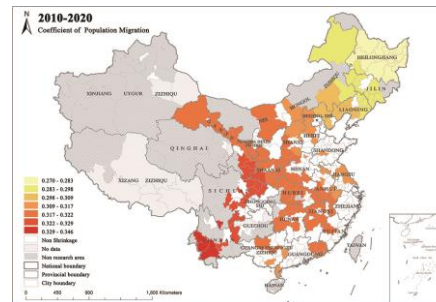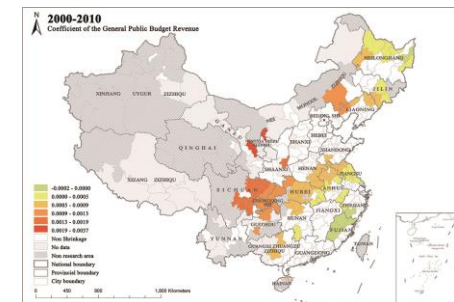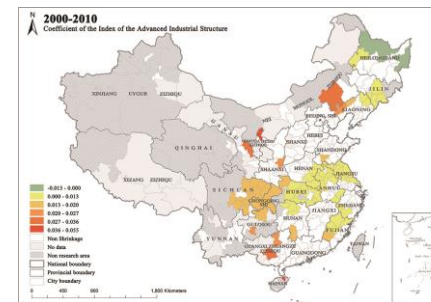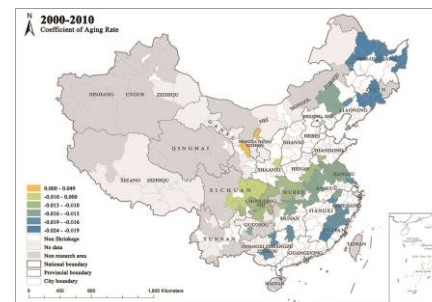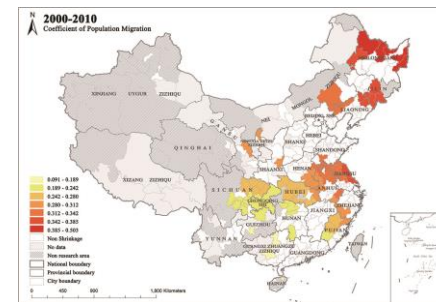
Fig.1 The coefficient of population migration

Fig.2 The coefficient of aging rate

Fig.3 The coefficient of the advanced industrial structure index

Fig.4 The coefficient of the general public budget revenue

DISCUSSIOIN & CONCLUSION

The impact of these factors varies across regions and changes over time. The outflow of a large number of laborers and the resulting rising aging rate are the main reasons for the shrinkage in southwest China. Structural unemployment and capital outflow caused by deindustrialization are the main reasons for the decline of most industrial cities in northern China.

CO-BENEFIT ANALYSIS FROM THE IMPLEMENTATION OF REDD+ PROGRAM IN WEST KALIMANTAN, INDONESIA: A REVIEW

Authors: Hangga Prihatmaja*, Ratih Solichia Maharani**
*Graduate School of Global Environmental Studies, Kyoto University **Graduate School of Agriculture, Kyoto University

I. INTRODUCTION

Deforestation & Forest Degradation
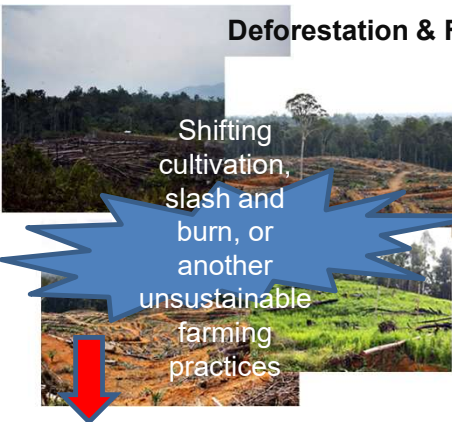
Shifting cultivation, slash and burn, or another unsustainable farming practices

Villagers are often accused as a main cause of forest loss and impacting the increased number of the GHG emission (IPCC 2014; Maharani et al. 2021)

INDC 2016:
Emission level from forestry sector should be reduced up to 29% of total emission BaU

REDD+ Program FORCLIME FC

Kapuas Hulu

Areas	Total Target During Program (2013-2020)
Kapuas Hulu	Emission decreased 300.000 – 400.000 tCO_2eq (0.04-0.05 $MtCO_2$ per year)

TARGET OF THE PROGRAM

II. PROBLEM IDENTIFICATION

Towards the target of the program of FORCLIME FC
- Villagers are often accused causing the Deforestation and Forest Degradation; therefore, the program should be implemented on village levels. (FORCLIME FC 2018).
- The program objective is hardly to understand by the villagers since they have no knowledge on it. (Personal Communication 2019).
- Since 2013 the program is also intended to improve villager's social welfare through non-forest and/or limited forest-resources-livelihood → Alternatives livelihood → Emission reduction is achieved. (FORCLIME FC 2018).

III. OBJECTIVE OF THE REVIEW

To investigate the update on the studies of REDD+ and its related issues, such as co-benefit and relation between the involvement of community towards the carbon emission reduction.

IV. METHODOLOGY

Non-structured In-depth Interview

Field Observation

Informant during an interview session is chosen through purposive sampling: Program managers at the local level, Village Facilitator, & Local champion.

Literature study on the applicable laws and regulations regarding REDD+ in Indonesia and FORCLIME FC by using *Critical Discourse Analysis* (Fairclough 1989; van Dijk 1995; Chng 1996; context by Nikander and Vehvilainen 2010).

Reviewed Literatures on REDD+

Paris Agreement 2015 & Indonesia's INDC 2016.

Syed and Mori 2020
Adaptation co-benefits have not been adequately communicated…

Skutsch and Turnhout 2020
Communities (villagers) were often perceiving as major driving factors of deforestation… Communities are also can be effective in halting deforestation.

Soliev et al 2021
Conflict happened because of …. absence of carbon rights framework, …

Isyaku 2021
Communities' motivation in practicing forest conservation: forest for survival, forest is beautiful, no pay no care, conservation volunteers, and we care but pay us.

RESULT: A REVIEW

DISCUSSION

- Studies on similar REDD+ topics did not show the correlation of livelihood improvement to the performance of emission reduction.
- Most studies showed the villagers were treated as an object of the program which means that the villagers was only accepting what is programmed by the program manager instead being a subject and defining what is best for themselves.
- No evidence on success story and lesson learned.

Direction of Robusta Coffee Development for Desa Emas Program Realization in Mekarbuana Village, Karawang Regency

Authors: Ni Putu Ayu Eka Sundari 1*, Arief Hartono 2**, and Andrea Emma Pravitasari 3**

*Graduate School of Agriculture, Kyoto University ** Department of Soil Science and Land Resources, IPB University

Background

Mekarbuana plans to develop robusta coffee, coffee production in this village still fluctuates between 0.2-0.8 tons/ha which is relatively low. A recommendation on the direction of robusta coffee development is needed in order to start the realization of the Desa Desa program in 2019-2023.
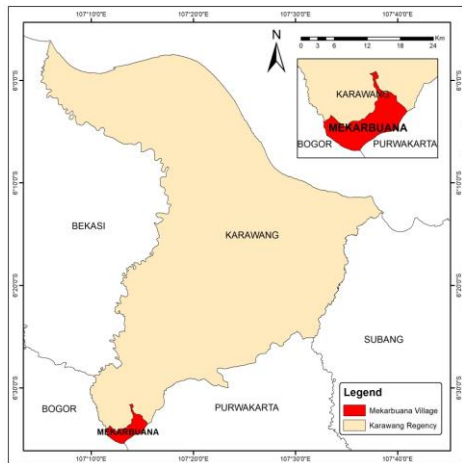
- Wide area: 2 675 Ha
- Dominated by hilly landform
- Located at: 120 – 1273 meter above sea level
- Dominant landuse: mixed garden (35.6%) dan forest (24.9%). Built up area dan paddy field (6.3%)

Figure 1 Location of Mekarbuana Village

Research Methods

01 Preparation for land unit map and questinnaires

02 Soil Sampling and farmers and interviewing local farmers.

03 Analysis of data and SWOT analysis

Results and Discussion

From the results of the actual land suitability analysis, all LU analyzed showed one similar inhibiting factor, soil pH. Other inhibiting factors found were steep slope and water availability.
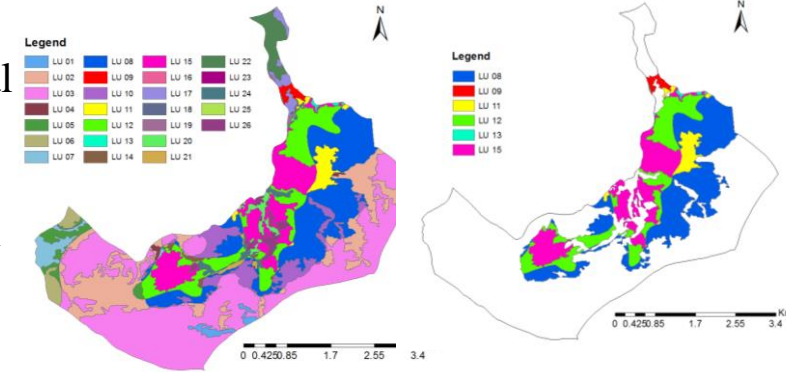
Figure 2. Map of land unit: (a) Mekarbuana Village (b) Sample Taken Focus

SWOT

Weakness
- Robusta coffee planted on sloopy area
- Low of soil organic C and pH level
- Low of input

Strength
- Production occurs in every year
- The six-land unit still classified as suitable (S2/S3)
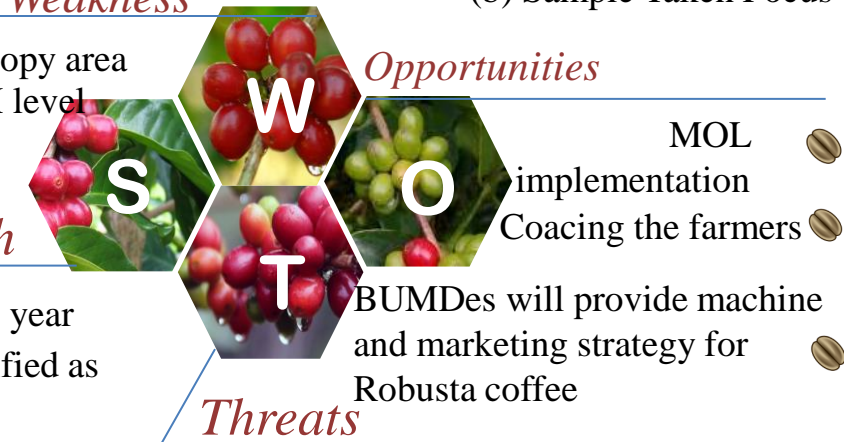
Opportunities
- MOL implementation
- Coacing the farmers
- BUMDes will provide machine and marketing strategy for Robusta coffee

Threats
- Fluctuation production affected income of the farmers.
- Low maintening affect the sustainability production

Conclusion

Three main aspects of robusta coffee development in the context of the realization of the Desa Emas, are increased production, quality development aspects, and robusta coffee marketing aspects. As the first step, improvement the soil pH is main effort for increasing the robusta coffee production.

Drivers of Corporate Climate Change Disclosure: Empirical Evidence from CDP Japan

ZHANG Sailu

Graduate School of Global Environmental Studies, Kyoto University
Global Environmental Policy Laboratory

Research Background

There is a trend toward an increasing number of Japanese companies **disclosing their efforts to combat climate change** as the global climate change problem becomes more intense (Figure 1).

Figure 1. CDP Climate Change Questionnaire Response Status of Japanese Companies, 2015~2019

Number of Companies   Response Ratio

Data source: CDP Japan, 2020.
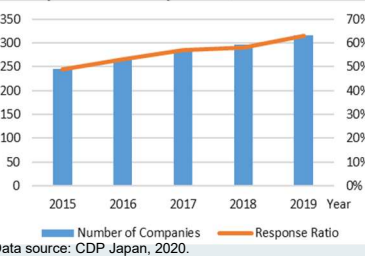
Companies can gain the trust of stakeholders such as investors by appropriately **evaluating and understanding climate-related risks and disclosing information related to climate change**.

However, among the companies that responded to the CDP questionnaire, many companies in Japan are still **not fully committed to climate change-related information disclosure**. Therefore, it is necessary to **clarify the drivers affecting information disclosure** to promote climate change disclosure in Japanese companies.

※CDP is a nonprofit organization which globally collects the data of corporate carbon disclosure, and has been considered as credible source of data in past studies).

Methodology & Research Design

Figure 2. Research Framework

(Ajused based on Ben-Amar & Mcilkenny, 2014; Nisak & Yuniarti, 2018)

Target firms: Firms that were targeted by CDP Japan in 2019
Final sample: 378 firms
Data source: Secondary data
Statistical analysis: Logistic Regression Model

Table 1. Variables in Logistic Regression Model

	Abbreviations	Explanations
Independent Variables		
Profitability	ROA	Return on asset
Financial Risk	LEV	Leverage ratio
Firm Size	TA	Total asset
Environmental Sensitivity	ES	High environmental sensitivity industries: 1 Otherwise: 0
Board Size	BSize	Number of board directors
Board Independence	INDIR	(Number of Independent directors/Number of directors)*100%
Foreign Investor	FSR	Foreign shareholding ratio
Dependent Variables		
Response Tendency	RES	If the firm responded to the CDP questionnaire: 1 Otherwise: 0
Transparence Tendency	TRANS	If the firm allowed the CDP to disclose the response: 1 Otherwise: 0

Research Gaps

➢ Driving factors affecting climate change disclosure by Japanese companies need to be studied.
➢ It is necessary to study the driving factors of climate change information disclosure in terms of corporate governance, especially foreign shareholding ratio, which has an influence on corporate management decision-making.

Objectives

➢ To clarify the driving factors of climate change disclosure by analyzing the corporate management indicators and the CDP survey results of climate change disclosure.
➢ To indicate the direction of climate change disclosure in Japan based on the empirical study.

Results & Conclusion

Table 2. Main Results

Variables	Model 1 = RES Coefficient	Model 2 = TRANS Coefficient
ROA	-6.691**	-3.554
LEV	-0.064	-0.006
TA	2.191***	1.647***
ES	2.057***	1.766***
BSize	0.020	0.020
INDIR	4.837***	4.011***
FSR	0.358**	0.079

*** (p＜0.01)   ** (p＜0.05)   * (p＜0.1)

✓ **Company size, profitability, foreign shareholding ratio, environmental sensitivity and board independence** are significant factors of **response tendency**.
✓ **Company size, environmental sensitivity, and board independence** have a significant positive impact on **disclosure transparency**.

Japanese companies need to promote dialogue with investors in the field of climate change through sufficient disclosure.

Japanese companies should promote the involvement of independent board directors in climate change disclosure.

References:
Ben-Amar, W., and Mcilkenny, P. (2014). Board Effectiveness and the Voluntary Disclosure of Climate Change Information. Business Strategy, and the environment, Published online in Wiley online Library, DOI:10.1002/bse.1840.
Nisak, K., & Yuniarti, R. (2018) The effect of profitability and leverage to the carbon emission disclosure on companies that registered consecutively in sustainability reporting award period 2014-2016, IOP Conference Series Earth and Environmental Science 164(1):012026.

Evidence of Indoor Dust Acting as Carrier for Metal-Based Nanoparticles: A Study of Exposure and Oxidative Risks

Authors: Ziyi Liu*, Yuxiong Huang*

*Shenzhen International Graduate School (SIGS), Tsinghua University, Shenzhen 518055, China

Background

Growing public health concern has developed with respect to the indoor environment, as people spend more than three-quarters of their time indoors. However, very few studies have examined the occurrence of metal-based nanoparticles (MNPs) in indoor dust. Single-particle inductively coupled plasma mass spectrometry (spICP-MS) emerged as a powerful technique for low-abundance MNPs quantification.

In this study, the presence of MNPs in indoor dust was determined with spICP-MS. The exposure and bioavailability of MNPs in lung fluid as well as the oxidative potential of indoor dust-associated MNPs were evaluated.

Methodology

Indoor dust samples were collected from five representative sites. MNPs in indoor dust were analyzed with spICP-MS (8900 ICP-MS, Agilent Technologies). The stability of MNPs exposed to lung interstitial fluids was investigated, and the oxidative potential of MNPs was evaluated with an ascorbic acid (AA) assay.

Results & Discussion

The spICP-MS investigation provided evidence of the existence of multielement MNPs in indoor dust, as MNPs containing up to 10 distinct elements were detected in all indoor dust samples (Fig 1a-1e). Mg, Al, Si, and Fe MNPs were presented in larger particle sizes and wider size distributions ranging from 100 to 500 nm, while Ti, Cr, Cu, Zn, Ba, and Pb MNPs were smaller (10–100 nm). Scanning electron microscopy images of indoor dust (Fig 2a,b) also evidenced that MNPs were mostly evenly distributed on the dust surface, ranging from ~60 to ~990 nm. The mass concentrations of Cr, Cu, Zn, Ba, and Pb MNPs were around 2–30 µg of MNPs/g of dust (Fig 1). However, Ti MNPs showed relatively high mass concentrations (up to 215 µg/g) in indoor dust samples, which may be attributed to the extensive application of Ti-based MNPs in industry and consumable products. Cu MNPs used in paints and Zn MNPs applied in sunscreens would also be introduced in indoor environment and pose threat.
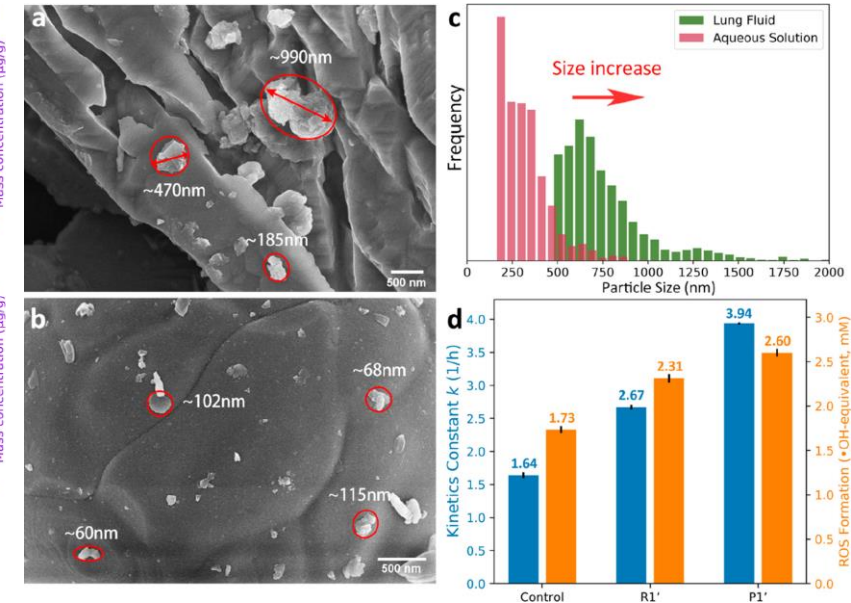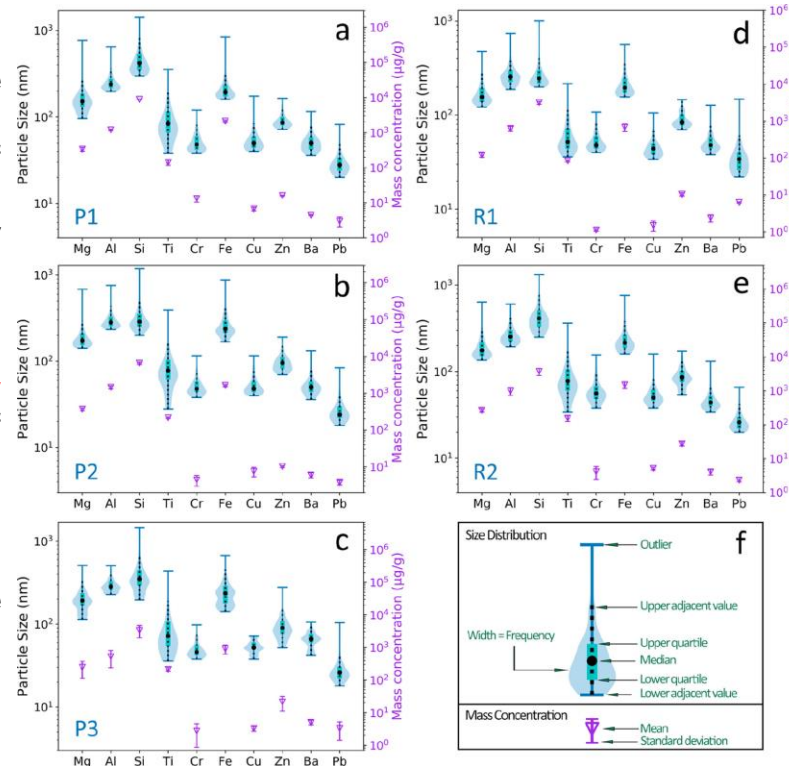
MNPs exhibited larger particles after exposure to lung fluids (e.g., Fe MNPs showed a 2.8-fold increase, Fig 2c). High ionic strength of lung fluids promoted aggregation of MNPs, which decreased their stability.

The presence of indoor dust generates reactive oxygen species (ROS), with the peroxidase-like activity kinetic increasing from 1.64 to 2.67 and 3.94 (Fig 2d). The concentration of generated ROS (•OH equivalent) increases from 1.73 mM to 2.31 mM and 2.60 mM, which is up to 1.5 times greater.

The long-term exposure to MNPs in indoor habitats may induce health risks, highlighting the need to better characterize these indoor contaminants.

Exploring comprehensive adaptation measures in rice agriculture: prospects and challenges in collaboration through Future Design with rice farmers in Kyoto

Masako Ichihara
Research Institute for Humanity and Nature (RIHN), Kyoto Climate Change Adaptation Center

Background

Kyoto Climate Change Adaptation Center (KCCAC) , was established in July 2021 under the collaborative agreement among Kyoto Prefecture, Kyoto City, and Research Institute for Humanity and Nature. It conducted data collection in the second half of FY 2021 to clarify materialized climate change impacts (Fig.1) . The revealed mechanism (Fig.2) was the complicatedly interrelated structure of many challenges which Kyoto has been already facing. Many respondents testified that climate change was mostly not their main concern. Otherwise, it degraded other challenges which already existed, such as aging, lack of successors, and change of lifestyles. A comprehensive approach to those compound social issues seems to be required in adaptation measures (IPCC 2022).

Rice and its farmers were identified as one of the most urgent sectors to take countermeasures. Various policies were already taken by the government, such as irrigation management, change of season in seeding, and development of new breeds with high tolerance (Pic. 1) against heat (Ministry of Agriculture, Forestry and Fishery, 2022). Most of those measures, however, were found to be recognized by most rice farmers as insufficient to improve the situation so far through our investigation.

Methodology

KCCAC proposes to apply Future Design method (FD, Saijo 2020) with the involvement of farmers to explore the aforementioned comprehensive adaptation measure.

Official website: https://kccac.jp
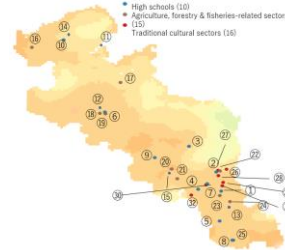
Fig.1: Overview of interviews
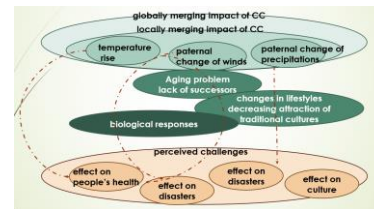
Fig.2: complicated structure of perceived challenges including climate change impact

Pig.1: Kyo-shikibu, a brand-new rice breed with high tolelance against heat

FD's outline is that the current generation will assume the role of the future generation at their current age, envision the desired future state of society, and explore what the current generation should do in order to reach that envisioned future. Experiments prove that people can activate "futurability", the ability to consider issues in the long term, to ensure future generations' well-being even through sacrificing current generations' benefits. FD has been highly evaluated as effective to approach complex issues. Rice agriculture falls into this scope.

Results (obtained at this point)

KCCAC planned to facilitate FD with rice farmers in several regions in Kyoto. All proposals, however, were not easily accepted in the first place. The main reasons are; most rice farmers are likely too occupied with hard Daily tasks to take the long-term view; most farmers may have got too aged to imagine future vision; FD seems too unfamiliar and vague to appeal to them. Therefore, KCCAC alternately seeks to conduct a questionnaire survey instead, as a primary step.

Meanwhile, this author participated in meetings of agricultural business operators, twice, to find FD may appeal to those people who ambitiously envision future agriculture.

Discussion

It might be ordinary farmers occupied with daily living who necessitate activating futurability more than agricultural business operators because ordinary farmers are often in severe situations. KCCAC's next challenge would be involvement of ordinary farmers through the effective and appealing proposition of FD.

Acknowledgment

References

・T. Saijo, 2020. "Future Design: Bequeathing Sustainable Natural Environments and Sustainable Societies to Future Generations." Sustainability 12(6467)
・Ministry of Agriculture, Forestry and Fishery, 2022. Report on Impact Survey of Global Warming.
・IPCC, 2022. 6th Assessment Report.

Indigenous people's perception of indigenous farming knowledge for climate change adaptation in Khumbu, Nepal

Tshering Ongmu Sherpa
Graduate School of Global Environmental Studies, Kyoto University

Background

There has been growing realization that solving the climate crisis requires more than just scientific knowledge. There is burgeoning recognition of indigenous knowledge for climate change adaptation. However, there is a dearth of empirical work available on perception of indigenous peoples (IPs) of the effectiveness of their farming knowledge to analyse their adaptation behavior using a socio-psychological model.

Objectives

❖ To observe the perception of IPs of climate change and its impacts on agriculture
❖ To assess perception of IPs on the use of indigenous farming practices for adapting to climate change using Protection Motivation Theory (PMT)

Methodology

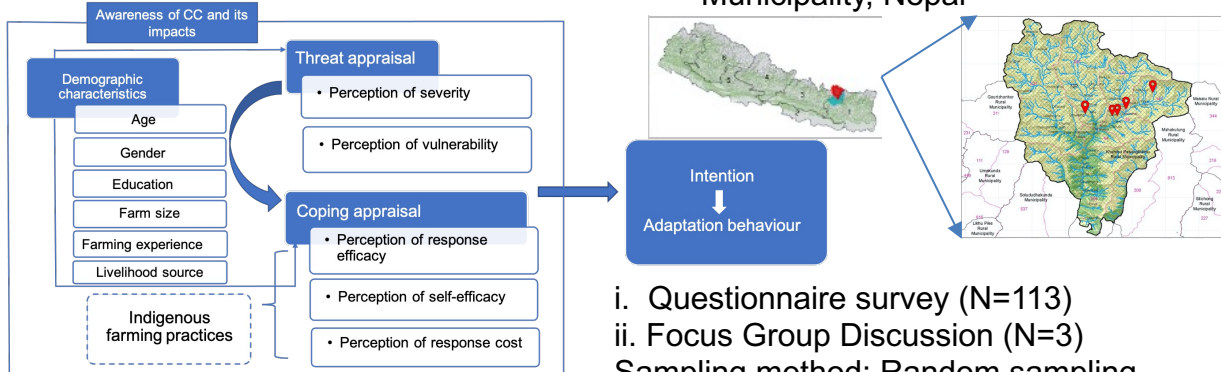**Study sites**: 5 villages of Khumbu Pasang Lhamu Rural Municipality, Nepal

Fig.1: Conceptual framework based on PMT model

i. Questionnaire survey (N=113)
ii. Focus Group Discussion (N=3)
Sampling method: Random sampling

Analysis ➡ i) Threat and coping appraisal components: Descriptive statistics
ii) Identifying correlation between coping appraisal and demographic variables: Spearman Rank's correlation test

Results and Discussion

1. Changes in climatic conditions

Snowfall frequency and intensity   Temperature

■ Decreasing ■ Increasing ■ No change ■ Don't know

Fig.2: Changes in the temperature and precipitation pattern
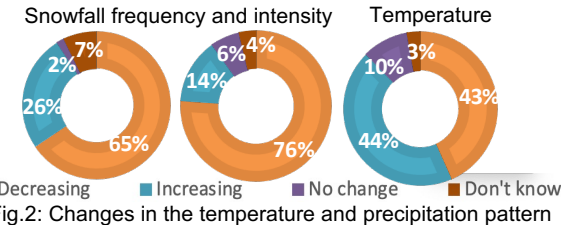
2. Impacts on agriculture

	Yes (%)	No (%)
Decline in crop yield	85	15
Increase in crop failure	73	27
Increase in crop damage	69	31
Increase in weed	73	27

Primary action taken→ Decrease planting

3. Threat appraisal

Perception of severity
Increase in climate-related hazards

Perception of vulnerability
Impacts of climate change

IPs have observed erratic precipitation pattern and temperature anomalies, which are posing a major threat to their lives and livelihood. The perception of adaptation efficacy assessment disclosed that indigenous knowledge is effective in adapting to changing climatic conditions, with the perception differing based on demographic variables. However, it was found to lack formal recognition by the government authorities.

4. Coping appraisal

Level of agreement on adaptation efficacy of indigenous practices	Response efficacy	Self-efficacy	Response cost
Average	3.76	3.72	2.76

Low 1 ◀ Efficacy ▶ High 5

Table 1: Spearman Rank's Correlation Test

Demographic variables	Response efficacy		Self-efficacy		Response cost	
	Spearman Rank's Correlation Coefficient (ρ)	P-value	ρ	P-value	ρ	P-value
Age	0.187	0.0479*	0.129	0.1739	0.022	0.8175
Education	-0.178	0.0600	-0.162	0.0870	-0.217	0.0211*
Farm size	0.005	0.9599	-0.063	0.5058	-0.255	0.0065**
Farming experience	0.159	0.0924	0.231	0.0140*	0.052	0.5815
Livelihood source	-0.180	0.0562	-0.1727	0.0674	-0.238	0.0112*
Gender	0.038	0.9810	0.131	0.9365	0.005	0.9976

Hence, in order to devise cost-effective climate change adaptation strategy, indigenous knowledge is essential to be incorporated in local climate policies and action plans.

LAND SUITABILITY ANALYSIS FOR SETTLEMENT DEVELOPMENT IN CIANJUR REGENCY

Nurul A. Tanjung[1,2,*], Ernan Rustiadi[2], Widiatmaka[2,] Corinthias P. M. Sianipar[1]

1 Graduate School Global Environmental Studies (GSGES), Kyoto University, Kyoto 606-8502, Japan; 2 Department of Soil Sciences and Land Resources Management, IPB University, Bogor 16680, Indonesia; Japan.

INTRODUCTION

The merging of Jakarta and Bandung metropolitans influence the development of the **surrounding area, especially the rural one**, leading to an increasing population and its problems. One of them is the rising land demand for settlements, but the land is limited. This research aims to model **land suitability for settlement,** analyzing the suitability and maximizing an efficient use of land.

METHODOLOGY

❑ **Study Area. Cianjur Regency** has been chosen as a case study. It is one of many regions between Metropolitan. Its population is 2256589 people **in 2018.**
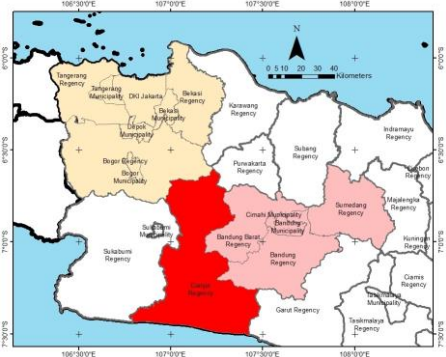
❑ **Data Collection.** Cianjur Regency in numbers (pdf). Spatial planning of Cianjur (shp), Landuse of Cianjur Regency 2018 (shp), LP2B of Cianjur Regency (shp). Landslide and flood risk 2019 (shp)

❑ **Method.** Multi-Criteria Evaluation (**MCE**) is applied to select suitability criteria (physical, accessibility, conservation and disaster) through Geographical Information System (**GIS**). Analytic Hierarchy Process (**AHP**) sets the weight of each measure to see which criteria are the most/ least important. **AHP involved 5 steps.**

1. Defining problem. The Problem is lack of settlement due to the increase in population.

2. Structuring the decision hierarchy of criteria.

3. Constructing a set of pairwise comparison on. Nine experts are interviewed to set the level of importance within criteria. They are from **governments, academics, and developers**. The following judgment matrix is used to calculate the priorities of the criteria:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & a_{nn} \\ a_{n1} & a_{n2} & & \end{bmatrix}$$

Where a_{11} is the preference of score comparison between sub-criteria 1 and itself. Where a_{xy} is the preference of score comparison between criterion **x** and criterion **y**.

4. Weighting the priority.

4.1. Prioritizing of the criteria can be estimated by finding the principal eigenvector **W** of matrix **A**, **Equation (a).**

4.2. Calculating the consistency value using the consistency index (**CI**) parameter obtained through the **Equation (b).**

4.3. Assessing The consistency ratio (**CR**) which is defined by **Equation (c).**

5. Determining the zoning of land suitability **Equation (d)** using GIS

$$AW = \lambda_{max} W \quad (a) \qquad CI = \frac{\lambda_{max} - n}{n - 1} \quad (b) \qquad CR = \frac{CI}{RI} \quad (c) \qquad I = \frac{c - b}{k} \quad (d)$$

Where **λmax** is the maximum eigenvalue of matrix **A**; **n** is the order of the comparison; Where **RI** is the Random Index. **RI** values depend on the number of **n.**. **CR < 0.1** is accepted; **I** is a distance between intervals. **c** is the number of the highest score. **b** is the number of the lowest score. **k** is the number of suitability classes that are wanted.

RESULTS and DISCUSSION

● A **dissent perspective** found between developers and governments and academics. **If** the **developer preferences** taken as a **basis**, the future settlement land will be according to the **local/customer interest**. Because **developer preferences** is often be substituted with the **local/customer interest.**
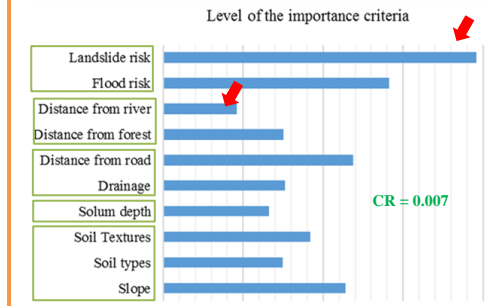
● The consistency of judgment (CR value) among sub-criteria is **0.007.** Therefore, it is consistent.
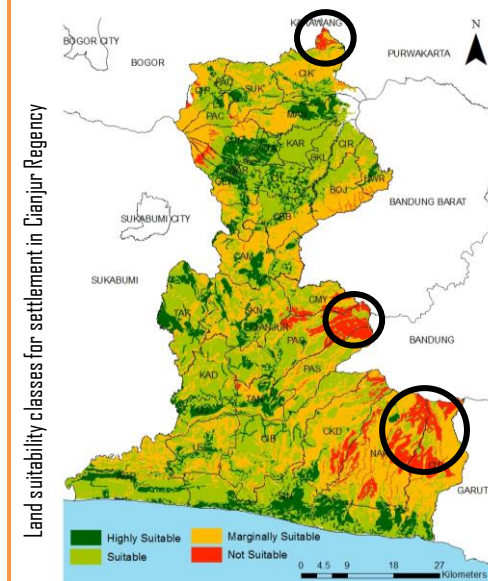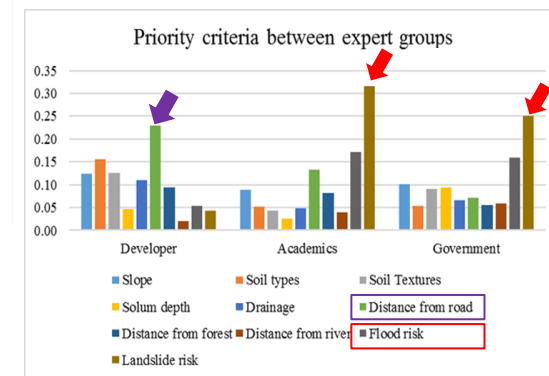
Suitability classes	(km²)	%
Highly Suitable	1282	36
Suitable	234	7
Marginally Suitable	**1569**	**44**
Not Suitable	498	14

· The **highly suitable class** land is the **priority recommendation** to build the settlement, then followed **suitable class**.

· The **marginally suitable class** is **possible** to be developed, but it is difficult and costly.

· **Not suitable class means** the land **cannot** be built for settlement

Local Sustainability Index Analysis in The Ciletuh- Palabuhanratu UNESCO Global Geopark, Indonesia

Authors: Siti Salsiah *,***, Izuru Saizen *, Endriatmo Soetarto ** and Andrea Emma Pravitasari ***

* Graduate School of Global Environmental Studies, Kyoto University ** Faculty of Human Ecology, IPB University *** Faculty of Agriculture, IPB University

Background

- **Ciletuh - Palabuhan Ratu UNESCO Global Geopark** is a **Geopark** area that is also **used as a tourist destination**. **Sustainable tourism** is one of **the goals of development.**

- In the process, the development of the concept of traveling must have **a long-term impact**, whether on t**he environment, social**, or **economic.**

- For this reason, **evaluating sustainability performance** at **the local level** is **essential** because each village has different characteristics. This study aims to find out t**he sustainability performance** based on the **Local Sustainability Index (LSI)** and to find out **the factors affecting LSI.**

Methodology

Sustainability performance was analyzed using **factor analysis** (Statistica 7), **moran's index analysis** (GeoDa)**, and cluster analysis** (Statistica 7) based on village potential data (2019), CPUGG land use maps, and CPUGG administrative maps.

The factors affecting LSI were analyzed using **Geographically Weighted Regression (GWR)** (ArcGIS 10.8).

Result and Discussion

- **Spatial distribution of LSI**

  There is a **trade-off** between the **economic** and **social dimensions** in the case of the CPUGG area.
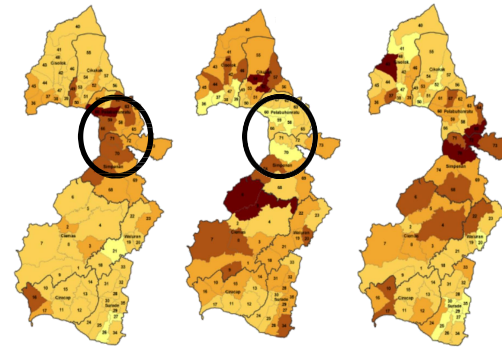
LSI$_1$ Economic   LSI$_2$ Social   LSI$_3$ Environmental

- Based on the moran's Index analysis, LSI$_1$ has Global Moran's I **(0.476)**, LSI$_2$ **(0.279)**, and LSI$_3$ **(0.269)**. The result shows the spatial distribution pattern of LSI$_1$, LSI$_2$, LSI$_3$ are **clustered.**
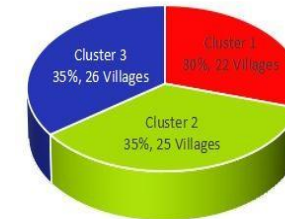
  - **1** (**L**-Eco, **H**-Soc, **M**-Env)
  - **2** (**H**-Eco, **L**-Soc, **H**-Env)
  - **3** (**L**-Eco, **M**-Soc, **L**-Env)

  * **L** (Low) - **M** (Medium) - **H** (High)

Cluster 3 35%, 26 Villages
Cluster 1 30%, 22 Villages
Cluster 2 35%, 25 Villages

- Based on GWR analysis, some variables have a significant impact **on increasing and decreasing LSI.**

Economic Dimension	Social Dimension	Environmental Dimension
• Household using electricity (2.0% - 4.5%) • BTS Tower (5.1% - 5.8%) • Distance to CBD (6.4% - 5.5%) • Hotel, hostel, inn (4.9% - 5.6%) • Restaurant (6.9% - 7.3%)	• Formal education facilities (5.5% - 6.6%) • Health facilities (4.9% - 5.8%) • Medical workers (3.2% - 5.7%) • Non-Profit Organization (8.7% - 9.5%)	• Plantation Area (0.4% - 8.5%) in the 54 villages • Paddy field (9.7% - 5.4%) in the 74 villages • Agricultural Land (5.1% - 11.8%)

Potential Threat of Antibiotic Resistant Bacteria in Intensive Aquaculture Industry and The Used of Phage as Biosensor

Authors: Hana Maulinawati*, Pingkan Aditiawati*, Kamarisima*, Ulya Alviredieta*

* Microbial Biotechnology Research Group, School of Life Sciences and Technology, Bandung Institute of Technology

Introduction

The major loss in the shrimp industry was mainly caused by bacterial infection. Even though antibiotic use in the industry has been banned for years, the re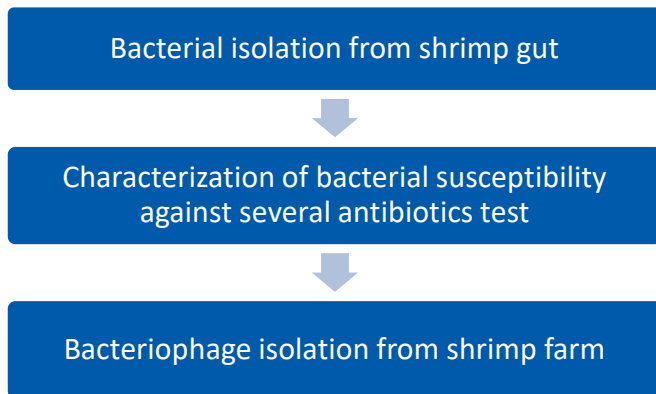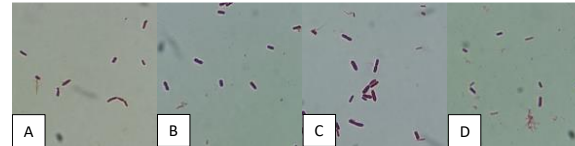maining antibiotics residue in the aquaculture environment served as a potential reservoir for the growth of antibiotic resistance bacteria (ARB) that threat the quality and quantity of aquaculture industry. Bacteriophages are known to have high target-specificity, making them potential for detecting bacterial pathogens. Thus this research aims to find a new approach to managing ARB-related disease by using a phage as a biosensor.

Methodology

Bacterial isolation from shrimp gut

↓

Characterization of bacterial susceptibility against several antibiotics test

↓

Bacteriophage isolation from shrimp farm

Result & Discussion

Fig 1. Gram staining under light microscope, 1000x magnification, A.SG01, B.SG05, C.SG06, D.SG07

Four bacteria, SG01, SG05, SG06, SG07, were isolated from the midgut of commercial shrimp. Using 16S rRNA sequencing, these isolates were identified as *Enterobacter hormaechei*. Based on antibiotic assay resulted all isolates resistant to more than five antibiotics and confirmed as antibiotic resistance bacteria (ARB).

Table 2. Bacteriophages isolation from three different shrimp farm: GF, ITP, and IBP

Table 1. Antibiotic resistance assay on isolated bacteria, R: Resistance, I: Intermediet, S: Sensitive

No.	Antibiotic	Concentration*	SG01	SG05	SG06	SG07
1	Amikacin	32 µg / ml	S	S	S	S
2	Gentamicin	8 µg / ml	S	S	S	S
3	Tobramycin	8 µg / ml	S	S	S	S
4	Ampicillin/Sulbactam	32/ 16 µg / ml	S	S	S	S
5	Amoxicillin/Clavulanic acid	32/ 16 µg / ml	**R**	**R**	**R**	**R**
6	Mezlocillin	128 µg / ml	S	S	S	S
7	Piperacillin/Tazobactam	128/ 4 µg / ml	S	S	S	S
8	Ticarcillin/Clavulanic acid	128/ 2 µg / ml	S	S	S	S
9	Fosfomycin	200 µg / ml	S	S	S	**R**
10	Nitrofurantoin	128 µg / ml	S	S	S	S
11	Cefoperazone	64 µg / ml	S	S	S	S
12	Cefotaxime	64 µg / ml	S	S	S	S
13	Ceftazidime	32 µg / ml	S	S	S	**R**
14	Ceftriaxone	64 µg / ml	S	S	S	S
15	Cefuroxime	32 µg / ml	**R**	**R**	**R**	**R**
16	Nalidixic acid	32 µg / ml	S	S	S	S
17	Lomefloxacin	8 µg / ml	S	S	S	S
18	Ciprofloxacin	4 µg / ml	S	S	S	S
19	Levofloxacin	8 µg / ml	S	S	S	S
20	Pefloxacin	8 µg / ml	S	S	S	S
21	Teicoplanin	32 µg / ml	**R**	**R**	**R**	**R**
22	Aztreonam	32 µg / ml	S	S	S	**R**
23	Co-trimoxazole	8 µg / ml	S	S	S	S
24	Growth		+	+	+	+

Conclusion

Thus, this study reveals the possible role of phages as a biosensor for detecting antibiotic resistance bacteria in the aquaculture industry. Therefore, further research is needed to apply phages for managing bacterial infection in aquaculture.

RESIDENTIAL SATISFACTION AND PLACE ATTACHMENT OF RURAL YOUTH

AR. Rohman T. Hidayat[1,2], Kenichiro Onitsuka[1], Corinthias P.M. Sianipar[1] and Satoshi Hoshino[1]

[1]Graduate School of Global Environmental Studies, Kyoto University, Kyoto - Japan. [2]Regional and Urban Planning Department, Universitas Brawijaya, Malang - Indonesia
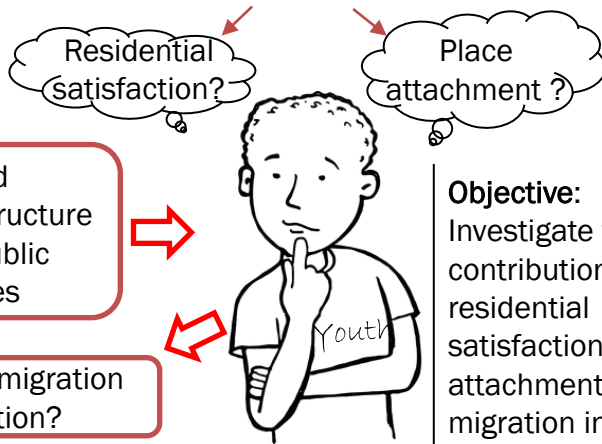
Introduction

drivers of actual migration

Residential satisfaction?

Place attachment ?

Rural areas
- Limited budget for infrastructure
- Geographical challenges

→ Limited infrastructure and public services

→ Rural out-migration intention?

Youth

Objective: Investigate the contribution of residential satisfaction and attachment to migration intention

Youth: period of finding a place to live and work

Methodology

Variables : residential satisfaction (convenience, comfort, health, safety, & community), place attachment (place dependency and identity, nature bonding, & social bonding), migration intention (intensity & firm plan availability)

Data collection : Closed-ended and self administrated questionnaire

Study location: Tambakasri Village, Malang Regency – Indonesia (a remote village and suffering net-outmigration)

Respondents : randomly selected 252 young villagers 15-24 years old from 1,667 rural youth
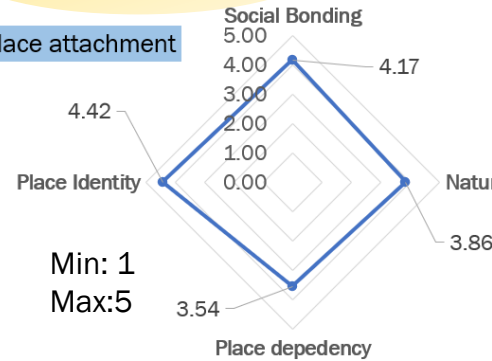
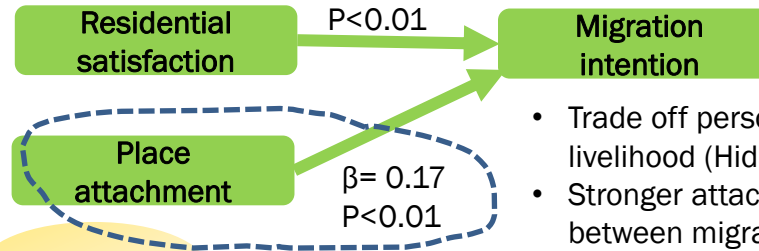**Analysis :** Structured Equation Model – Partial Least Square

References

Ge, & Hokao. 2004. *Journal of Environmental Sciences (China)* 16:138–44

Raymond et al. 2010. *Journal of Environmental Psychology* 30(4):422–34.

Hidayat, et al. 2022. *Administrative Sciences* 12(2):48.

Results & Discussion

Place attachment

Social Bonding 4.17
Nature bonding 3.86
Place depedency 3.54
Place Identity 4.42

Min: 1
Max:5

Residential Satisfaction

satisfaction living facilities 4.50
satisfaction access to work 4.05
satisfaction access to cities 3.36
satisfaction access to cities 4.31
satisfaction access to the CBD 3.10
satisfaction access to public services 3.22
satisfaction natural environment 3.83
satisfaction landscape 3.79
satisfaction sanitary healthy 3.81
satisfaction no pollution 4.07
satisfaction residential safety 4.01
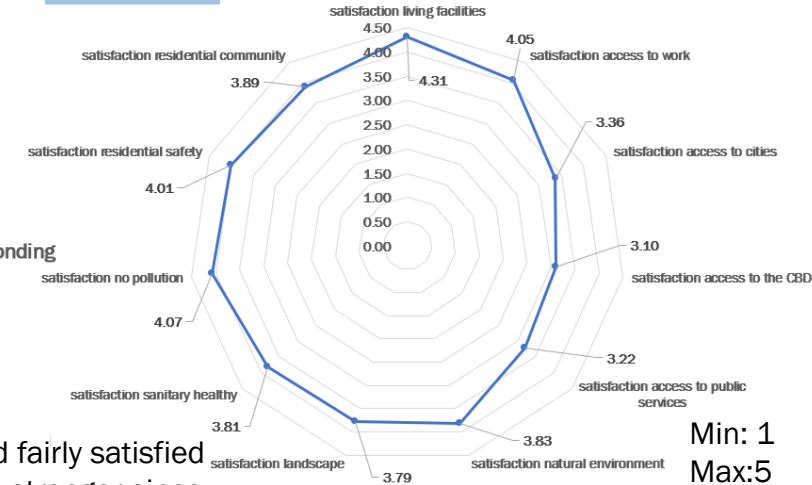satisfaction residential community 3.89

Min: 1
Max:5

- Considerably strong place attachment and fairly satisfied with current condition. Attachment can be stronger since they are at young age, naturally. Infrastructure may not affect the place attachment
- However, satisfaction level is dependent to infrastructure condition.

- Better infrastructure, better satisfaction, decreasing migration intention
- better infrastructure, increasing place attachment, increasing migration intention

$R^2 = 014$

Residential satisfaction → **Migration intention**
β= -0.33 P<0.01

Place attachment → β= 0.17 P<0.01

- Trade off personal aspect to economic aspect to secure their livelihood (Hidayat et al., 2022).
- Stronger attachment is beneficial to maintain the connection between migrant and place of origin, possibly to return home

Conclusion

The combination of Residential satisfaction and place attachment affects migration intention with opposite effects (reduction and strengthening of migration intention)

Rural Landscape Management for Agrotourism Development
Located in Cisarua District, Bogor Regency, Indonesia

Mutiara Dewi

* Graduate School of Global Environmental Studies, Kyoto University ** Department of Technology and Ecology

Synergies and Trade-offs in Water-Energy-Food Security Nexus: A South Korea Case Study

Authors: Daehan An*

* Global Environmental Policy Laboratory, Graduate School of Global Environmental Studies, Kyoto University

Ⅰ. Introduction

1. Background

▶ Water, Energy and Food (WEF) are essential resources, and demand for these resources will increase by more than 50% by 2050

▶ WEF nexus is a holistic framework for analyzing the trade-off & synergy between WEF resources

2. Challenges and gaps

▶ South Korea, which is high resources consumer, has challenges in ensuring WEF security

▶ Quantitative analysis at national level is limited

3. Research objectives

▶ To explore a quantitative analysis of synergies & trade-offs as identified between the WEF security nexus in South Korea

(1) Identify influencing in the WEF security indicators

(2) Analyze the most influential indicators

(3) Propose policy priorities for effective resource management

Ⅱ. Methods and Materials

1. Spearman's rank correlation

▶ Explore the relations between two sets of indicators

2. Network analysis

▶ Identify the influential indicators under correlation

3. Data

▶ Total 48 indicators (2004-2018)
- 16 indicators for water, energy and food, for each of which availability, accessibility, affordability, and productivity are evaluated

Ⅲ. Results

1. Total 591 interactions (synergy & trade-off)

▶ Improving/reducing an indicator in each sector could improve the other indicator
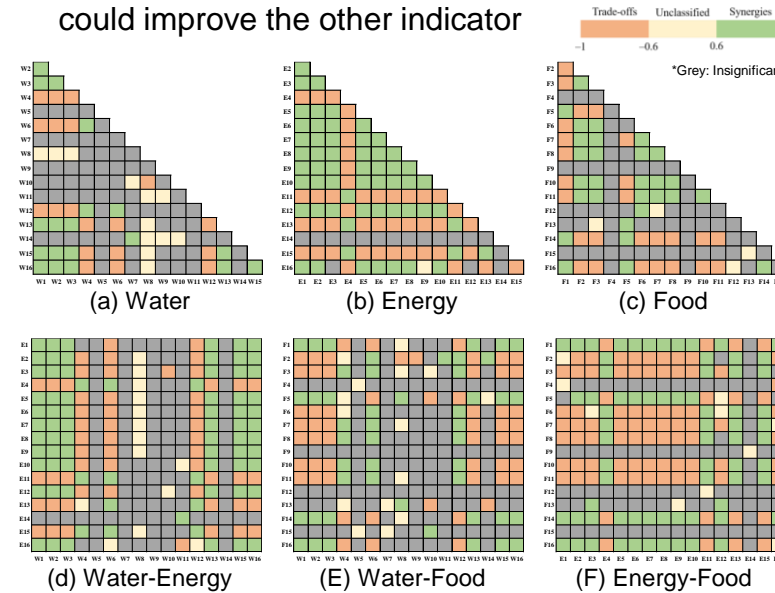
[Fig. 1] Interactions within/among WEF security indicators

2. Most influential indicators in 591 interactions

(1) Energy: Renewable & non-renewable energy

(2) Food: Value-added of agriculture

(3) Water: Water infrastructure
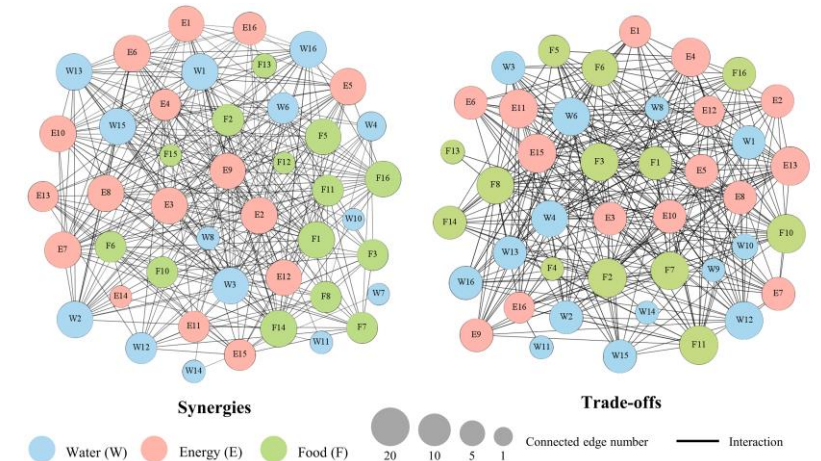
[Fig. 2] Visualization of the interactions in WEF security indicators

Ⅳ. Conclusions

▶ WEF sectors in South Korea are complexly interconnected and that WEF security can be improved through the nexus approach

▶ Effective resource management could be achieved through policies prioritized for renewable energy, water infrastructure, and value-add of agriculture

The influence of urban hygiene and sanitation with stunting prevalence, Study Case: West Java-Indonesia

Rahma Widya Ningrum*, Pingkan Aditiawati, Kamarisima, Arina Noer Cahyanti, Indra Wibowo

School of Life Sciences and Technology, Bandung Institute of Technology

Background

Indonesia: 24,4%
(SSGI, 2021)

Stunting illustration

- Internal
  - Genetic
  - Gut microbiome
- External
  - Physical & psychic
  - Nutrition intake
  - Urban hygiene
  - Socio-economic status
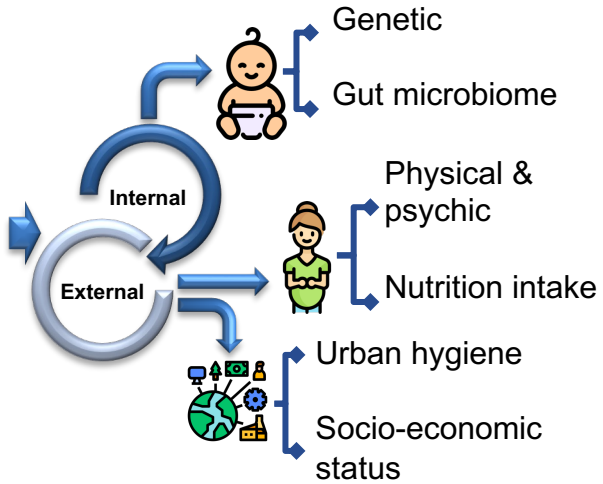
Methodology

- Determine stunting children prevalence in West Java
- Quantify the abundance of microbes in areola and water facilities
- Isolate and identified the potential pathogen
- Screen the antibiotics resistance ability

Result and Discussion
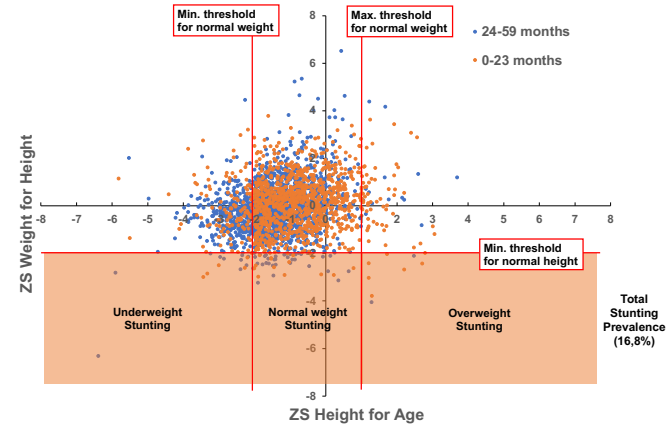
Fig. 1 Children nutrition status distribution

The highest % = 24-59 months (73%)
- 0.3% overweight
- 61.3% normal weight
- 38.4% underweight
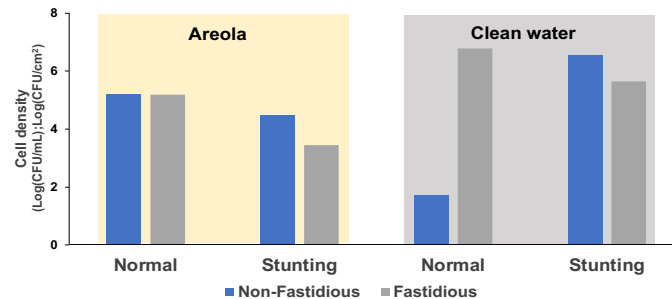
Fig. 2 Bacterial abundance from mother's areola and water facilities

Urban hygiene → Areola bacterial abundance → Affecting infant gut microbiome
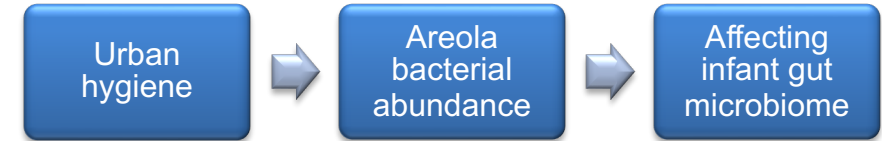
- Total bacteria in areola samples higher in normal sample than stunting sample
- Total bacteria in water facilities higher in stunted sample than normal sample

Pathogen isolated: *Staphylococcus saprophyticus*

- Resistance against more than four antibiotics (MDBR)
- Correlation of poor hygiene with the presence of pathogenic bacteria

Conclusion

- The infection cause from this pathogen interfere the nutrient absorption by dysbiosis and became hard to control.
- Proper mitigation is needed to prevent such outbreak in the future.

The Role of Domestic Migrants in Collective Action for CPR Management in Rural Community : A Case Study of Yamate District, Kumenan Town

Authors: Daigo Nishizaki*
* Graduate School of Global Environmental Studies, Kyoto University

Ⅰ. Introduction

1. Background

▶ it has been noted that the presence of migrants may have a negative impact on the collective action, which is action imposed to achieve the common good for Common Pool Resource (CPR) management.

▶ In some agricultural communities in Japan, as the population has been declining and aging, domestic migrants for farming are expected to be key persons in the management of local resources.

2. Challenges and gaps

▶ Limited studies focus on domestic migrants for farming in the view of collective action, which are unique to Japan in recent years.

3. Research objectives

▶ Analyzing how the collective action for the co-management of irrigation can be achieved in the Yamate district, Kumenan town, a grape growing area that is increasingly accepting domestic migrants.

3. Research questions

(1) What variables promote collective action in the Yamate District?
(2) How has domestic migration changed the situation of variables?

Ⅱ. Methods and Data

1. Social-Ecological System(SES) Framework

▶ Analyzing how each of variables of Resources (RS, RU), Governance Systems (GS), and Actors (A) interacted in the action situations, the place where the collective action takes place.

2. Data collection (5/2022-9/2022)

▶ Semi-structured, open-ended interviews with 19 farmers and landowners selected by snowball sampling regarding their community work, positions, rules, etc.

Ⅲ. Results

Components that promote collective action identified in the analysis using the SES Framework
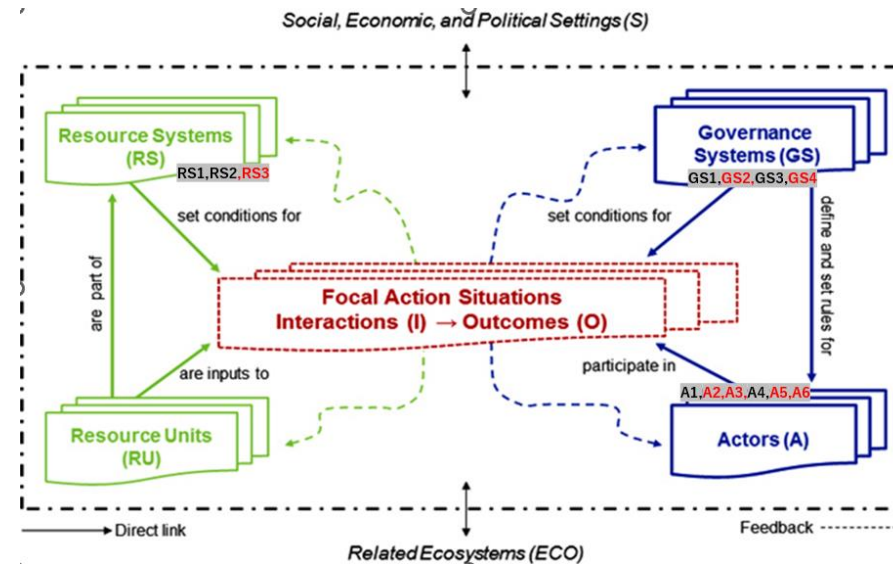
[Fig. 1] SES framework with multiple first-tier components

Resource System (RS)
- RS1 : Clarity of system boundaries
- RS2 : Size of resource system
- RS3 : Productivity of system

Governance System (GS)
- GS1 : Policy area
- GS2 : Regime type
- GS3 : Rule-making organizations
- GS4 : Rules-in-use

Actors (A)
- A1 : Number of relevant actors
- A2 : Socioeconomic attributes
- A3 : History of past experiences
- A4 : Leadership
- A5 : Norms/Social capital
- A6 : Dependence on resource

[table. 1] Variables identified as promoting components in the analysis. Red letters indicate that the situation has changed as a result of the increase in migration.

Ⅳ. Conclusions

▶ Based primarily on coding of interviewee's discourse, 13 valuables were found to promote collective action in the irrigation system in the Yamate district.

▶ 7 of the 13 valuables (red letters in [table. 1]) are considered to have been positively changed as a result of the increase in domestic migration.

Understanding the support for carbon taxation in Iran using the Theory of Planned Behavior

Author: Bahareh Ghafouri

* Graduate School of Global Environmental Studies, Kyoto University ** Laboratory of Global Environmental Policy

1. Background information

Current research aims to apply Ajzen's (1991) socio-psychological **Theory of Planned Behavior** (TPB, figure 1) to understand the determinants of support for carbon taxation in the Iranian context. Additionally, the study will analyze the **role of actual climate change knowledge** in support for carbon taxation.
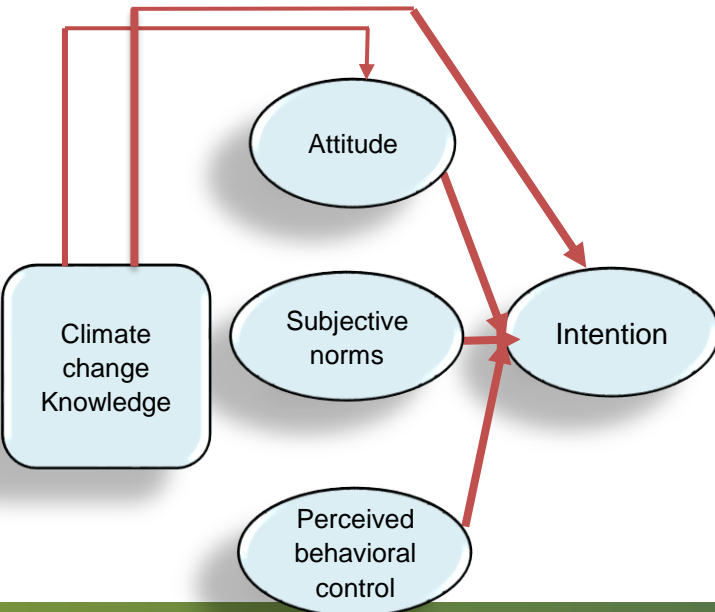
Figure 1. research framework adopted from Ajzen (1991)

2. Methodology

Proposing a hypothetical carbon tax of US$ 10/CO2e

Online Questionnaire survey: 5-point Likert scale, from May 10th to June 15th 2022, total of 198 engaged responses

Statistical analyses: T-test, correlation, Structural Equation Modelling (SEM) using R programming language

3. Main results

3.1. Descrptives: figure 2. geographical distribution of respondents
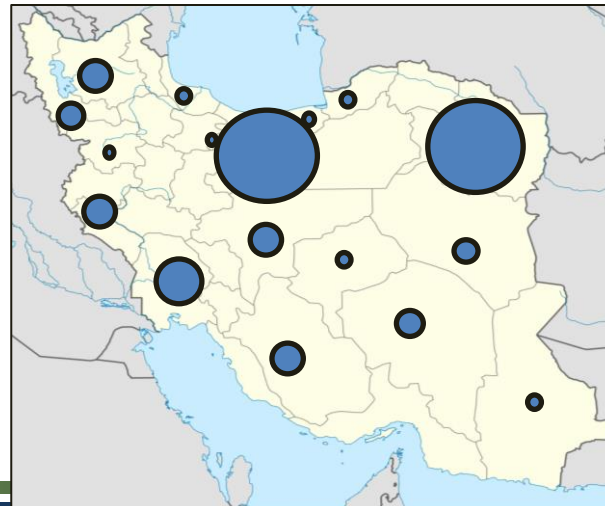
3.2. Correlation: Table 1

	Mean	SD	Knowledge	Attitude	Subjective norm	PBC
Knowledge	9	2.1	-			
Attitude	3.7	0.98	0.216**	-		
Subjective norm	3.1	0.9	0.002	**0.576***	-	
PBC	2.9	1	0.085	**0.474***	**0.342***	-
Intention	3.4	0.92	0.128	**0.705***	**0.496***	**0.593***

3.3. SEM: Table 2

Intention~	Regressions			
	Estimate	Standard error	P-value	standardized path coefficients
Attitude	0.518	0.112	0.000	0.605
Subjective norm	0.048	0.113	0.671	0.045
PBC	0.207	0.061	0.001	0.274
R-square (R²) = 0.697				
Attitude~ Knowledge	0.676	0.382	0.077	0.130
R-square (R²) = 0.017				

4. Discussion

TPB is suitable for understanding the determinants of support for carbon taxation in Iran. Addition of **Knowledge did not increase the model fit**. **Attitudes** followed by **perceived behavioral control** were significant in predicting intentions. This is in line with several past research (e.g. Cheng and Hung, 2016; Zahedi et al., 2019). Building positive attitudes through educational programs are key to policy success.

Using Logic Model Theory for Program Evaluation: Air Pollution Policy in Ulaanbaatar

Author: Batkhuyag Undrakh

* Graduate School of Global Environmental Studies, Kyoto University ** Department of Global Environmental Policy, Kyoto University

Background

➢ Globally, household air pollution caused 3.8 million deaths in 2016, accounting for 7.7% of global mortality.

➢ Air pollution has become a social problem since around 2007 in the city of Ulaanbaatar.

➢ 80% of the air pollution is caused by coal stoves.

➢ The 2018 Government resolution No.62, 'Prohibition of the use of raw coal'. The resolution banned the use of raw coal and introduced improved fuels instead. The National Committee for Environmental Pollution Reduction is responsible for implementing the resolution.

Research objectives

The research aims to apply the logic model theory to air pollution control in Ulaanbaatar, examine the actual situation, and clarify the issues.

Methodology

The research using the logic model theory. The theory takes four steps.

1. Need assessment of Resolution No. 62.
2. Process assessment of the resolution clarifying the causal relationship between each activity and the KPI (Key Performance Index).
3. Compared the KPI between different outcomes.
4. Compare the air quality indexes before and after Resolution No. 62 enacted.

Results

➢ In implementing Resolution No. 62 of the Mongolian government, it clarified the policies considered important in the logic model and verified the causal relationship of each policy.

➢ There are 9 main policies, and their implementation period is divided into two stages, before and after the introduction of improved fuel, and the final outcome of each is clarified.

➢ A total of 27 entities, including national institutions, local governments, and NGOs, were involved in the implementation of the policy, which fully reflected the intentions of various circles. However, it was a problem that the target value was not set, especially policy from 2 to 9.
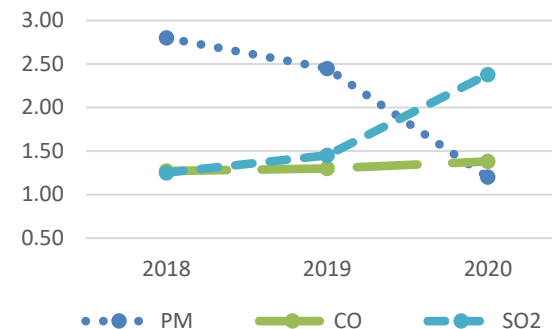
Fig.1. Changes in the degree of air pollution

➢ As shown in Fig. 1, it was a success that the total amount of dust was reduced to near the standard value. However, carbon monoxide increased slightly, while sulfur dioxide increased to 1.5 times the standard value.

➢ In contrast, hospitalization rates for respiratory illnesses have actually decreased (Figure 2).

➢ In the future, it will be necessary to examine the impact of sulfur dioxide on public health.
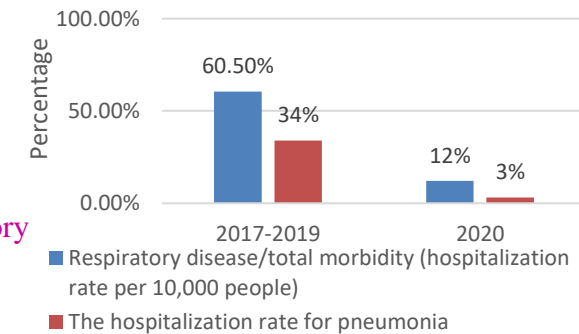
Fig.2. Respiratory disease

Conclusion & Discussion

➢ The research finds that the KPI of the each policy is influencing the increase of air quality in Mongolia. However, since the KPI is not formulated with a clear target value, it is not possible to assess whether the goal of the policy has been achieved.

➢ The cost of the improved fuel is competitive and subsidized for the poor, but this relies heavily on the cheap supply from the company. However, the increased consumption and the increasing need for subsidizing due to COVID-19 have raised a concern about the sustainability of this initiative.

➢ There is also a need to explore and implement ways to reduce sulfur dioxide from improved fuels.

Read more: Batkhuyag Undrakh (2022). An Evaluation of Air Pollution Control in Ulaanbaatar. *Japanese Journal of Evaluation Studies*, 22(2), 123-135.

Poster Presentations - Environmental Technology

A feasible approach for azo dye degradation using natural magnetite in heterogeneous Fenton oxidation

Authors: Wen-Min Wang*, Xinzheng Li*, Xin Du* , Qian-Yuan Wu*

* Tsinghua Shenzhen International Graduate School, Tsinghua University

Background

Dye wastewater is carcinogenic, teratogenic, mutagenic, and poorly biodegradable, threatening human health. The conventional Fenton oxidation method for degrading dye wastewater suffers from the regeneration of Fe^{2+} and secondary pollution, which limits its industrial application.

Natural iron minerals are considered efficient, inexpensive, abundant and eco-friendly catalysts in the heterogeneous Fenton reaction to prevent massive iron leaching or precipitation of iron hydroxide. It is unclear what the optimal parameters are and what the main reactive radical species are.

H_2O_2

•OH
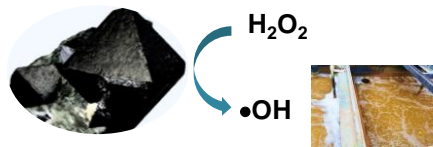
Objective

- To develop a heterogenous Fenton oxidation catalyzed by natural iron minerals for dye degradation.
- To determine the optimum parameters.
- To explore the main active species.

Methodology

Magnetite

RY3
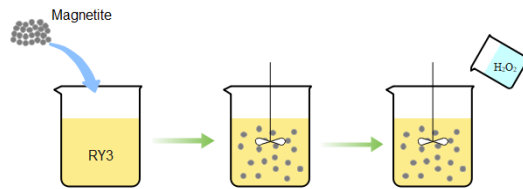
H_2O_2

- Effect of catalyst dosage
- Effect of H_2O_2 dosage
- Effect of pH value
- Effect of pollutant concentration
- Investigation of •OH generation

Results and Discussion
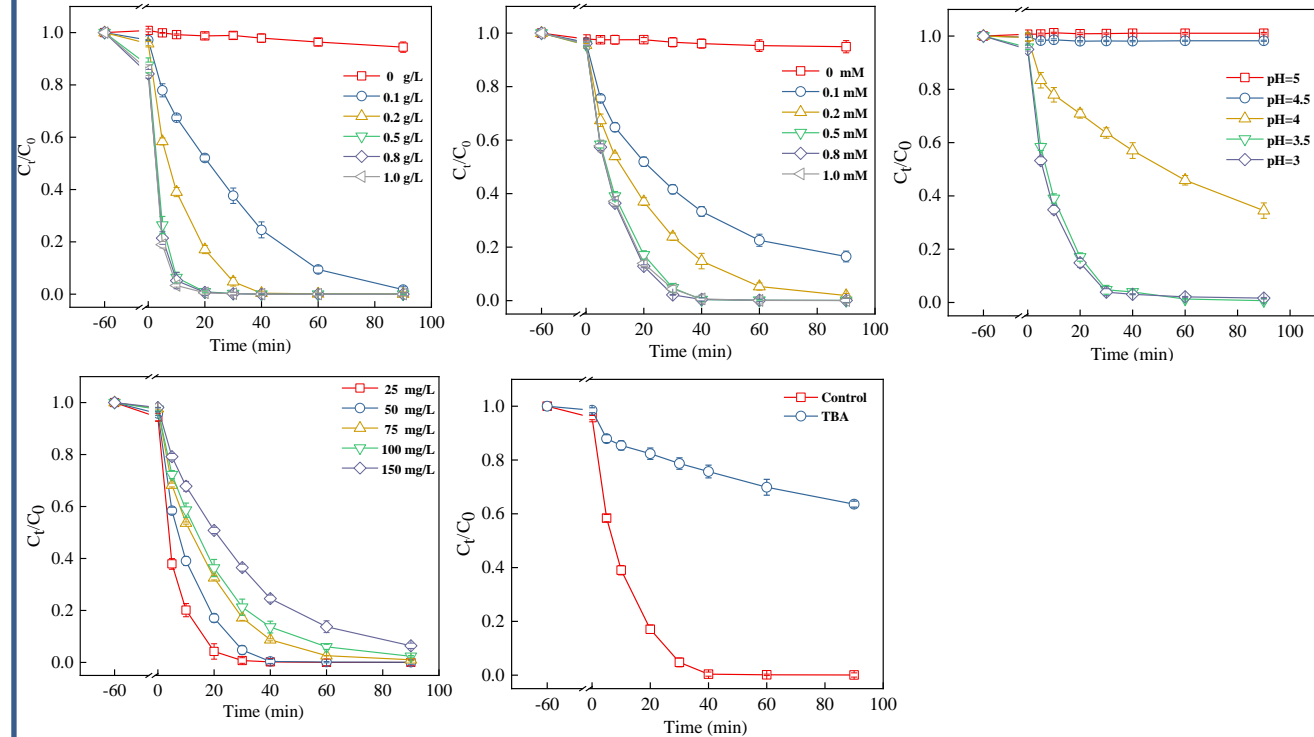
☐ Magnetite performed well in activating H_2O_2 to degrade azo dye.

☐ The optimum parameters for reactive yellow 3 degradation: 0.2 g/L of magnetite, 0.5 mM of H_2O_2, pH of 3.5, 50 mg/L of reactive yellow 3.

☐ •OH were the dominant reactive radical species.

Abundance of antibiotic-resistant bacteria in Tonle Sap River impacted by domestic wastewater

Authors: Monychot Tepy Chanto*, Sornpisey Khut**, and Chanthol Peng*

*Water and Environment Research Unit, Institute of Technology of Cambodia, **Faculty of Chemical and Food Engineering, Institute of Technology of Cambodia

1. Introduction

❖**Background:** The overuse and misuse of antibiotics in a various applications causing the emergent and widespread of antibiotic resistant bacteria (ARB). Thus, the monitoring and assessment of ARB in the water system are essential for public health protection.

❖**Objective:** Quantify the antibiotic-resistant and multidrug-resistant bacteria (MDR) in freshwater influenced by domestic wastewater.

3. Result: Physicochemical and Bacteria Analysis
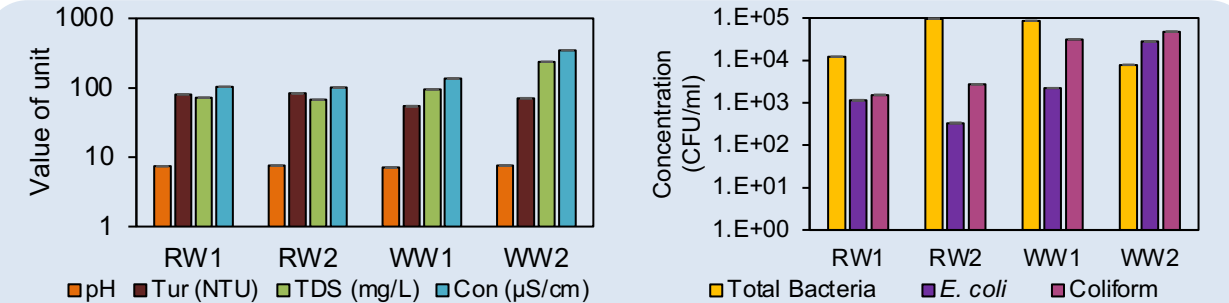
As a result, both physicochemical parameters and microbiological parameters in WW1 and WW2 are quite higher than RW1 and RW2.
The concentration of Total bacteria was found more in RW2 and WW1 while *E. coli* and Coliform were found more abundant in WW2. This agreed that thevalue of physicochemical parameters in WW2 are higher compare to other sites.

5. Conclusion and Acknowledgement

To sum up, this finding implies that there is a high frequency of ARB in the fresh water of TSR which could possibly pose a great harm to public health and could also contributing to the more serious emergence of resistant in other pathogenic bacteria.

2. Material and Method
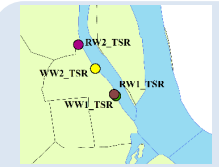
River-water samples (RW1 and RW2) and River water mix with wastewater samples (WW1 and WW2) were taken from different location along Tonle Sap River, Phnom Penh, Cambodia.

Sampling

Physicochemical Analysis

➢ Temperature
➢ pH
➢ Turbidity
➢ Electrical conductivity
➢ And total dissolve solid

Microbiology Analysis

➢ Cuture-dependence method: Enumeration of total bacteria and Antibiotic-resistant *Escherichia coli* (resistance to ampicillin (AMP), kanamycin (KAN) and ciprofloxacin (CIP)).
➢ Antibiotic susceptibility test by disc diffusion method: Multidrug-resistant bacteria.

4. Result: Concentration of antibiotic and multidrug-resistant *E. coli*
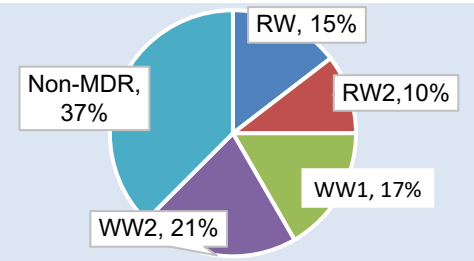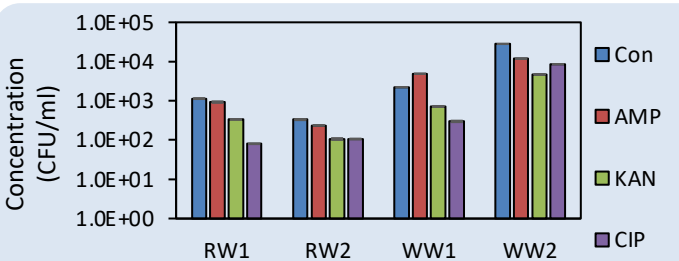
E. coli in all samples were shown to be resistant to all antibiotics and more resistant to AMP (10^2 to 10^4 CFU/ml) followed by KAN (10^2 to 10^3 CFU/ml) and CIP (10^1 to 10^3 CFU/ml). This because the study area is in the capital city of Cambodia which surrounded by hospitals and many domestic wastewater outlets that discharge directly into the river itself. The concentration of antibiotic-reistant *E. coli* is high in WW1 and WW2 because these two sites are the wastewater outlets connected to the river. This also lead to the pitch value of multidrug-resistant *E. coli* (n=48) in these two sites; 16.67% in WW1, and 20.83% in WW2 followed by RW2 (10.41%) and RW1 (14.58%).

Acceleration of granulation sludge process in SBR system using coffee husk biochar in low COD/N wastewater

Authors: Ngoc –Thuy Vu[1], Khac -Uan Do[1], Izuru Saizen[2],

(1) School of Environmental Science and Technology, Ha Noi University of Science and Technology, Ha Noi, Viet Nam
(2) Lab of Regional Planning, GSGES, Kyoto University, Japan

BACKGROUND

To accelerate the aerobic granulation process as well as promote the treatment efficiency, this study used biochar from the coffee husks with size from 0.1 to 0.3 mm as the carrier. added to batch reactors (SBRs) to evaluate granular sludge formation as well as COD and ammonium removal efficiency at a number of different organic contamination loads. After 1 week of adding biochar from the coffee husk to the activated sludge system, the biomass started to attach to the carrier to form a biofilm and seed sludge. Granular sludge with a size of less than 1 mm were formed on the 21st day of operation. The sludge particle size tended to increase gradually and stabilized at the size of 2 - 3 mm after 3 months of operation. The granular sludge also has the ability to absorb nutrients at a low level of 1 mg NH_4^+-N/g dry biomass. The COD removal efficiency in the granular sludge system was stable at 95 - 97 % in both organic pollution loads of 2.4 kg COD/m^3.day and 4.0 kg COD/m^3.day. The ammonium removal efficiency at the pollutant load 0.12 kg NH_4^+-N/m^3.day reached 93%. Continuing to increase the pollutant load by 0.2 kg NH_4^+-N/m^3.day and 0.48 kg NH_4^+-N/m^3.day, the treatment efficiency still achieved 88% and 75%, respectively.

INTRODUCTION

*The significant of this research is the application of biochar made from coffee husks (with simple and low-cost manufacturing technology), to treat high concentration of ammonium nitrogen in the domestic wastewater as a low-cost bio-adsorbent as well as a carrier promoting granular sludge formation in the SBR system.

*Some factors affecting the ammonium treatment efficiency of granular sludge system adding coffee husk biochar will be studied to find out suitable conditions for domestic wastewater treatment process

OBJECTIVES

Establishing the granular sludge in SBR system for treating domestic wastewater with adding coffee husk biochar as promoting granulation agent.

MATERIALS AND METHODS

RESULTS AND DISCUSSION

➢ Results showed that stable aerobic granules were achieved with good settleability, high pollutant removal efficiency and microbial diversity.

CONCLUSIONS AND RECOMMENDATION

❖ Making use of coffee husk biochar offers an effective solution for aerobic granulation in SBR for treating domestic wastewater.
❖ Biochar facilitates biofilm growth and granule formation and help to sustain the stability of aerobic granules for long-term domestic wastewater treatment operation.

An assessment of home ranges and habitat preferences of semi-captive elephants in Myanmar

Jue Jue [1], Shozo SHIBATA [2]

Graduate School of Agriculture, Kyoto University, Department of Forest and Biomaterials Science

1 Background

- ❖ Three types of elephants (*Elephas Maximus*)- wild, semi-captive, captive
- ❖ 80% of them are semi-captive, have been using in the timber industry and tourism
- ❖ **No detailed knowledge – preferred habitat and minimum required roaming size** that can reduce **HEC (Human-Elephant Conflict)**

Timber industry

MTE

Tourism

MTE

2 Methodology

- ❖ Two elephants (male and female), in total six elephants, of three sites, different in working type and habitat size from two regions
- ❖ Semi-structured interview in no-habitat camp working for tourism
- ❖ Collection of food plants by following them for four days and GPS tracks by attaching the GPS on the collar of the elephants

Statistical analysis- Descriptive statistics, Kernel density-kh100, Manly Selection Ratio

Study sites

Attaching GPS on the collar of the elephant

3 Results and Discussion

Preferred plant species and habitat

Preferred food family

No habitat site - **Napia** (*Pennisetum purpureum*) as the **main food**

Habitat sites - **Species from Poaceae Family (51%)**

Bamboo and grass **may satisfy critical nutrients**

Preferred habitat – Secondary forest ($X2$ 135.9464 df 7 p value 0.00000)

Number of species in each family

Food plants family

Used and available proportions
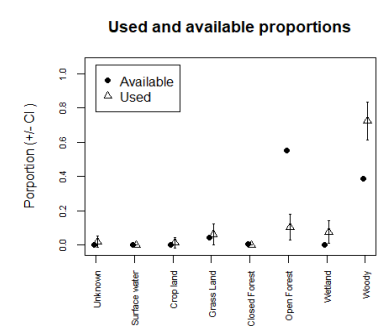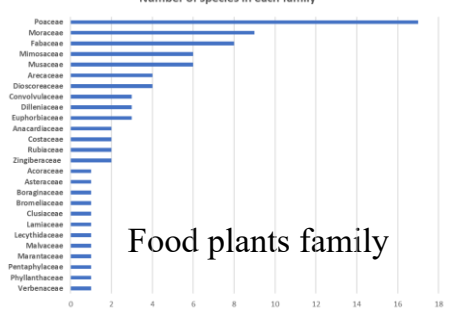
Preferred -woody (secondary forest)

4 Results and Discussion

Home Range (HR) Size

- ❖ **Daily home range size - 0.895 km²** (0.376 km² to 2.377 km²) by Kh100 at 95% contour
- ❖ Permitted average HR size-0.181 km² < the resulted HR average size
- ❖ Elephants went out of their permitted area, except one site depending on food availability and land use condition.

Male elephant working for tourism
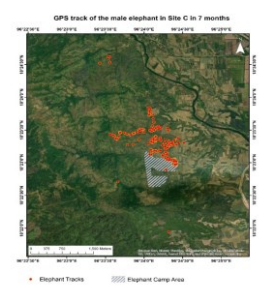
Are Urban Forest Ecosystem Services related to Public Green Space? A Case Study of Kyoto City

Yusong Xie [1], Jiefeng Kang [2], Satoshi Hirabayashi [3], Shozo Shibata [1,2]

1 Graduate School of Agriculture, Kyoto University 2 Graduate School of Global Environmental Studies, Kyoto University
3 US Forest Service/The Davey Tree Expert Company

BACKGROUND

- ☐ Evaluation of urban forest ecosystem services is **critical in urban forests planting and maintenance**.
- ☐ Ground-investigation-based methods can **provide accurate assessment** for ecosystem services.
- ☐ Most previous studies on urban ecosystem service mapping **only focus on certain ecosystem services.**
- ☐ To enhance the mainstreaming of ecosystem services in urban planning, **ES mapping is necessary**.
- ☐ Most research is for American and European cities, while **less for the others like Asian cities**.

RESEARCH AREA

In the Built-up area of Kyoto City, **large green spaces are limited in number and scattered**, so it is important to use the existing green spaces wisely to enhance the ecosystem services. In addition, Kyoto city has a **huge number of public service facilities, shrines and temples.** Exploring the relationship between the current urban forest effect and the above green spaces is of great significance for the rational planning and layout of trees.
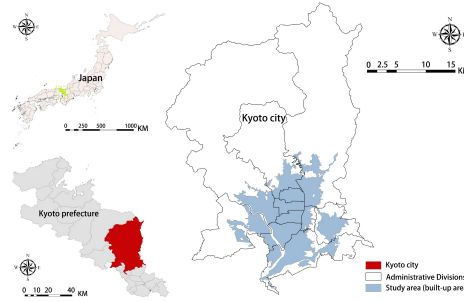
METHODOLOGY

Field Survey: Set 151 quadrats (size: 20 m x 20 m) in the built-up area of Kyoto City. The species name of all woody plants in the quadrat are recorded, as well as some other attributes.

i-Tree Eco tool, was used to assess the carbon storage, carbon sequestration, air pollutants removal, and runoff reduction for each tree of each quadrat.

Empirical Bayesian Kriging as one of automatic interpolation methods, often considered more accurate. It was applied to map the spatial distribution of ecosystem services of urban forest.

Land use abb.	Land use subtypes	Quadrat number
Com	Commercial area	12
ComNbr	Neighborhood commercial area	9
ResLow	Exclusively low-rise residential area	35
ResHigh	Mid/high-rise residential area	38
Resother	Other residential area	34
Ind	Industrial area	23
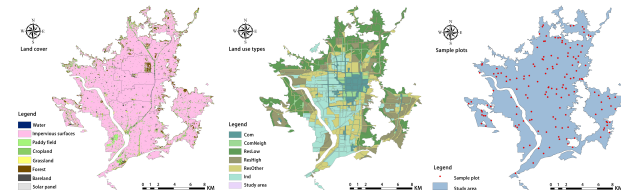
RESULTS & DISCUSSION

Mapping ecosystem services

- ➤ The spatial distribution of Ecosystem services value (ESV)：**peak areas in the northeast and south**, while the central area, the northern, the eastern and the southeastern have lower ESV.
- ➤ The high concentration hotspots are located in the southwest surroundings and northeastern region, with **the largest hotspot area in the northeastern region**.
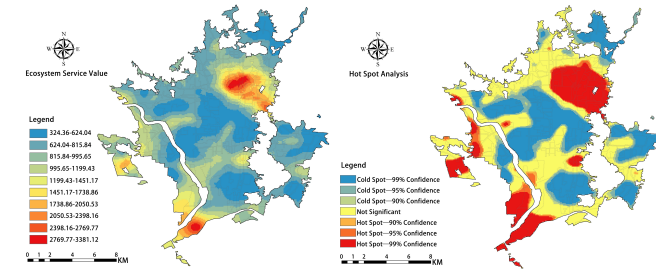
Ecosystem services and land use

- ➤ The rank of the ESV was **ResLow > ResOther > Ind > ResHigh > ComNbr > Com**.
- ➤ Carbon storage is the most important component (highest value) of the ESV of urban forest, and other ecosystem services in the order of **carbon storage > runoff reduction >= $PM_{2.5}$ removal > carbon sequestration > O_3 removal >= NO_2 removal > SO_2 removal.**
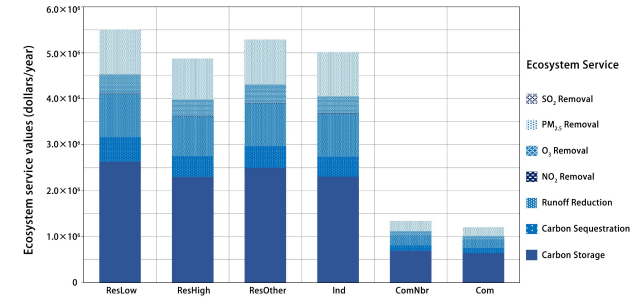
The relationship between ESV and public space distribution

The correlation analysis revealed that the distribution of public service facilities and urban parks were **significantly correlated with ESV**, with **negative correlation for urban parks** and **weak correlation for public service facilities**. so the study concluded that supporting greenery of basic service facilities and urban parks are the main places to enhance urban ecosystem services.

Calibration of Portable Carbon Monoxide and Ozone Sensors of a Low-Cost Air Quality Monitoring Device Using Multiple Linear Regression Approach
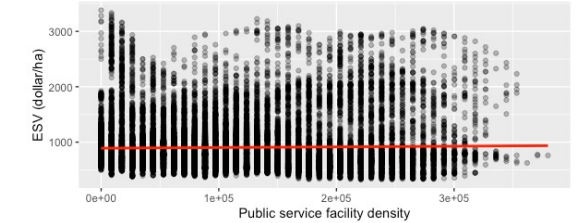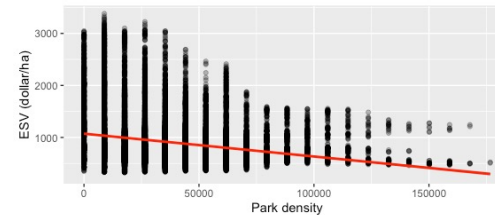
Anuva Bhowmick *, **, Yosuke Sakamoto **, ***, ****, Kentaro Murano **, Yoshizumi Kajii **, ***, **** and Suwanna Kitpati Boontanon *, **

*Graduate Program in Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, Faculty of Engineering, Mahidol University**Graduate School of Global Environmental Studies, Kyoto University, ***Regional Environment Conservation Division, National Institute for Environmental Studies, Japan, ****Graduate School of Human and Environmental Studies, Kyoto University

A. Bhowmick

Background

- Quality of ambient air is degrading day by day beside standard devices of Air Quality Monitoring (AQM) is *costly*
- The low-cost air quality monitors have becoming popular but lack of *proper calibration* became an issue
- A group of researchers are working to *develop the compact and useful $PM_{2.5}$ instruments with gas sensors (CUPI-G)* (Fig: 1) in the Kyoto University atmospheric lab of Japan.
- The $PM_{2.5}$ *sensor* of this device was *already calibrated* (Nakayama et. al., 2018).

The main objective of this study is to calibrate the portable gaseous sensors i.e., CO, O_3, of the CUPI-G air quality monitoring device.

Figure 1: CUPI-G Device

Data Collection Locations:

Atmospheric Chemistry Lab, KU

Near Road, Kyoto City

NIES, Tsukuba

Methodology

The ambient air was supplied at the *same time and location* using the standard devices and CUPI-G device. The review on working principle of Gas Monitoring Standard device and the CUPI-G device was performed, then the methodological steps are divided into following parts.

Data Collection and Processing

Data collection by the *standard* device

Data collection by the CUPI-G device

CO Analyzer

O_3 Monitor

Statistical Analysis for Data Calibration

Single Linear Regression (SLR)
$$\hat{y} = b_0 + b_1 x_1$$

Multiple Linear Regression (MLR)
$$\hat{y} = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3$$

b_0	=	Y intercept
b_1	=	Slope of the regression line
x_1	=	Voltage of experimental device
$\hat{y}$	=	Concentration of experimental device

b_0	=	Y intercept
$b_1\ b_2\ b_3$	=	Regression coefficients
$x_1 x_2\ x_3$	=	Variables such as voltage of experimental device, temperature, humidity
$\hat{y}$	=	Concentration of experimental device

Selection of best fit Equation for **CO** and **O_3** of CUPI-G Dataset

Results and Discussion

In this study, it has found that *MLR showed better results over SLR* and below equations will be used for future work to find monitoring device concentration.

- For CO; y= 135.5723 + 1.182699X (Standard Device Concentration) - 4.45395 X (Temperature) - 0.49979 X (Relative Humidity) with R^2 = 0.914
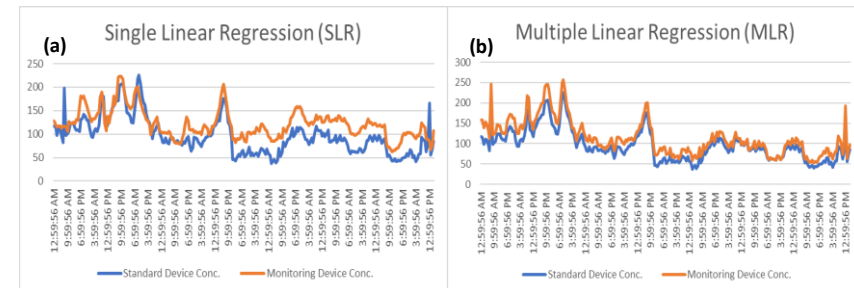
Figure 2: Graphical representation of SLR (a), MLR (b) for CO

- For O_3; y = 41.16488 + 0.12463 X (Standard Device Concentration) + 1.749207 X (Temperature) - 1.36732X (Relative Humidity) where R^2 = 0.951
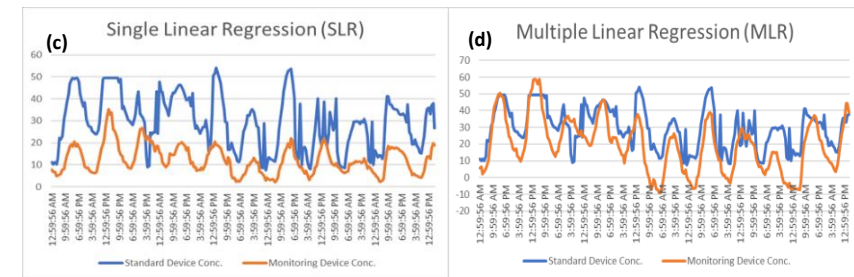
Figure 3: Graphical representation of SLR (c), MLR (d) for O_3

Acknowledgement

Reference

Nakayama, T., Matsumi, Y., Kawahito, K. and Watabe, Y., (2018). "Development and evaluation of a palm-sized optical $PM_{2.5}$ sensor". Aerosol Science and Technology, 52:1, 2-12, DOI: 10.1080/02786826.2017.1375078

Changes in toxicity and adsorbable organic bromine concentrations in ozonated reclaimed water irradiated with sunlight

Authors: De-xiu Wu*, Wen-long Wang*, Ye Du**, Liu He*, Qian-yuan* Wu*

- *Tsinghua Shenzhen International Graduate School, Tsinghua University   ** College of Architecture and Environment, Sichuan University

Background

WWTP second effluent → Ozone Disinfection → **Supplied water resource for river**   **Municipal reuse**

Reclaimed Water
- Dissolved organic matter.
- Bromine ion.

Reuse Safety
- By-products. e.g., adsorbable organic bromine (AOBr)
- Toxicity.

Methodology

Toxicity evaluation

Chinese hamster ovary cell + Ozonated reclaimed water

reactive oxygen species — phosphorylation H2AX histone — succinode-hydrogenase

Macromolecule → Cell

Intracellular oxidative stress — DNA double strand breakage — Cell viability

Results and Discussion

✓ Solar irradiation reduces AOBr and cytotoxicity.
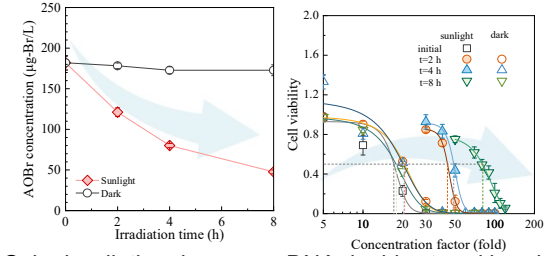
✓ Solar irradiation decreases DNA double strand breakage.

Less pH2AX foci
Less genotoxic
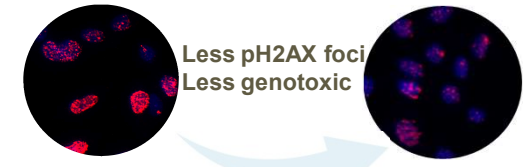
✓ UV part of sunlight dominant.
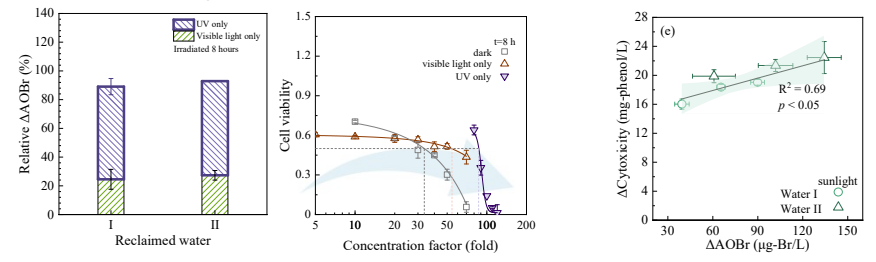
✓ AOBr decreases and cytotoxicity decreases correlated.

Sunlight irradiation is helpful on improving ozonated reclaimed water quality.

CHARACTERIZATION OF REFUSE DERIVED FUEL (RDF) OBTAINED FROM MUNICIPAL SOLID WASTE – A CASE STUDY ON QUẢNG NGÃI PROVINCE

Authors: Hoang Thi Hong Van 1, Nguyen Thi Anh Tuyet 1, Van Dinh Son Tho 2
1 School of Environmental Science and Technology, Hanoi University of Science and Technology
2 School of Chemical Engineering, Hanoi University of Science and Technology

BACKGROUND

- Towards low-C economy, Vietnam's goal is net zero emissions by 2050.
- To encourage the development of newly alternative energy sources: solar energy, wind energy, hydrogen energy, energy from waste, or refuse derived fuel (RDF) in the direction of applying circular practices.
- RDF is a fuel of a certain quality that is made from more raw and less pure ingredients found in solid waste (ASTM 56-2004 standards).

Code	Decription
RDF-1	Waste is used in discarded form
RDF-2	Waste is treated according to coarse particle size with or without ferrous separation when 95% by weight passes through the 150 mm mesh sieve (Coarse RDF – cRDF)
RDF-3	The treated waste is separated from glass, metal and inorganic materials and crushed by 95% by weight passing through a 50 mm mesh sieve (Fluff RDF)
RDF-4	Flammable waste is processed into a powder form, so that 95% of the weight passes through a 2 mm mesh (Powder RDF)
RDF-5	Combustible waste is compressed into pellets, slugs, blocks or cakes (Densified RDF – dRDF)
RDF-6	Flammable waste is processed into liquid fuel (Slurry RDF)
RDF-7	Combustible waste is processed into gaseous fuel (Syngas RDF)

Picture 1. RDF from industrial waste (URENCO-VietNam

METHODOLOGY

Garbage was collected from a local waste treatment company in Binh Son District, Quang Ngai province, VietNam. This amount was already separated by sizes:
(1) 8 cm or larger
(2) from 2cm to 8cm
(3) from 1cm to 2cm
(4) less than 1cm

The study determined the composition and some basic chemical properties related to the flammability of MSW, including chemical composition, moisture content, ash content, and calorific value. (they were determined in accordance with ASTMD 3173 standard, ASTMD 3175 standard, ASTMD 3174 standard, TCVN 200:2011 standard).

- Samples waste was dried, dehumidified and measured with a calorimeter bomb to obtain a high calorific value. The test equipment includes IKA C2000 Basic (calorimeter); IKA KV600 Digital (chiller accompanyied with the calorimeter); IKA WERKE Model MF10 (size crusher). Besides, HHV of the waste samples (in discarded form) can be estimated using Dulong formula [8].

$$HHV = 2,326 \ (145[C] + 610 \ ([H] - 1/8[O]) + 40[S] + 10[N])$$

Where: HHV- high heat value of waste sample (kJ/kg)
[C], [H], [O], [N], [S]: proportion of C, H, O, N, S (% weight), respectively.

Picture 2. Solid waste with a size of 8 cm or larger

Picture 3. Solid waste with a size less than 8 cm

RESULTS & DISCUSSION
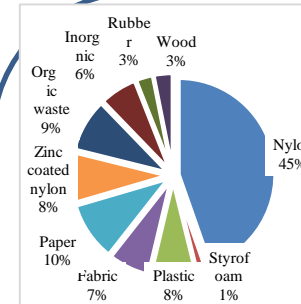
Figure 1. Mass composition of solid waste with a size of 8 cm or larger
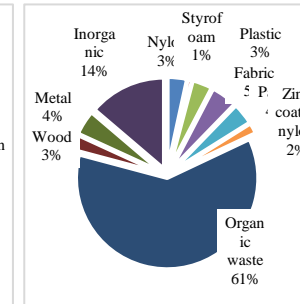
Figure 2. Mass composition of solid waste with a size from 2 cm to 8 cm
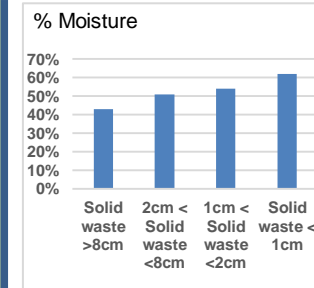
Figure 3. Moisture content

Figure 4. Ash content

Table 1. The calorific value of the sample wastes

Type	Type of waste	Calorific values (HHV, Kcal/kg)	
		Dulong formula	Calorimeter bomb
(1)	Solid waste with a size of 8 cm or larger	7,728	6,935
(2)	Solid waste with a size from 2 to 8 cm	3,742	-

Table 2. The calorific value of potential dRDFs

Code	Description	(HHV, Kcal/kg)
RDF-5.1	dRDF – category 1, in which combustible waste with size of 8 cm or larger is compressed into pellets, slugs, blocks or cakes	6,955
RDF-5.2	dRDF – class 2, in which the combustible waste is 8 cm or larger in size, the inorganic waste has been removed and then compacted into pellets, slugs, blocks or cakes	7,419
RDF-5.3	dRDF – category 3, in which combustible waste with size of 8 cm or larger is romeved inorganic waste and garden waste, then is compressed into pellets, slugs, blocks or cakes	7,844

Comparing with HHVs of popular types of coal that are using as fuel source in power plants and/or cement industry, it can be clearly seen that, the dRDF with combustible waste of 8 cm-size or larger can be used as an alternative fuel for co-firing in heavy industries. In Vietnam, as resulted, we proposed to completely co-firing RDF in cement kilns at the rate of about 10% to 15% of total heat required. In order to fit the conditions of existing technologies, it is necessary to study further on the combustion process of the above dRDFs applied to cement production.

CONCLUSIONS

- Type (3) and type (4) are not effective to burn because of its' high composition of soil and inorganic substance with very high ash content. In term of heat effectiveness, type (2), the solid waste of size less than 8cm, is also not effective to be produced and used.
- The combustible waste of 8 cm-size or larger can be used to produce dRDF and use as an alternative fuel for co-firing in thernal power plants or cement industry. We can produce different types of RDF with higher calorific values, excluding hard-to-burn components or non-flammable components.

Comparative Study of 3 Post-disaster Housing Proposals in Rural Communities After the 2017 Earthquake in Mexico

Authors: Maria Perez
* Graduate School of Global Environmental Studies, Kyoto University

Background and Methodology

On September 19th, 2017, an earthquake of 7.1M stroke Mexico. The event left over 190 thousand buildings damaged. Among the most affected, **rural housing in the State of Puebla experienced great damages**. **(A) Alpanocan** and **(P) Pilcaya** are two communities with poverty rates above 70%, where more than 1/3 of the houses suffered severe damages. Post-disaster housing (PDH) proposals were made to try to solve people's needs in these two sites.

This study takes three PDH proposals using different materials and strategies: **① 3D Sandwich panel Permanent Houses (3D) ; ② Temporary Housing Bamboo Modules (THB); ③ A Bahareque Housing Prototype (BHP).**

The **methodology** is based on official government data and literature regarding the 2017 Puebla Earthquake, PDH and rural housing and vulnerability. GIS Tool Mapping was applied to process local data and **Qualitative data was obtained via observational analysis**, **on-site participation on the 3 construction proposals, and semi-structured online interviews to the NGO leaders.**

State of Puebla

A

P

Results

① 3D
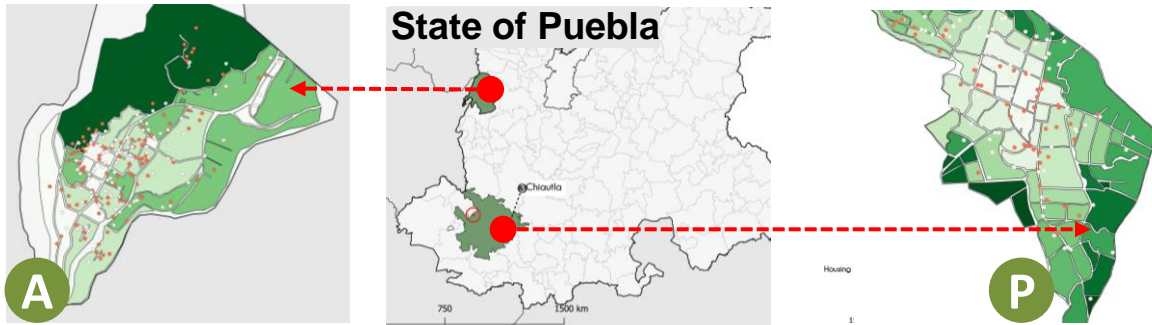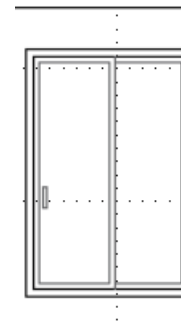
Site: Alpanocan
Dim: 38-42 m2
Mat: Prefabricated
Construction: Local NGO
Time: 3-30 D
Volunteers: 20

② THB

Site: Pilcaya
Dim: 12 m2
Materials: Bamboo
Construction: Local NGO
Time: 1 D
Volunteers: 10

③ BHP
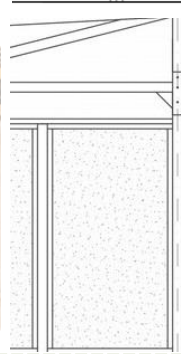
Site: Pilcaya
Dim: 35 m2
Materials: Clay-timber-cane
Construction: University
Time: 1-2 W
Volunteers: 20

Discussion

Time
Durability
Adaptability
Participation
Costs

Time
Durability
Adaptability
Participation
Costs

Time
Durability
Adaptability
Participation
Costs
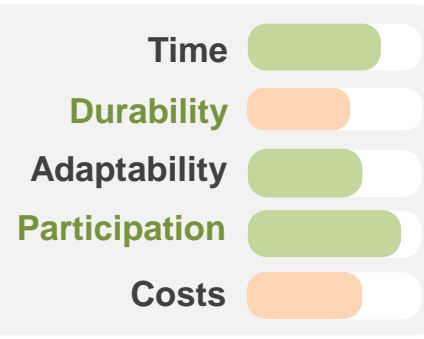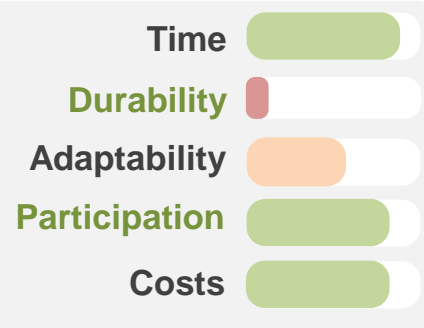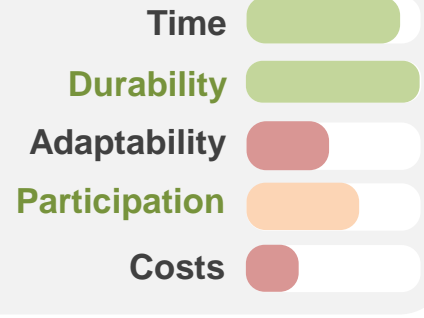
Economic incentive in enhancing community waste separation and collection: A panel data analysis in China

Sun Jie*, Misuzu Asari*
* Graduate School of Global Environmental Studies, Kyoto University

【Background】

Since 2017, many cities in China have implemented economic incentives to promote citizens' waste separation. Incentive mechanisms have been proven to motivate residents to separate their waste, while empirical research is still needed to determine whether this separation behavior could be maintained over time. The main objective of this paper is to investigate waste separation management activities in the city of Dongying, China, as a case study to clarify how local community citizens' waste separation activities change over time cross-sectionally under the influence of an economic incentive mechanism – Point System.

【Methodology】

1. Research area

The research area is Dongying City, with 404 communities and 190,284 families. The city started Point System (Fig.1) for waste separation activities in 2019. The data collected from September 2020 to June 2022 was chosen.
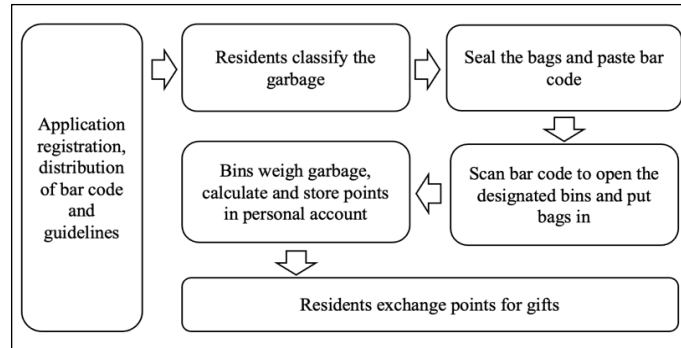
Figure 1. Process of waste classification with Point System

2. Data analysis

This study took the community as the unit and adopted panel data analysis to examine the long-term impact of the Point system(PS) on waste separation behavior. Community participants and community recycling amount was set as the dependent variables, and PS system operation time as the independent variable; there are also several control variables such as community household number, community resident attributes, community building type, equipment placement, and functions. Data analysis was carried out by STATA

【Results and discussion】

1. Measurement results of community participation and recyclable
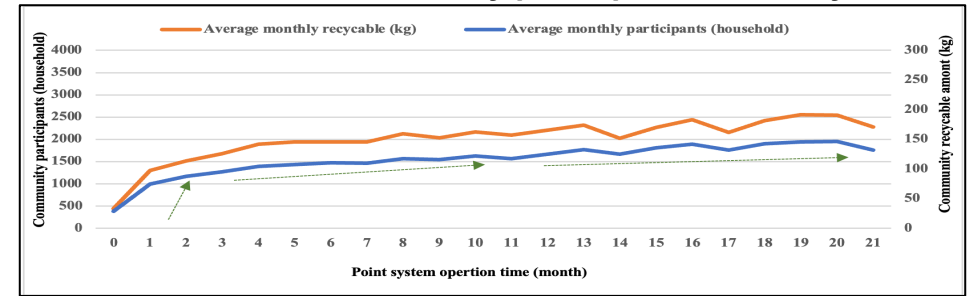
Figure 2. The average monthly community participants and recyclable with Point system

Depending on Figure 2, results showed that community resident waste participation and recycling behavior leads to growth in the early stages and gradually show saturation without growth in the middle and late stages. while the further data validation is still required.

2. Panel data regression results

From the data, we can see that the LSDV model is the most appropriate for the sample data. The effect of PS operation time on the dependent variables is very small, with the same result as Figure 2. This result implies that there are limitations to the incentive mechanism that it could only motivate small part residents to participate; for those who are not affected by financial incentives, education or compulsory means were suggested to be used.

Table 1. Regression Results in participants and recyclable

VARIABLES	Participants LSDV	Recyclable LSDV
PS operation time	0.047***	0.073***
	(7.20)	(8.97)
Ln Comm household	0.984***	0.716***
	(243.59)	(141.26)
Comm building	0.787***	1.294***
	(81.88)	(107.16)
Comm attribute	-1.339***	-2.261***
	(-1107.84)	(-1489.98)
Equip placement	-2.10***	-2.710***
	(-3124.63)	(3211.50)
Equip function	-2.956***	-4.837***
	(-237.00)	(-308.86)
Constant	-3.183***	0.337***
	(-42.28)	(3.56)
Observations	1705	1705
R-squared	0.574	0.513
Comm dummy	Yes	Yes
Month dummy	Yes	Yes

Effects of spatial variations on soil nitrogen dynamics in *Chamaecyparis obtusa* forest through *in-situ* ^{15}N tracing method

Zixiao Wang[1], Makoto Shibata[1,2], Jinsen Zheng[3], Fukushima Keitaro[4], Jiajie Du[1], Shinya Funakawa[1,2]

1: Division of Environmental Science and Technology, Graduate School of Agriculture, Kyoto University *Kyoto, Japan* 2: Graduate School of Global Environmental Studies, Kyoto University *Kyoto, Japan*
3: Forestry and Forest Products Research Institute, Agriculture, Forestry and Fisheries Research Council *Tsukuba, Japan* 4: Center for Ecological Research, Kyoto University *Shiga, Japan*

Introduction

Nitrogen (N) is one of the major nutrients that limits the growth of plants.(Vitousek and Howarth, 1991; Dijkstra et al., 2015). Inorganic N nutrients, NH_4^+ and NO_3^-, are major constituents in soil N dynamics (**Fig. 1**). Widely-used experimental set-ups, such as in-lab incubation without plants (Tokuchi et al., 2000), excluding live fine roots and their competition with soil microbes (Rütting et al., 2011).
To avoid the disturbance on live fine roots, an experiment combining^{15}N tracing method and *in-situ* incubation with virtual soil cores (VSC) was developed (Rütting et al., 2011).
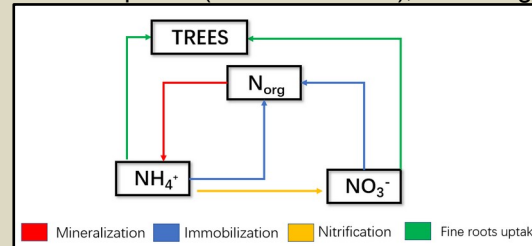
Fig. 1 Gross productions and consumptions in soil N cycling.

Objectives

1. To illustrate the significance of fine roots in soil N transformations.

2. To study about uptake strategy of *Chamaecyparis obtusa* (*Japanese cypress*) under different ambient inorganic N pool sizes.

Methodology
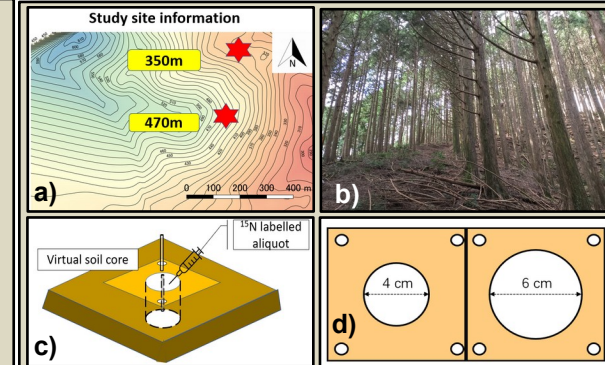
***In-situ* experiment**

(a) *In-situ* incubation was conducted in late March 2021 at up and down slope in Mt. Hiei, Shiga Prefecture.

(b) Both sampling sites were dominated by *Japanese cypress*.
(c) Paired inorganic ^{15}N aliquot ($^{15}NH_4NO_3$, 2.2 mg $^{15}NH_4$-N kg^{-1}, 98 atom% ^{15}N; $NH_4^{15}NO_3$, 0.2 mg $^{15}NO_3$-N kg^{-1}, 98 atom% ^{15}N) and deionized water were injected through VSCs. Each treatment has five replicates. **d)** Injection and sampling templates were designed for reducing lateral diffusion.

Results and discussion

a) Fine roots' uptake in gross N consumption rate
b) Uptake strategy of Japanese Cypress under different N status

Up slope $^{15}NH_4^+$ Down slope $^{15}NH_4^+$

- Fine root uptake
- Nitrification
- Immobilization
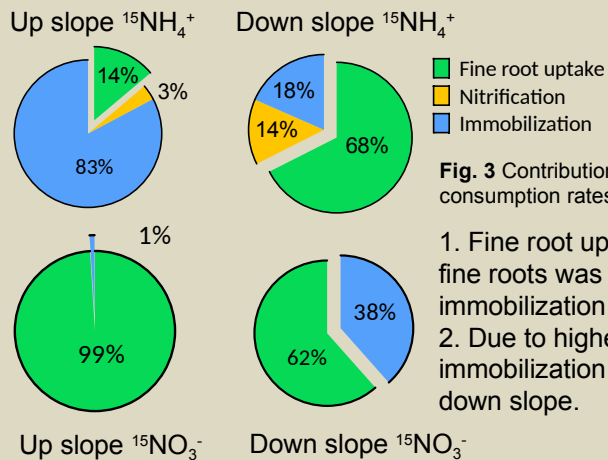
Fig. 3 Contribution of each process in gross consumption rates of NH_4^+ and NO_3^-.

1. Fine root uptake of ammonium by fine roots was **higher** than immobilization at down slope.
2. Due to higher nitrate concentration, immobilization of nitrate **increased** at down slope.

Up slope $^{15}NO_3^-$ Down slope $^{15}NO_3^-$

	Up slope	Down slope
NH$_4$-N mg N kg^{-1}	18±4***	11±0
NO$_3$-N mg N kg^{-1}	0.63±0.00	3.4±1.7**
Fine root biomass kg m^{-3}	1.5±1.1**	0.83±0.47

Table 1 Soil chemical properties at up and down slope.

Fig. 2 Temporary amount of 15N in fine roots

$^{15}NH_4^+$ assimilation at down slope was higher than that at up slope when ambient ammonium pool size decreased while net uptake rates of NO3$^-$ at both slopes did not show significant differences when nitrate pool size increased. This can explain that uptake strategy of ammonium of *Japanese cypress* is **not affected** by ambient pool size.

Conclusions

1. The significance of uptake of live fine roots should be considered in soil N transformation studies.

2. Uptake strategy of mature *Japanese cypress* does not correspond to variations in ambient inorganic N pool sizes.

Effects of temperature on hydraulic and buffering performances of soil-bentonite mixture

Authors: Rongguang YU*, Takeshi KATSUMI*, Atsushi TAKAI*, Tomohiro KATO*, Lincoln Waweru GATHUKA*

* Graduate School of Global Environmental Studies, Kyoto University

Background

Bentonite-based barriers
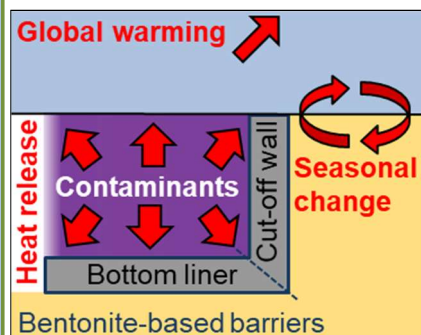
- Thermal impacts occur during the barrier operations

- The performance of barrier material in different thermal conditions?

Methodology

Mixing process

Soil → 5% bentonite slurry → Bentonite powder → SB

$$\frac{m_{bentonite}}{m_{soil}} = 7.5\%$$

Specimen preparation

SB → Vertical compaction

D = 60 mm, H = 11.5 mm
ρ_d = 1.73 g/cm³

T-1 T-2 T-3

Hydraulic conductivity tests with 1M CaCl$_2$ at different T

21.4ºC 40.0ºC 57.2ºC
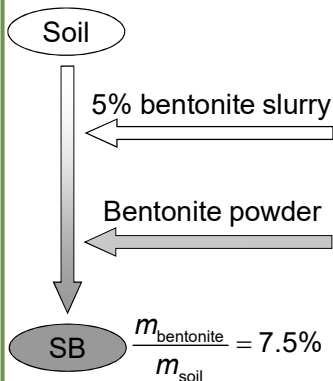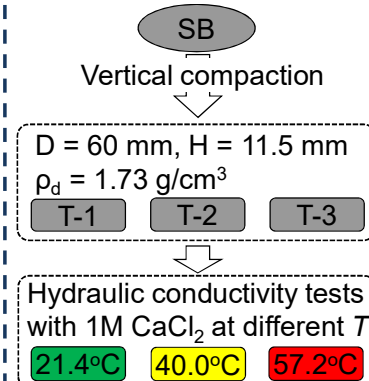
Instrument modification

T Fluctuation ≤ ±0.3 ºC
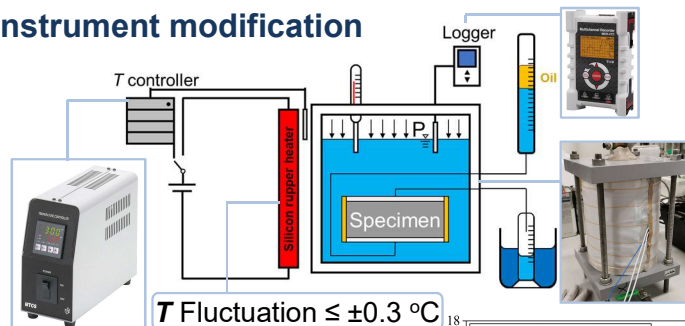
Theoretical basis

- Hydraulic conductivity k

$$k \propto \left(\ln \Delta H \right) / \Delta t \quad \text{Exp. measured}$$

- Intrinsic permeability k_{in}

$$k_{in} = k \left(\eta / \rho g \right) \quad \text{Permeant property}$$

$\rho g / \eta$ of 0.98 mol/L CaCl$_2$
Wimhy, I. M. (1994)

T-3 (14.88)
T-2 (11.60)
T-1 (8.04)

Results

PVF = $V_{effluent}$ / $V_{specimen\,void}$

T dependency is not obvious

T = 57.2 ºC
T = 40.0 ºC
T = 21.4 ºC

EC breakthrough

EC$_{Influent}$ = 109.3 (1.0 mol/L CaCl$_2$)

T = 57.2 ºC
T = 40.0 ºC
T = 21.4 ºC

Inversion

Complete breakthrough at high temperature will be delayed

Temperature rising accelerate the breakthrough at beginning
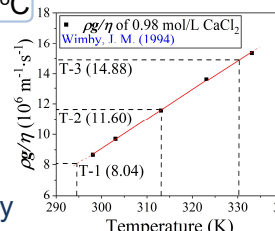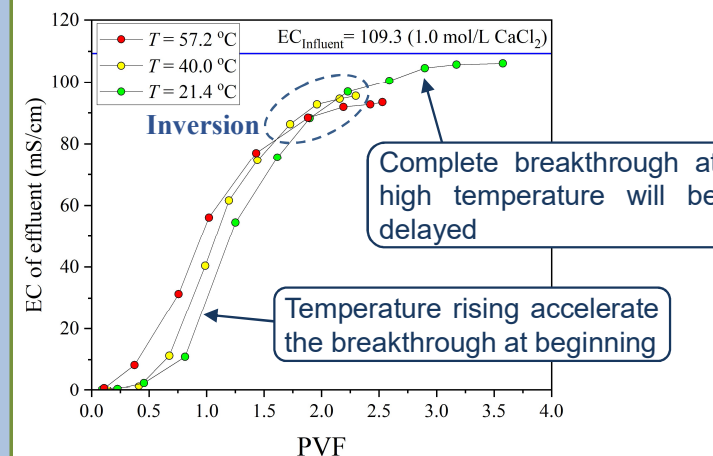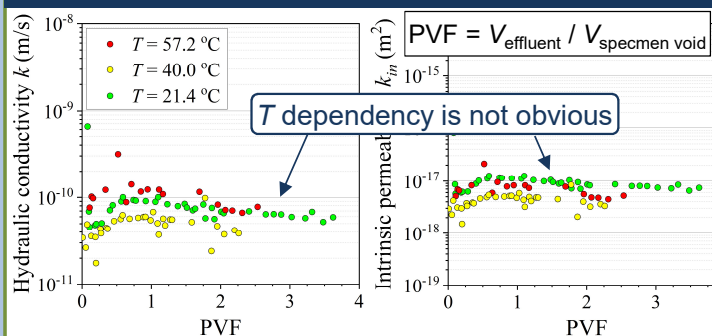
Discussion

- Neither k nor k_{in} have shown obvious temperature dependency; But conclusion could only be given after the verification of repeat tests with a more accurate method of specimen preparation, e.g. consolidation.

- The inversion of EC breakthrough curves indicate a more intensive diffusing as temperature rising when the value of k in each cases are close.

- A comprehensive explanation of the breakthrough curves required more observations about the ionic concentrations of Na$^+$ and Ca^{2+} in the effluent.

Environmental Costs and Benefits from Circular Agriculture: A Case Study on Waste Management in Sugarcane Cultivation

Min Hein Khant*, Balasuriyage Thulangi Gayathma Balasuriya* Shabbir H. Gheewala** and Trakarn Prapaspongsa*

*Graduate Program in Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, Faculty of Engineering, Mahidol University, Nakhon Pathom, Thailand
**The Joint Graduate School of Energy and Environment (JGSEE), King Mongkut's University of Technology Thonburi, Bangkok, Thailand

BACKGROUND

The growth of agriculture contributes to rising of civilization. However, it is one of the significant sectors that contribute to adverse environmental impacts. Improper management of agricultural waste results in harmful consequences on the human health and the ecosystem. The environmental costs and benefits of circular agriculture are evaluated by considering direct emissions from the field and the supply chain of sugarcane waste management in this study.

OBJECTIVES

- To assess the life cycle environmental costs and benefits of circular agricultural systems through the recovery of materials and energy from the wastes generated in sugarcane cultivation in Thailand.

METHODOLOGY

Goal and Scope Definition

Unit of Analysis: Waste management in sugarcane production in Thailand in 2019. System boundary: Sugarcane waste management on the field and, energy and materials usage from the supply chain in sugarcane cultivation of Thailand. Life cycle inventory (LCI): EMEP/EEA, Ecoinvent v3.8. Life cycle impact assessment (LCIA) Method: ReCiPe 2016.

RESULTS AND DISCUSSIONS
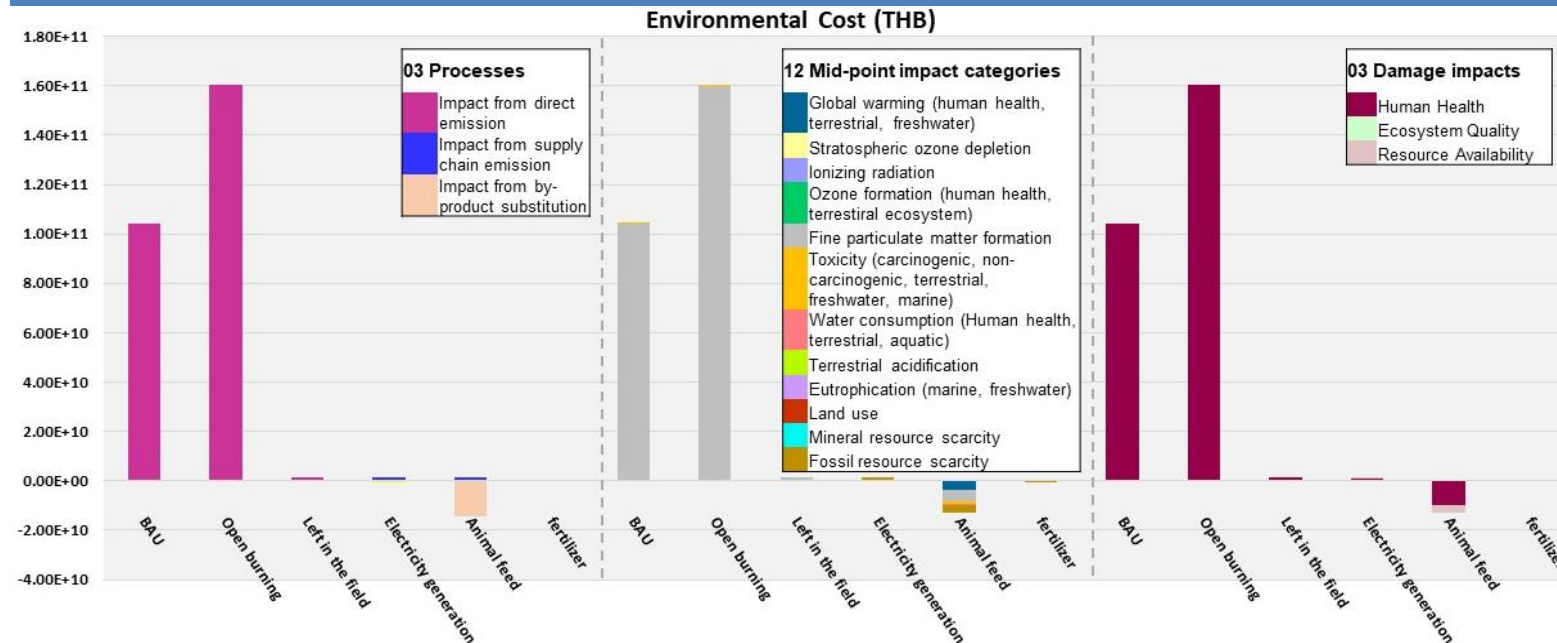
Figure 1: Life cycle environmental costs of business as usual (BAU) and alternative waste management systems in sugarcane production in Thailand in 2019

- Figure 1 shows the environmental costs of circular agriculture systems in sugarcane waste management and residues left in the field are significantly lower compared to the BAU scenario in all. Fine particulate matter formation is the major contributor in the mid-point level and human health damage has the highest contribution to the environmental costs in the three damage levels.
- The environmental costs of the sugarcane waste management system in Thailand can be significantly reduced by adopting circular agriculture practices. Although cane residues left in the field practice have benefits, it has low possibility to control the enormous amount of cane residues in the field.
- Moreover, animal feed from cane trash is leading as the most environmentally beneficial one among the circular agriculture practices of the study with benefits of over 117 billion THB followed by fertilizer and electricity generation with benefits of over 104 billion THB and 103 billion THB respectively.

From blue tents to the right to the city: counter-mapping the struggles against forced evictions in the Tokyo 2020-2021 Olympic context

Authors: Augusto Cesar Oyama*, Chiho Ochiai*, Nanako Inaba**, Misako Ichimura***

* Graduate School of Global Environmental Studies, Kyoto University; ** Institute of Global Concern, Sophia University; ***Artist, founder of the Neru Kaigi group

This work is the result of an internship carried out in collaboration with the following organizations:
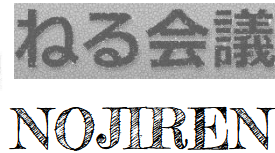
Both advocate for the rights of homeless people in the Shibuya area.

Background Revitalization, requalification, redevelopment or, to use the language of the International Olympic Committee (IOC) leaders, "valuable urban legacy", whatever the name given to the process that brings together international capital "specialized" in entrepreneurial city policies, which continues to be strongly legitimized with sporting mega-events, many studies document that gentrification, real estate speculation and environmental injustices are marks that, with rare exceptions, accompany these mega-projects. However, there is a lack of works that analyze large-scale **forced evictions or involuntary displacements, especially related to the most vulnerable and excluded social groups** (homeless people, public housing residents, migrants, among other minorities), and how the **main arguments, from environmental narratives to urban legacy discourses, carry specific agendas that legitimize violations of human rights**, especially housing-related. The Tokyo 2020 Olympic Games are exemplary in this regard. This research relies on previous experiences, such as the Rio 2016 Olympics, **analyzing and producing counter-hegemonic maps through geographic information systems software** to give visibility to the context of the forced evictions.

Methodology Participant observations of support activities related to the homeless people; semi-structured and oral history interviews with activists, former residents of public housings, who were evicted in Olympic context, researchers and former Tokyo Metropolitan Government officials. Mapping, photographs and newspapers are also used to examine historical tensions, especially in Olympic-related areas.

Tensions (past or in dispute) of involuntary evictions and territories in resistance

New National Stadium

September 10, 2013 — September 29, 2022

October 17, 2022

September 24, 2022

Yoyogi Park & Blue Tent Village Forced evictions between 2013 and 2016

1963-built Kasumigaoka apartments (public housing) (demolished) Involuntary displacements between 2015 and 2016

Yoyogi National Stadium

Meiji Park (destroyed) Forced evictions between 2013 and 2016 (officialy)

(Photographed by Han-Gorin No Kai before renovation) — (June 27, 2019)

Miyashita Park (destroyed and semi-privatized, rebuilt atop a three-story shopping) Forced evictions between 2010 and 2017

Mitake Park & Community Kitchen Ongoing forced evictions in 2022

(Summer 2010) — (April 13, 2019)

September 17, 2022

0   250   500 m

Evictions/ Resistance

Demolitions

City for whom? Two **f**undamental discussions: **(i)** local governments and the IOC instrumentalize housing and land policies to privatize public spaces and evict poor populations; **(ii)** there are counter-hegemonic actions (eg Neru Kaigi and NOJIREN) which are renewing the debate on the right to the city.

IMPACTS ASSESSMENT OF WASTEWATER FROM OUTLETS TO THE COAST OF DANANG BAY, VIETNAM

Authors: Phuoc Quy An NGUYEN*, Shinya Echigo**, Quang Long NGUYEN*

* Faculty of Environment. University of Science and Technology. The University of Danang
** Graduate School of Global Environmental Studies. Kyoto University

BACKGROUND AND CHALLENGES

- A long coastline: 3,260 km
- Vietnam's territorial water occupies about 1,000,000 km² of the South China Sea.

Accidental pollution events in the marine environment frequently affect the coastal areas.

(1) Nha Trang   (2) Phu Quoc

WWTPs have not been built in NW areas of Danang City → Wastewaters and stormwater discharge directly into the coast.

1. To elaborate and validate a modelling approach dedicated to simulating correctly the coastal water quality under the thread of multiple pollutant sources issued by the urban environment.

2. To implement this approach to the case of Danang coastal area, Vietnam.

METHODOLOGY

Urban model

| Drainage system, topography, land use, precipitation | Dry weather flow, Relative flow fluctuations | Build-up rate, Max. build-up, ADWP, detachment rate, Wash-off exponent |

Surface runoff model → Flow discharge of rainwater → Pipeflow model → Flow discharge of wastewater → Urban water quality model → Concentration of pollutants

Coastal model

Tide, bathymetry, wind, water level/discharges, boundary condition → Hydrodynamic model → Water level in the study domain → Coastal water quality model → Modelled spatial distribution of pollutants on the coastal area

Surface runoff model: Data requirement

Land use | Drainage network | Topography | Precipitation

Urban water modelling - **MIKE URBAN**
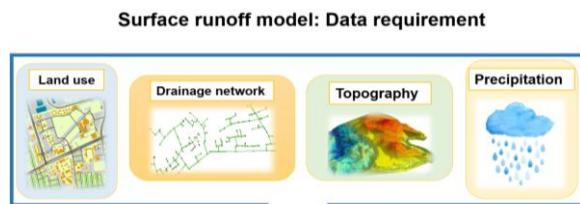
Flow discharge of rainwater

2D Hydrodynamic model: Data requirement

Bathymetry | Boundary conditions | Locations and Flow discharges of wastewater sources | Wind

Coastal modelling – **MIKE 21 FM**
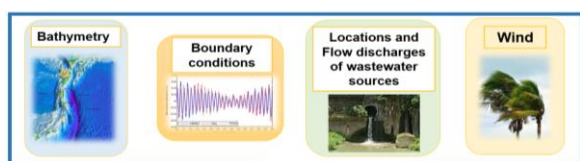
Water level, velocity, current in the research domain

RESULTS AND DISCUSSION

Urban drainage modelling

Observed rainfall of January 2016

Discharge of outlet 5 during January 2016
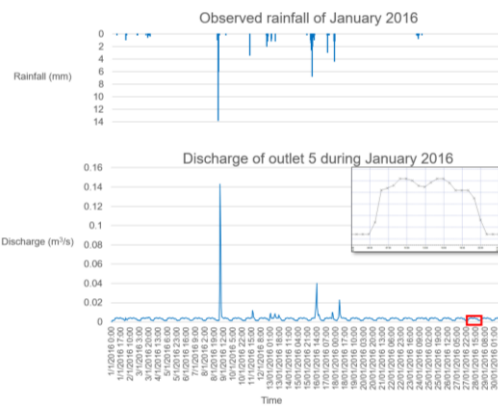
Unstructured mesh generated for the offshore domain

Boudary 10 | Boudary 20 | Boudary 60 | Boudary 40 | Boudary 30 | Boudary 50
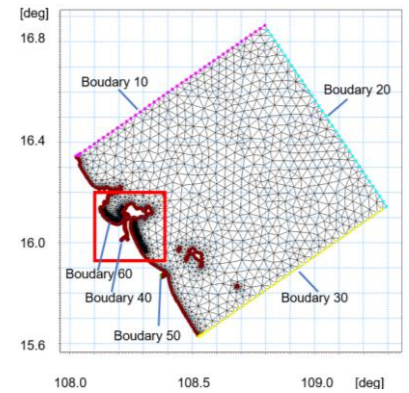
Hydrodynamic model calibration
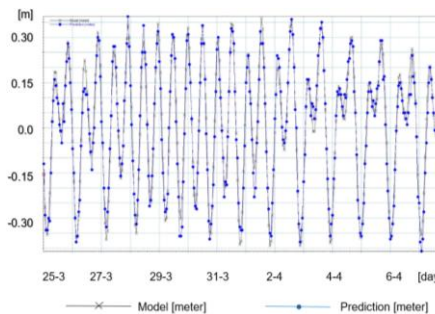
Hydrodynamic model validation
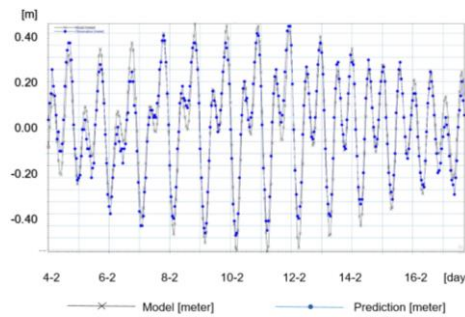
→ Model produced a good simulation that can be used to simulate the water quality.

PO43- concentration distribution
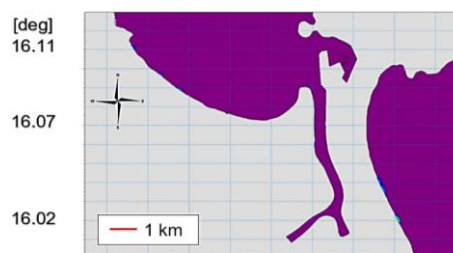
. NH4+ concentration distribution
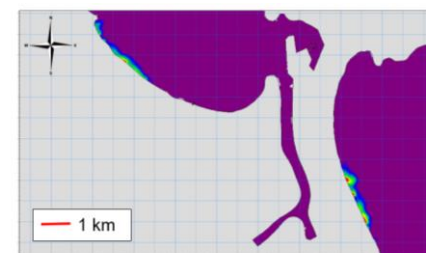
→ When wastewater discharge with a longer time, the impacts of PO43- NH4+ on the coast are not changing clearly because wastewater is diluted with rainwater.

CONCLUSIONS

1. Modelling approach is good to combine urban and coastal models.

2. 1D Hydraulic model - to calculate the flow discharges and water quality of drainage system in NW areas of Danang.

3. 2D Hydrodynamic model is coupled with the coastal water quality module to simulate the water quality of NH_4^+ and PO_4^{3-} on the coast.

MUNICIPAL WASTEWATER TREATMENT SLUDGE MANAGEMENT IN VIETNAM: A REVIEW OF THE CURRENT AND SOLUTIONS

Authors: Diep Ngoc Khoi VO*, Makoto TOKUOKA**, Shuhei TANAKA***, Van Quang TRAN*, Nhu Thuc PHAN*

* Faculty of Environment. University of Science and Technology. The University of Danang
** Mikuniya Corporation. Japan; *** Graduate School of Global Environmental Studies. Kyoto University

INTRODUCTION

The diagram of the complete representation of the Biological treatment of Sludge

Mechanical treatment — Screen, Grit chamber, Primary Settling

Biological treatment

Sludge treatment — Thickening, Stabilisation, Dewatering, Incineration

Disposal landfill

return flows from sludge treatment

Sludge — Excess Sludge

Sludge disposal — agricultural use, landscaping

A REVIEW IN VIETNAM

METHODOLOGY

- Overview of the number of plants and wastewater treatment technologies
- Statistics of WWTP sludge volume and sludge characteristics assessment
- The current status of sludge treatment technology and propose solutions

Types of wastewater technologies applied and their presence in different regions

North (n = 18) Central (n = 15) South (n = 17)

Number of WWTPs

- Activated sludge A2O: 17%, 12%
- Aeration ponds: 7%
- Aerobic ponds: 6%
- Biological ponds: 13%, 6%
- Conventional activated...: 28%, 13%, 18%
- Covered anaerobic ponds: 27%
- Imhoff + trickling filters: 6%
- Oxidation ditch: 11%, 20%, 29%
- Sequencing batch reactor: 44%, 13%, 24%
- Trickling filter: 7%

WB, 2018

RESULTS AND DISCUSSION

The estimated wastewater sludge generation (m³/year) with dry matter of 15%

25.639   103.084   148.040

m3/year

Central region: Bình Định (n=2), Đà Nẵng (n=6), Hội An (n=1), Huế (n=1), Nghệ An (n=2), Ninh Thuận (n=1), Quảng Bình (n=1), Thanh Hóa (n=1)

North region: Bắc Ninh (n=2), Bắc Giang (n=1), Hà Nam (n=1), Hải Dương (n=1), Hải Phòng (n=1), Hà Nội (n=8), Quảng Ninh (n=2), Thái Nguyên (n=1), Vĩnh Phúc (n=1)

South region: An Giang (n=1), Bà Rịa - Vũng Tàu.. , Bình Dương (n=2), Buôn Ma Thuột (n=1), Cần Thơ (n=1), Đà Lạt (n=1), Thành phố Hồ Chí.., Nha Trang (n=1), Sóc Trăng (n=1), Trà Vinh (n=1)

WB, 2018

The characteristic of municipal wastewater treatment sludge in Hanoi, Vietnam

Parameter	Kim Lien WWTP			Truc Bach WWTP
	Primary Sludge	Secondary Sludge	Dewatering Sludge	Dewatering Sludge
pH	6.20-8.40	6.67-8.24	7.17-8.04	7.20-7.60
Moisture (%)	96.9-99.7	99.1-99.6	98.8-99.4	97.9-98.0
TS (g/L)	2.82-31.01	3.88-8.65	6.49-11.58	19.94-21.44
VS (g/L)	1.79-17.47	2.07-5.18	3.93-7.25	13.8-14.56
VS/TS (%)	56.32-65.03	53.49-61.50	60.56-62.59	67.7-69.47
COD (mg/L)	2221-24974	2707-8925	7173-12405	7083-23681
COD (g/kgTS)	488-1558	698-1032	937-1106	332-1178
TN (g/kgTS)	29.6-84.8	47.4-53.5	47.2-66.8	53.5-58.2
TP (g/kgTS)	13.2-28.0	29.4-36.1	26.77-32.94	27.8-33.5

N.V.Anh et.al, 2017

THE CURRENT OF WWTP SLUDGE TREATMENT TECHNOLOGY

- **Drying yard & Disposal**
  Bai Chay, Ha Khanh WWTPs (Quang Ninh)
- **Dewatering & Disposal**
  Kim Lien, Truc Bach, Bac Thang Long (Ha Noi); Hoa Xuan, Son Tra (Da Nang), Bac Giang WWTPs
- **Anearobic digestion (Biogas)**
  Yen So, Long Bien WTTPs (Ha Noi)
- **Dewatering & Composting**
  Binh Hung (HCM City), Da Lat WWTP

- Binh Hung (HCM City) & Da Lat WWTPs (Composting): Lack of land area to expand the capacity and odor generation
- Yen So, Long Bien WTTPs (Anaerobic digestion): Not full WW capacity, CDS with a low concentration of organic constituents
- Da Nang WWTP (Landfill sites): Increasing the volume of treated wastes and operation costs
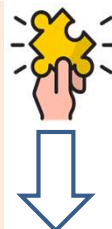
SOLUTIONS FOR SLUDGE MANAGEMENT

Combined — Wastewater, Rainwater

Separated — Wastewater, Rainwater
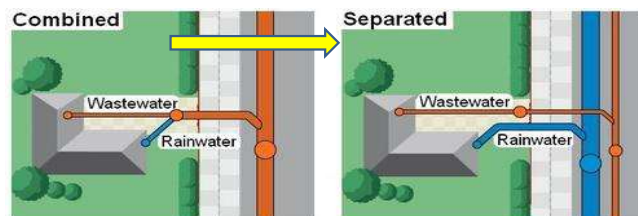
Co-Compost

CONCLUSIONS

- WW treatment technologies are applied in a variety of WWTPs in Vietnam.
- Sludge has a high content of organic matter and nutrients, none hazardous.
- Application of co-composting technology for sludge stabilization.

Performance of Face Masks in Blocking Airborne Microplastics from Acrylic Board Cutting

Yin Nyein Myat*, Ekbordin Winijkul*, Wenchao Xue* and Joyee S. Chatterjee*

* School of Environment, Resource and Development, Asian Institute of Technology, Thailand.

Introduction

- Airborne microplastics are a developing source of concern among several pollutants in the atmosphere.
- Ingestion, inhalation, and dermal contact are the three main routes for microplastics and nanoplastics to enter the human body.
- Wearing face masks can also be the individual protection to avoid the entering of atmospheric microplastics into the human bodies, like the other pollutants and pathogens in the air.
- In this study, the effectiveness of different types of face masks in the blocking of airborne microplastics was investigated.
- The objectives of the study were:
1) To examine the performance and compare the filtering efficiencies of different face masks to block microplastics in the air;
2) To compare the tests of partially opened and fully covered positions of a face mask for the exposure of airborne microplastics.

Acknowledgement

Methodology

- The plastic board was cut with the same cutting process, cutting tools, and operating time by the operator during the sampling time of the high-volume air sampler to get the microplastics (MPs) samples in the air. Three scenarios were performed: (i) only operating as regular particulate matter sampling, (ii) setting up face masks over the filter, and (iii) partially opened face mask over the filter.

Fig 1. Schematic drawing of the position of face mask and filter paper

- A direct particle counting method was used to identify the characteristics and quantity of MPs under a stereomicroscope.
- The equation (1) was used to differentiate the MPs particle removal efficiency of ten different types of face masks used in this study.

$$Filtering\ Efficiency\ (FE)\ (\%) = \frac{a-b}{a} \times 100 \qquad (1)$$

Where, a = the number of MPs without a face mask, b = the number of MPs with face mask

Results and Discussion

Different types of face masks	FE % (MPS)
SUR1	71.9
SUR2	61.9
3D	80.6
N95	95.6
KN95	95.6
SPM	46.9
COM1	38.1
COM2	61.3
HM1	76.3
HM2	73.8
P-SUR1	59.4

Fig 2. The filtering efficiency of different types of face masks for MPs

- The observed MPs were in the length range of 50-250μm, which is consistent with the findings of MPs size in previous studies of atmospheric MPs distribution in urban, suburban, and coastal environments.
- N95 and KN95 represented the best filtering efficiency (95.6%) for MPs. The two selected surgical masks in this study reported the FE for MPs at 71.9% and 61.9%, respectively. The homemade face masks with CDC-guided designs have the FE for MPs at 76.3% in a T-shirt mask and 73.8% in a double-layered handkerchief face mask. The 3D designed face mask used in this study shows 80.6% FE for MPs by reducing with its special design for PM2.5 protection. The fashionable sponge mask can reduce 46.9% of MPs' exposure and two selected commercial fabric masks have 38.2% and 61.3% FE respectively. Due to the reduction in filtering efficiency in the partially opened position of the face mask (P-SUR1), an increased risk of inhaling more MPs in any unfitted position of wearing a face mask than in the proper way has been studied. Therefore, it is more important to consider wearing face masks properly to get protection effectively.
- This study examined the airborne MPs under a high air flow rate, and face masks will protect MPs in the air with better efficiency at normal or different breathing rates during daily activities than the high air flow used in this study.

Piezoelectric-Induced Internal Electric Field in Bi$_2$WO$_6$ Nanoplates for Boosting the Photocatalytic Degradation of Organic Pollutants

Authors: Zhenying Jiang (zy-jiang20@mails.tsinghua.edu.cn), Yuxiong Huang* (huang_yuxiong@sz.tsinghua.edu.cn)

* Tsinghua-Berkeley Shenzhen Institute (TBSI), Tsinghua Shenzhen International Graduate School (SIGS), Tsinghua University

Background: Piezoelectric effect assisted photocatalysis for environmental remediation is a promising strategy to suppress rapid electron-hole recombination. In this work, we fully utilized both piezoelectric and photocatalytic properties of Bi$_2$WO$_6$ nanoplates for the removal of organic pollutants. The superior catalytic activity was attributed to the accelerated electron-hole pairs separation efficiency associated with the enhancement of piezoelectric effect-induced internal electric field.

Methodology

Na$_2$WO$_4$·2H$_2$O   Bi(NO$_3$)$_3$·5H$_2$O

H$_2$O → Stirring → Hydrothermal → 140 °C 24 h → Bi$_2$WO$_6$
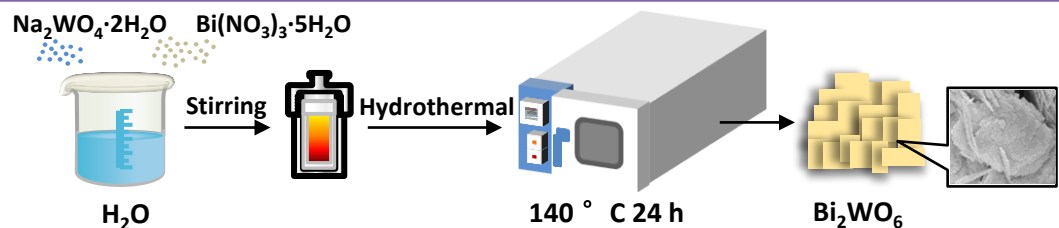
☐ Bi$_2$WO$_6$ nanoplates were synthesized by a facile hydrothermal procedure.

Results and Discussion
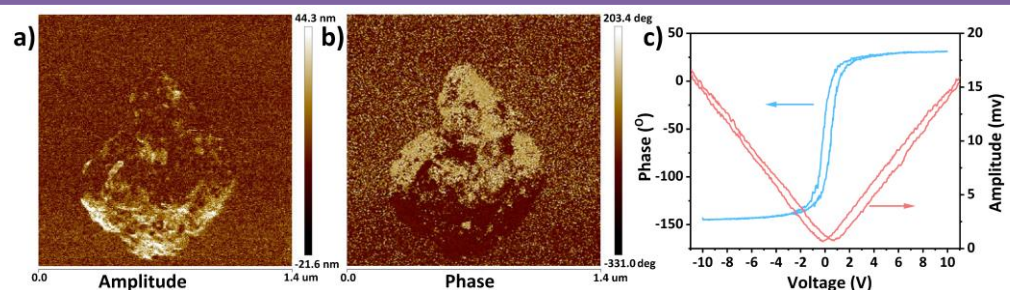
☐ PFM analysis show obvious polarization occurred in Bi$_2$WO$_6$ nanoplates under external voltage.
☐ The piezo response phase-hysteresis loop and amplitude-butterfly loop further confirm the piezoelectric response of Bi$_2$WO$_6$ nanoplates.

Results and Discussion
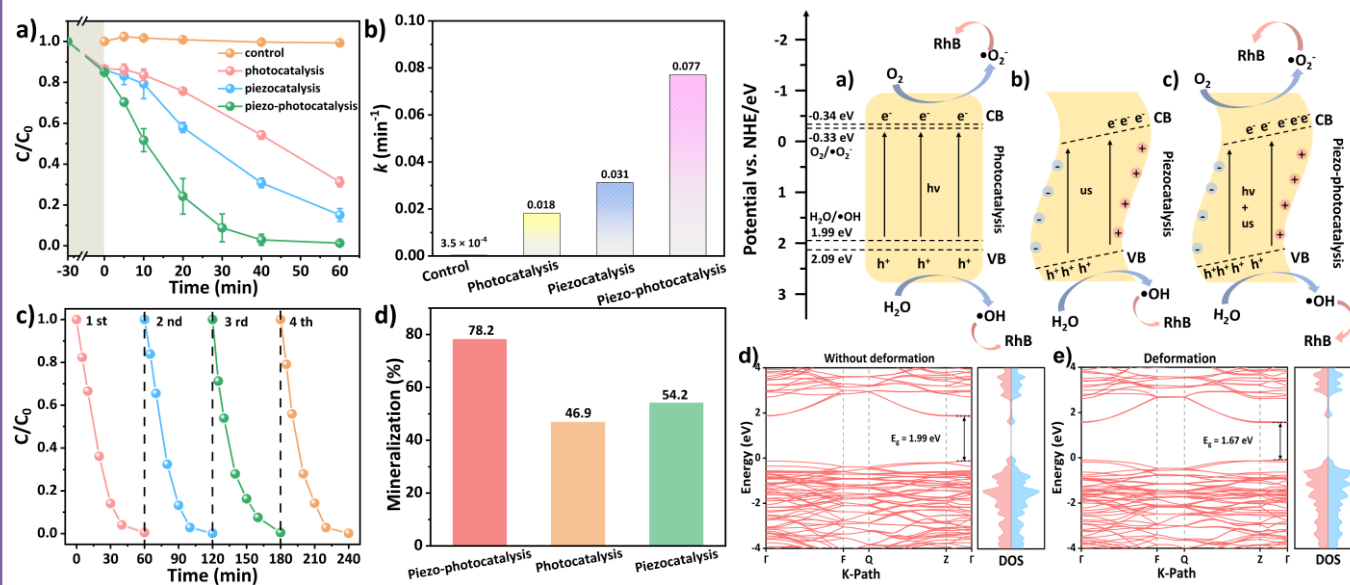
☐ The piezo-photocatalysis of Bi$_2$WO$_6$ nanoplates exhibit the highest degradation efficiency and mineralization degree.
☐ The Bi$_2$WO$_6$ nanoplates have good reusability and stability.
☐ Internal electric field promotes the separation of photogenerated carriers.
☐ DFT calculation reveals piezoelectric potential tilts band structure to narrow bandgap.

Possibilities of Bamboo as Durable Wall Material in Indonesia: Learning from Vernacular Architecture Cases in Indonesia and Japan

Authors: I Made Nuradi KERTA* Hirohide KOBAYASHI*

* Graduate School of Global Environmental Studies, Kyoto University

1

2

3a

3b

Kyoto Case

4

Background

One role of bamboo as construction material is in provision of humanitarian shelter, especially in bamboo growing region, most of which are also world's most disaster prone. This role becoming more urgent with increasing frequency of disasters caused by global climate change. While the material use has been extensive, cases are mainly for Temporary Shelter. This study aims to investigate the typical practice of bamboo wall for dwelling, seen from the potential of enduring application beyond temporary shelter.

Methodology

Data for this study was collected from on-site survey on four village in three islands in Indonesia, with interview with villager done in Naga Village, West Java and Sade village, Lombok Island. In Kyoto, interview was held with bamboo construction professional along with observation on wall types and samples. Reference case for Indonesian humanitarian shelter is from Yogyakarta earthquake 2006.

← Image 1-4: proposed bamboo wall classification into 4 Types. All instance of types can be found in Japan vernacular case. Among two type of woven bamboo, one is plait-work type (3B)
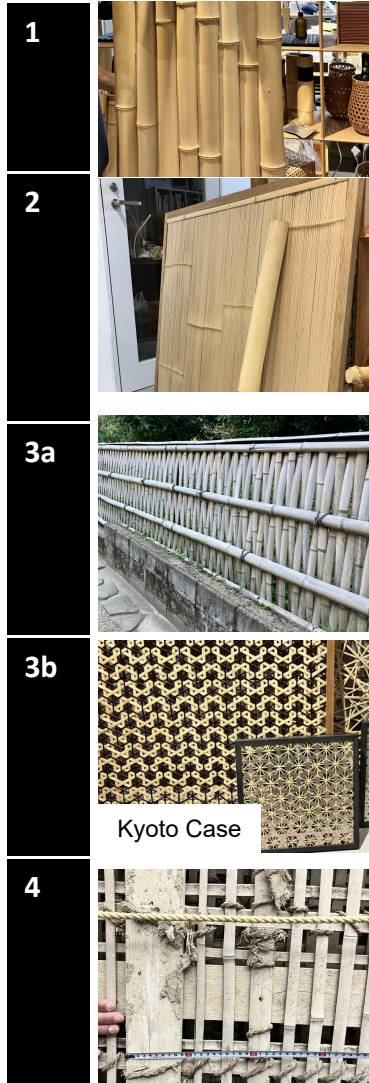
Findings: Unique Lesson From Each Case Studies

1. Naga Village:
transfer of construction culture (creativity & evolution), natural ventilation, lighting and shading, mitigate natural hazards effects

2. Sade Village:
Natural shading (compared to Naga), replaceable element, maintenance

3. Kyoto Case
Rediscovery and reinvention of new pattern, which can contribute to better perception, thus to some extent, might address some negative view or bias.

4. Yogyakarta Shelter - 9 Years After (2015)
Reuse, local resource, slightly transformed material, technical simplicity, evolution (contemporary technique), progressive housing (initially), natural ventilation (permeable wall), reduction of transport, embodied energy reduction

Plait-work type (3B) while found in Kyoto case, is the dominant type in the three Indonesia cases. Other than sustainable attributes, there still some challenges surrounding this type:
- Limited technique for extending building life-time: usualy only plastered thinly with lime (Naga case) and is not generaly compatible with wet wall technique which could extend life-time
- It is found that in case of Naga and Yogyakarta, wall often are changed to heavier non-cultivated material if condition permit (economic and traditional law). In the latter case, only 4 out of 97 houses reuse the bamboo provided during disaster relief.

Such challenges concerning sustainable extension of material life use are corresponding with common barrier hindering bamboo material use, namely Durability, Policy and Aesthetic Bias.

Further Study:

It is deemed necessary to assess other types of walls, each afford to address the common barrier through diversity of means, particularly 'wet' wall construction with bamboo and plaster.

Potential Application of Crop Residue-Based Adsorbent for Dye Removal

Authors: Yan Ying Tan*, Abdul Aziz Abdul Raman*, Archina Buthiyappan**, Mohd Izzudin Izzat Zainal Abidin*

* Department of Chemical Engineering, Faculty of Engineering, Universiti Malaya, 50603 Kuala Lumpur, Malaysia.   ** Institute of Ocean and Earth Sciences (IOES), Universiti Malaya, 50603, Kuala Lumpur, Malaysia.

Background

✓ Dyes production >700,000 tons/year.
✓ Types of commercial dyes >100,000 types.
✓ About **50% of dyes** are discharged into water system throughout the dyeing processes.

Properties of leaves:
✓ Lignin, cellulose, hemicellulose, pectin
✓ Functional groups (carboxyl, carbonyl, hydroxyl)
✓ Widely available

Methodology

Crop Residue ➜ **Eco-Friendly Adsorbent**

Collection of passion fruit leaves

↓

Wash with distilled water

↓

Dry at 80 ℃

↓

Grind and sieve to obtain size <150 μm

↓

Carbonize at 600 ℃ for 1 hour

↓

Wash and dry at 105 ℃

↓

Impregnation using iron oxide

↓

Magnetized Leaf-Based Adsorbent
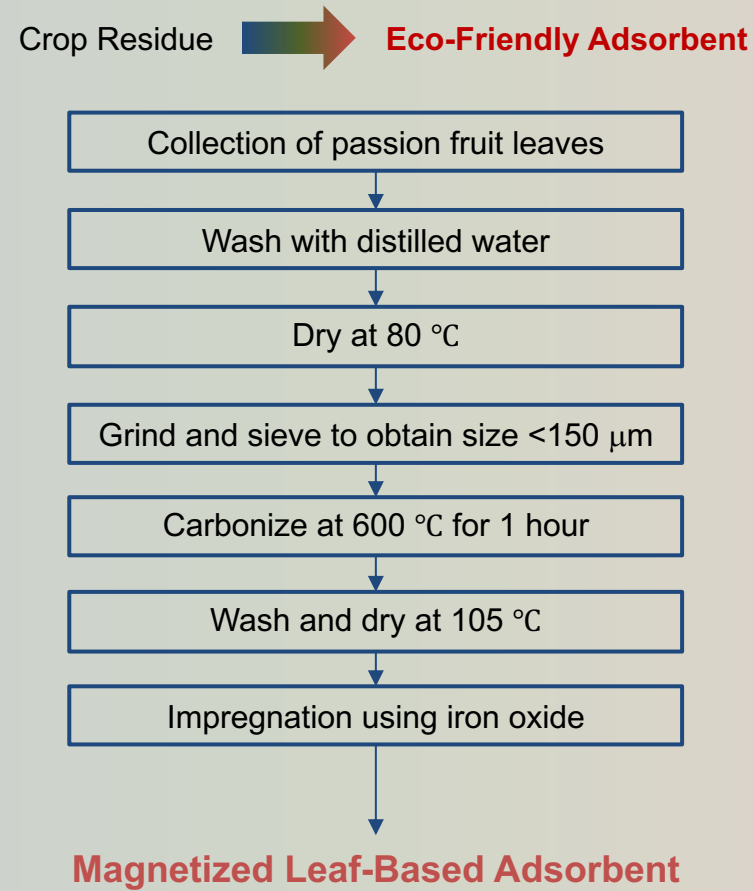
Results and Discussion

Effects of Operational Parameters

Effect of pH — Color removal (%): pH 3: 69.2%, pH 7: 66.2%, pH 11: 54.5%

Effect of Adsorbent Dosage — Color removal (%): 1 g/L: 55.3%, 3 g/L: 69.2%, 5 g/L: 84.0%
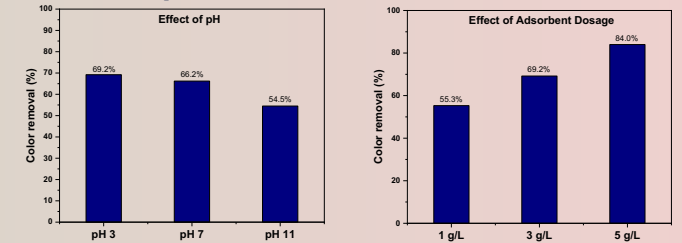
✓ Higher color removal (69.2%) was achieved under acidic condition compared to neutral (66.2%) and alkaline (54.5%) conditions.
✓ Color removal increased from 55.3% to 84.0% when adsorbent dosage increased from 1 to 5 g/L.

Adsorption Isotherms & Kinetics

Langmuir Isotherm Model
$y = 0.2482x + 0.0094$
$R^2 = 0.9983$

Pseudo-Second-Order Kinetic Model
$y = 0.0165x + 0.0028$
$R^2 = 0.9970$
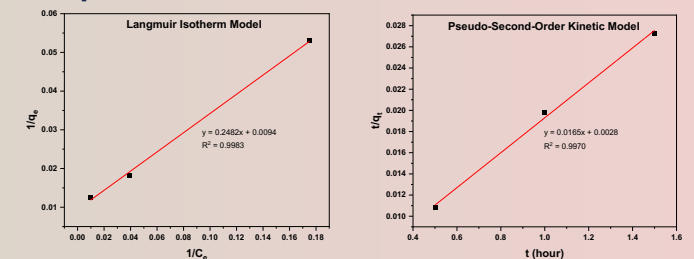
Monolayer Chemisorption Process

Short Summary

Passion Fruit Leaf ➜ **Wastewater Treatment**

REMOVAL OF BORON IN AQUEOUS SOLUTION BY MODIFIED CHITOSAN

Ho Hong Quyen*, Hoang Hai*, Tran Vu Chi Mai*, Masashi Kurashina** and Mikito Yasuzawa**, Shigeo Fujii***

* Faculty of Environment, University of Science and Technology, The University of Da Nang, Vietnam
** Department of Applied Chemistry, Graduate School of Science and Technology, Tokushima University, Japan, *** Kyoto University, Japan

INTRODUCTION
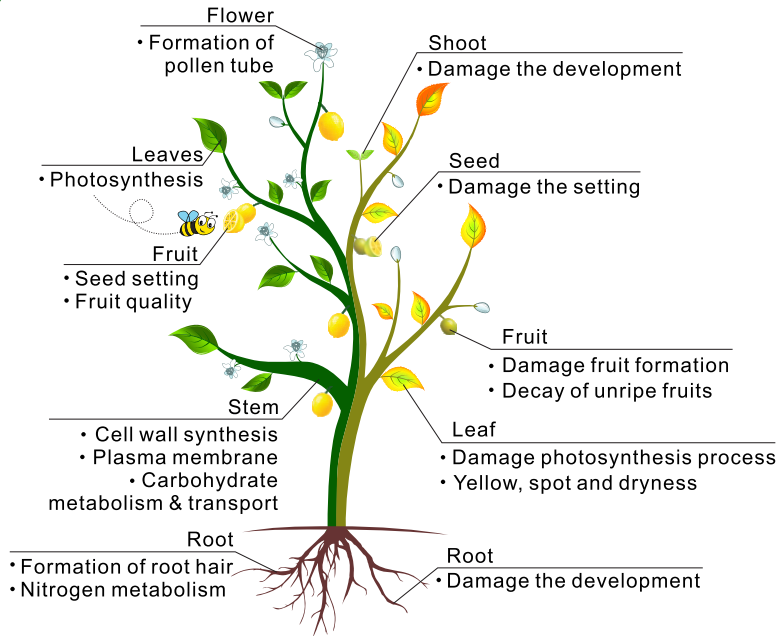
Functions of boron (on the left)
and its excess in plants (on the right).

Flower
• Formation of pollen tube

Leaves
• Photosynthesis

Fruit
• Seed setting
• Fruit quality

Stem
• Cell wall synthesis
• Plasma membrane
• Carbohydrate metabolism & transport

Root
• Formation of root hair
• Nitrogen metabolism

Shoot
• Damage the development

Seed
• Damage the setting

Fruit
• Damage fruit formation
• Decay of unripe fruits

Leaf
• Damage photosynthesis process
• Yellow, spot and dryness

Root
• Damage the development

RESULTS & DISCUSSION

1. BORON ADSORPTION ISOTHERM

Amberlite IRA 743   GChs
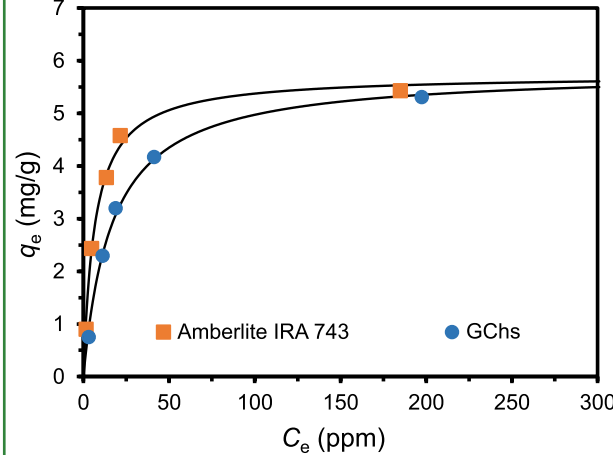
- The maximum boron adsorption capacity of GChs was at 5.80 mg/g.
- The maximum boron adsorption capacity of commercial resin Amberlite IRA 743 (5.73 mg/g).
- Boron adsorption capacity using GChs was similar to the result of commercial resin Amberlite IRA 743.

2. BORON ADSORPTION KINETIC

- - - Pseudo-first order model
— Pseudo-second order model
• q_t: Experimental data (mg/g)
■ C_e: Equilibrium concentration (ppm)
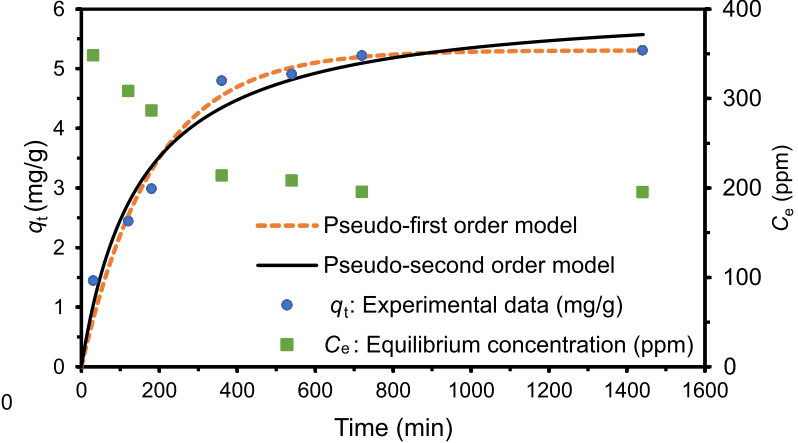
Adsorption equilibrium was reached after
700 min by using gluconated chitosan particles.

3. EFFECT OF pH

■ q_e (mg/g)   ● C_e (ppm)
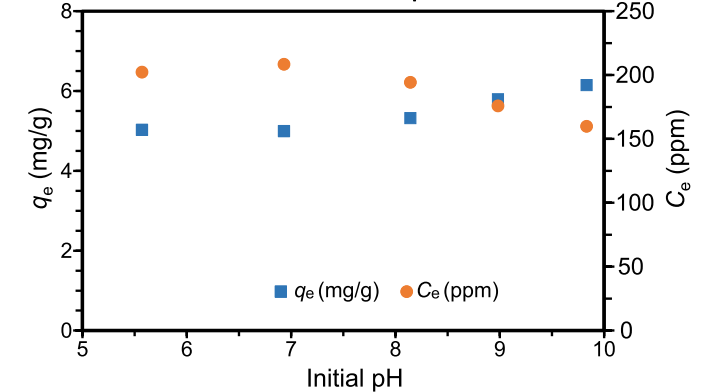
The capacity of boron adsorption increased while
pH rose from 5.6 to 9.8

EXPERIMENTAL

Chitosan flake 5 g
Acetic acid 500 mL 1% (v,v)

D-(+)- glucono - 1,5 lactone

NaOH 1M

Room temperature 12 h

Reflux 115°C, 24 h

Transfer to beaker

Gluconated chitosan solution

Centrifuge
Wash by acetone

Particles

Dialysis

Purified product

Wash by acetone
Filter & dry

Gluconated chitosan particles

Boron adsorption mechanism

Characterization

Method of boron concentration determination

Azomethine-H → Boron-Azomethine-H complex + 2H₂O

B(OH)₃

CONCLUSION

Gluconated chitosan particles exhibited the maximum adsorption capacity at 5.80 mg/g after 700 min. The boron adsorption capacity enhanced with the increase in initial pH. There was a slight increase in boron adsorption in the presence of NaCl salt; therefore, GChs may be applied for boron removal from saline water or seawater.

Research Of The Used EV Power Battery Recycling Market In China: The Barriers To Industry Development

Author: LI SHENGNAN*

* Graduate School of Global Environmental Studies, Kyoto University, Environmental Education Laboratory

Introduction

➢ With the development of China's electric vehicle market, the generation of retired power batteries has gradually increased. How to properly dispose of them becomes an urgent problem.

➢ Recycling retired power batteries is a good method to avoid resource waste and environmental pollution. However, although advanced research on recycling used electric vehicle batteries is steadily progressing, there are few comprehensive studies.

➢ In order to advance the development of China's used electric vehicle battery recycling market, it is necessary to grasp the current situation and existing problems comprehensively. However, although advanced research on the recycling of used electric vehicle batteries is steadily progressing, there are few comprehensive studies.

Objective:

➢ In this study, we would like to discuss the barriers of the used power battery recycling market from a comprehensive point of view.

Methodology

This study applied a qualitative analysis method to analyze the data collected by literature review including academic literature as well as news articles, conference presentations, press releases, and reports, and expert interviews. The analytical framework is developed by Ahl et al(2019) which including five areas: technological, economic, social, environmental and institutional.

```
literature review
      ↓
analytical framework
      ↓           ↓
literature      expert
review          interview
      ↓           ↓
   qualitative analysis
```
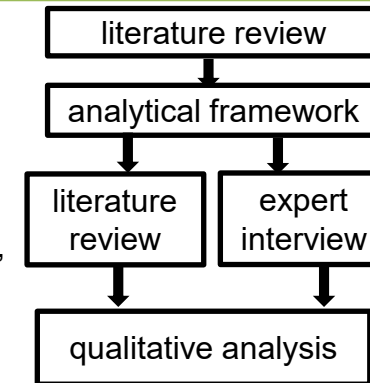
Results and discussion

	Common problem 1	Common problem 2
technological	The technological efficiency is not high.	There are still technologies limitations.
economic	Low profits	Lack of financial incentives.
social	Immature recycling system	Lack of cooperation from consumers etc.
environmental	Environmental burden	Environmental protection investment
institutional	Lack of specific policy	Lack of regulation

Soil reclamation at quarry mining site by using amendments from organic wastes

Authors: Le Hoang Son, Vo Quoc Dat, Huynh Thi Minh Hieu, Pham Thi Ngoc Tho, Nguyen Dinh Tuan

* Danang University of Science and Technology, Faculty of Environment

Introduction

❑ **Quarry mining are slowly rendering the fertile usable soil unfit for use**
- Loss of fertility
- Lack of nutrients and minerals
- Loss of useful bateria and microorganisms
- Loss of moisture

❑ **Objectives of study**
- Understand the characteristics of organic amendments
- Assess the potential of organic amendments for soil reclamation

Methodology

❑ **Element component analyze**
- Parameters: C, N, P, K, Ca, Mg
- Substrates:

❑ **Soil reclamation experiment**
- ➤ Water holding capacity (WHC)
  - o Mixture: Soil & amendments (2:1 by volume)
  - o Analyze the WHC
- ➤ Soil reclamation potential
  - o Mixture: Soil, rice hulls & organic waste (2:1:1 by volume)
  - o Analyze the C, N, P, K, Ca, Mg

Results & discussion

❑ **Element component analyze**

Subtrates	C	N	P	K	Ca	Mg	C/N
			% of dry wt				
Soil	0,1	0,0	0,2	8,1	7,1	3,5	2,5
Rice hulls	51,0	0,6	0,1	0,7	0,4	0,1	85,0
Sawdust	31,5	0,1	0,0	0,1	0,1	0,0	225,0
Coffee ground	60,0	0,4	0,1	0,8	0,3	0,1	150,0
Sugarcane	59,9	1,0	0,1	1,2	0,4	0,1	63,1
Biochar	56,8	1,5	1,1	3,7	0,3	0,0	39,2
Food waste	39,4	4,2	2,8	1,4	0,5	0,1	17,3
Sewage sludge	34,0	5,1	0,1	0,1	1,6	0,1	6,7
Livestock manure	27,2	1,5	0,5	0,6	1,0	0,3	18,0

❑ **Water holding capacity**

	Water content (%)	Drainage (%)	Evaporation (%)
Blank (Soil)	64%	17%	18%
Sugarcane	54%	33%	13%
Coffee ground	77%	14%	10%
Biochar	42%	49%	9%
Sawdust	66%	26%	8%
Rice hulls	59%	34%	8%

➤ Soil had low concentration of nutrition

➤ Rice hulls have a potential for enhancing water holding capacity of soil

❑ **Soil reclamation potential**

Treatment	C	N	P	K	Ca	Mg	C/N
				g/Kg dry wt			
Organic waste	298 ± 32	15 ± 2	12 ± 1	65 ± 8	49 ± 3	23 ± 2	20 ± 2
Sewage sludge	268 ± 34	19 ± 2	3 ± 0,2	56 ± 5	53 ± 6	23 ± 3	14 ± 3
Livestock manure	260 ± 26	7 ± 1	4 ± 0,3	57 ± 6	53 ± 4	25 ± 3	37 ± 5
Blank (Soil)	0,5 ± 0,1	0,2 ± 0,1	2,5 ± 0,1	81 ± 9	71 ± 5	35 ± 2	0,5 ± 0,01

➤ Mixture of soil, rice hulls and livestock manure have a great potential for soil reclamation
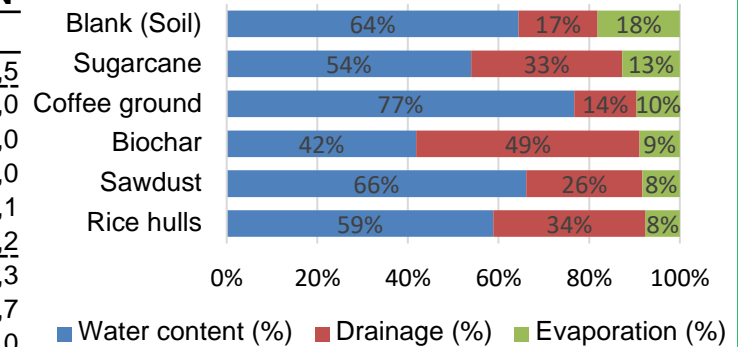
Solutions to improve the operational efficiency of aerobic tanks in the wastewater treatment system of BacDau Fishery factory

Authors: Phan Thi Kim Thuy, Nguyen Ngoc Thanh, Nguyen Van Thanh, Nguyen T T Thao, Ngo H T Phuoc, Nguyen Van Trung, Pham T M Yen, Nguyen Ngoc Han, Tran Ha Quan and Tran Van Quang

Faculty of Environment, Danang University of Science and Technology (DUT), Viet Nam

Introduction

Bac Dau Fishery factory, Danang city, VietNam

Seafood Wastewater
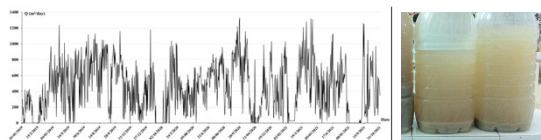
Treatment Process

The fluctuation of the contaminant load in the influent & The high concentration of organic matters and nutrient

→ Method & Tech.: Suitable
→ Operation: Unstable & overload;
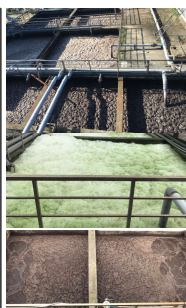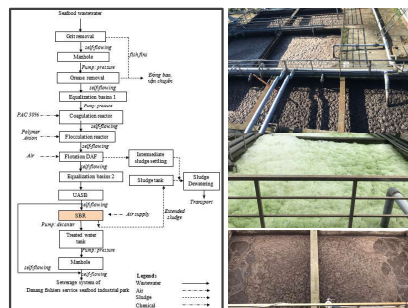
Research → Solutions to improve the operational efficiency of aerobic tanks

Methodology

Approach

Setup and operation model in laboratory

Collecting data → Designing model → Operating model → Evaluating results

- Reactor;
- Aeration systems;
- ...

- Adaptation of activated sludge;
- Determination the parameters for aerobic process

- Adaptation of activated sludge; MLVSS: 2.5-3.5 g/l.
- The wastewater taken from seafood processing plant (after pre-treatment)
- The ratio F/M increased from 0.25-0.95g COD/g sludge.day.
- Sampling & Analysing: pH, alkalinity, COD, NH_4^+, NO_3^-, PO_4^{3-}

Results and Discussion

Survey results: Characteristics, Environmental conditions (SBR) & Operation loading

Parameters	Concentration [Min-Max (Average)]
BOD_5, mg/l	786.3 - 2,013 (1,529.7)
COD, mg/l	1,250 - 3,285 (2,518.1)
$N-NH_4^+$, mg/l	124.7 - 146.9 (134.7)
T-N, mg/l	427.5 - 574.5 (487.1)
T-P, mg/l	15.9 - 25.2 (20.4)

No	Para.	Unit	Value
1	pH	-	6.3-6.9
2	DO	mg/l	2.4-4.2
3	SV30	ml/l	520-630
4	MLSS	g/l	8.2-9.5
5	MLVSS	g/l	7.1-8.5
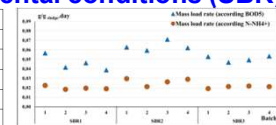
Information	Unit	Max	Aver.
Contaminant load of BOD_5	kg BOD_5/ day	705.2 [1]	343.1 [1]
		269.3 [2]	199.5 [2]
Contaminant load of N-NH_4^+	kg N-NH_4^+/ day	307.5 [1]	149.6 [1]
		102.9 [2]	76.2 [2]

Note: [1] – Need to treat & [2] – Capability to treat

Wastewater contains a high concentration of organics and nutrients; In SBR: Environmental conditions are not guaranteed & MLVSS is very high. SBR is operating with low loading and can only meet less than 50 % of the loading compared with the capacity of the factory

Experiment results → Determination the parameters for aerobic process
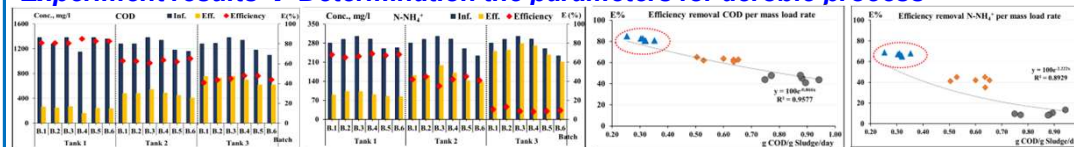

→ The parameters are recommended: HRT > 8h & F/M: 0.25 to 0.35 gCOD/g sludge.day

Conclusion & Recommendation

In Bac Dau fishery factory:

➤ Wastewater contains a high concentration of organics and nutrients
➤ SBR: Environmental conditions are not guaranteed & MLVSS is very high; Operating with low loading and can only meet less than 50 % of the loading compared with the capacity of the factory.

In order to improve the operational efficiency of SBR, the recommendations include:

✓ Adjusting MLVSS about 2.5 -3.5 g/l; HRT > 8h & F/M: 0.25 to 0.35 gCOD/g sludge.day
✓ Developing the operating procedures for SBR

Sonication regeneration of spent granular activated carbon and ion-exchange resins for removal of per- and polyfluoroalkyl substances from water

Suratsawadee SUKEESAN[1], Narin BOONTANON[2], Shigeo FUJII[3], and Suwanna KITPATI BOONTANON[1,3,*]

[1]Graduate Program in Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, Faculty of Engineering, Mahidol University, [2]Faculty of Environment and Resource Studies, Mahidol University, [3]Graduate School of Global Environmental Studies, Kyoto University; E-mail: suwanna.boo@mahidol.ac.th (*Corresponding author)

Background information

Because of the toxicity and persistence of per- and polyfluoroalkyl substances (PFAS) compounds, adsorbent disposal has a negative environmental impact, necessitating ready and cost-effective treatment methods. The purpose of this research is *to investigate the use of the sonicate technique (ST) to regenerate three types of spent adsorbents for PFAS removal: GAC, IRA910 (strong anion resin), and DOWEX MB-50 (mixed ion-exchange resin).*

Sustainable regeneration techniques should be considered in order to reduce operating costs while maintaining long-term system sustainability.
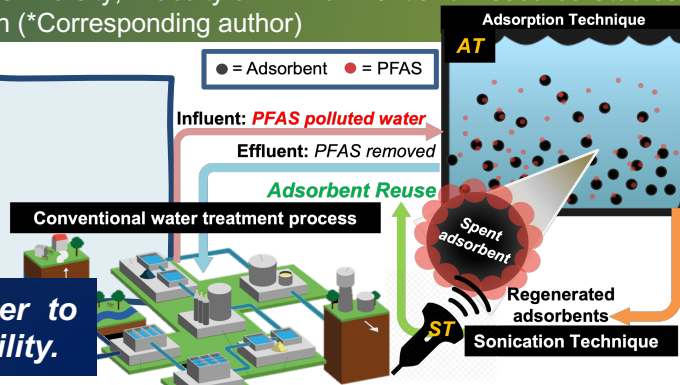
Methodology

Operating Condition :
- Frequencies: 130 kW and 20 kHz.
- Applied power density: 250 W L^{-1}
- Regeneration time: 30 min.

Fourier-transform infrared (FTIR)   SEM micrographs

Adsorbent Characterization

PFOA, PFOS, PFHx

PFAS   **Regenerated adsorbents**   PFAS   Samples

Sample Extraction

First Batch Adsorption   **Second Batch** Adsorption

500 mL of Milli-Q water   **Adsorbent Reuse**   *Presep-C PFC Cartridge*

Adsorbent Preparation

GAC   IRA 910   DOWEX   Sonication Technique   PFAS: Analyzed by HPLC-MS/MS

Results & Discussion

DOWEX had the highest *adsorption capacity > GAC > IRA910* (at 6 h) for regenerated spent adsorbents after the second adsorption-regeneration cycle. This demonstrates *the feasibility and potential of ST for regenerating spent adsorbents as an alternative to chemical regeneration.*

The significance of optimizing reaction parameters for obtaining regenerated should be investigated further.

FTIR spectrums

At 1149 cm^1, PFAS adsorption was observed, which was attributed to SO$_3$ and disappeared after regeneration.

DOWEX

SEM Analysis

Cracks appeared surface

- IRA910: ST has a significant effect on the surface ability and affects the adsorption capacity
- GAC: the cracked surfaces did not affect removal efficiency in the second cycle; *however, carbon residues could be retained within pores after several reuses and decreasing pore properties.*

Adsorption Technique

= Adsorbent   = PFAS

Influent: **PFAS polluted water**
Effluent: *PFAS removed*

Conventional water treatment process

Adsorbent Reuse

Spent adsorbent

Regenerated adsorbents

Sonication Technique

Spent adsorbents regeneration

86.80 %   83.81 %   73.52 %   87.54 %   82.29 %   56.96 %   88.43 %   85.75 %   75.28 %

q$_e$ (mg/g)   Removal efficacy (%)

PFOS   PFHxS   PFOA   PFOS   PFHxS   PFOA   PFOS   PFHxS   PFOA

GAC   IRA910   DOWEX

50 µm   500 µm   500 µm

Study on the stone industry and local stone use in Kitahira village, Shiga Prefecture

Authors: SATO Keika*, OCHIAI Chiho**

*Department of Architecture and Architectural Engineering, Kyoto University
** Graduate School of Global Environmental Studies, Kyoto University

Background

The Kitahira village, Shiga Prefecture, has produced granite, and the stone industry has flourished in the area since the Middle Ages. The granite was processed by stonemasons and used as materials for house foundations, and walls, to use in local houses and other regions.The existing houses and scenery of Kitahira still shows its characteristics as a stone producing area.

This study will document masonry techniques in granite-producing areas and the landscape and housing characteristics created by these techniques.

Stone exported to other regions

Stone materials used in the region

Methodology

Interviewed people experienced in the stone processing industry and residents to clarify the history and technology of the masonry industry in the Kitahira area.
Analyze the types, distribution, and characteristics of local stone materials in residences by field survey and summary of information obtained from it.

Results

Use of processed stones

stone wall   curb stone

Inubashiri(A)   foundation stone(B)

stone paving(C)   entrance stone(D)   warehouse stone(E)

Leftover stones

Distinctive stone uses

Disccution

Based on interviews and field surveys, local stone materials used for house foundations and masonry are listed in the map.There were also cases of stones that had been converted by residents or left piled up after they were no longer in use, which is considered characteristic of areas where masons lived.

Synergistic effect in anaerobic co-digestion of rice straw and septic tank sludge in Hanoi

Vu Thi Thu Tra, Nguyen Pham Hong Lien, Dang Ngoc Hai Ha, Huynh Trung Hai, Nguyen Thi Anh Tuyet.

School of environmental science and technology, Hanoi University of Science and Technology

INTRODUCTION

Rice straw (RS) is estimated to generate more than 46 million tons/year.

Figure 1. Rice straw

→ Burn
→ Biochar

Septic tank sludge (STS) generated throughout Hanoi is about 500 tons/day.

Figure 2. Septic tank sludge

→ Bury
→ Microbial fertilizer production

→ Rice straw and septic sludge are capable of anaerobic decomposition.

RESEARCH PURPOSES
Investigate the performance of co-digestion of rice straw and septic tank sludge.

MATERIALS

(1) RS was cut, crushed, and milled with size 1-2mm.
(2) STS was mixed before the study.
(3) Inoculum-sludge was obtained from the anaerobic digestion of organic waste research and was finely sieved.

a. Rice straw   b. Septic tank sludge   c. Inoculum
Figure 3. Materials in this study

METHODOLOGY

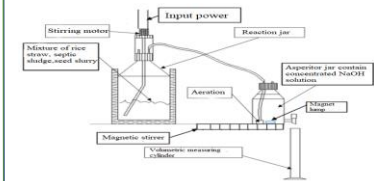The material after pretreatment is put into the Duran flask and mixed.

Figure 4. Schematic diagram of the anaerobic leach bed reactor

Table 1. Characteristics of RS, STS and Inoculum

	TS (%WW)	VS (%WW)	C (%)	N (%)	C/N	pH
Rice straw (R)	92,07	58,21	34,21	1,35	25,34	-
Septic tank sludge (BBP)	7,46	5,74	26,52	1,97	13,46	7,5
Inoculum	16,98	8,75	20,34	2,16	9,42	8,2

BMP experiment

Blank sample,
Cellulose sample,
RS sample and STS sample

Table 2. Co-digestion experiment.

Mixing ratio* (RS: STS)	Experimental conditions	
100:0	Temperature	37 ± 2⁰C
90:10	Stirring	continuous, v=60 r/m
70:30		
50:50	Time	60 days
0:100	Reactor volume	500mL

(*The ratios according to total solids (TS))

RESULTS & DISCUSSION
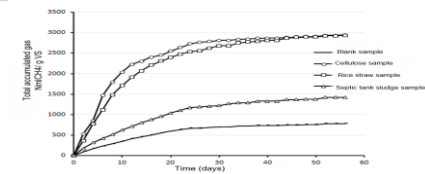
Figure 5. Total gas accumulation of samples in BMP.experiment.

The biomethane potential (BMP) of straw and septic tank sludge, respectively, was 426 Nm CH4/gVS and 136 Nm CH4/gVS.
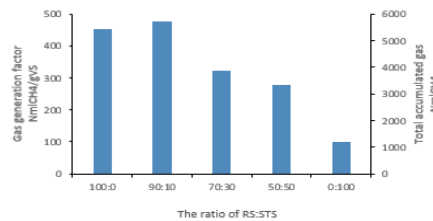
Figure 6. Total gas accumulation and gas generation coefficient in the co-digestion experiment.
- The total amount of accumulated methane obtained in the mixtures with a higher percentage of straw was greater.
- Total gas production of the RS to STS ratio 90:10 was the highest.
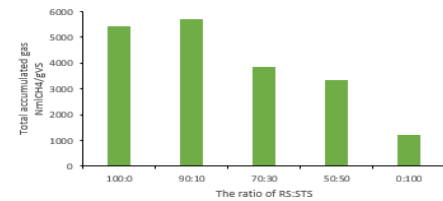
Figure 7. The amount of methane gas produced per 100ml volume at different mixture ratios.
- The amount of gas per unit volume of mixtures with a higher ratio of straw was greater because mixtures with a lower ratio of straw were dilute and have a larger working volume.
- The amount of gas per unit volume of mixtures of the RS to STS ratio 90:10 was the highest.
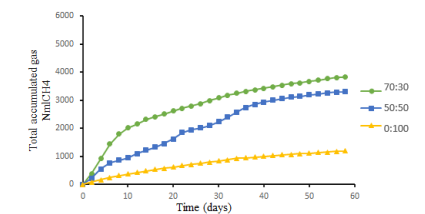
Figure 8. Total gas accumulation of different mixture ratios.
The samples with high ratio of RS to STS had longer lag phase.
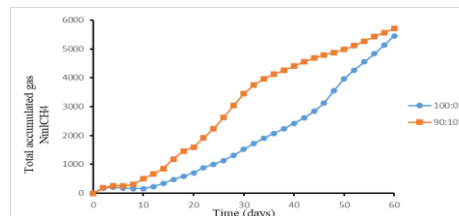
Figure 9. Total gas accumulation of different mixture ratios
The samples with low ratio of RS to STS had shorter lag phase, about 10 days.
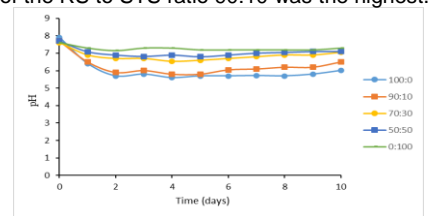
Figure 10. Variation of pH in the mixture during the first 10 days
STS help to maintain suitable pH for disgestion.

CONCLUSIONS

The majority of the substrate ratios under investigation and the mono-digestion of straw were inhibited in the early phases of the process, possibly due to the accumulation of volatile fatty acids. Total gas production of the rice straw to septic tank sludge ratio 90:10 was the highest (5705 NmlCH4/60 days). However, the ratio of 70:30 showed a faster start-up time and a large gas yield in a short time.

RECOMMENDATIONS

It is necessary to scale up the study with the tank-to-tank ratio (R: BBP = 70:30) to review the efficiency in gas decomposition.

Synthesis of Keratin/Polyvinyl Alcohol composite as an adsorbent for industrial wastewater treatment

Ta Ngoc Ly, Nguyen Thi Huyen Suong, Pham Thi Hong Phuong
* Danang University of Technology and Science, Department of Biotechnology

Background

Poultry feather with about 90% keratin conten has been massively produced, causing major environmental and health issues. Keratin contains a variety of functional groups on the backbone and side chains of the proteins and is an ideal component to fabricate a range of novel adsorbent systems for separation of toxic pollutants.
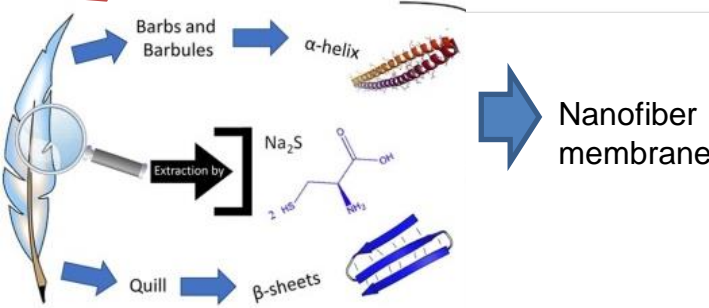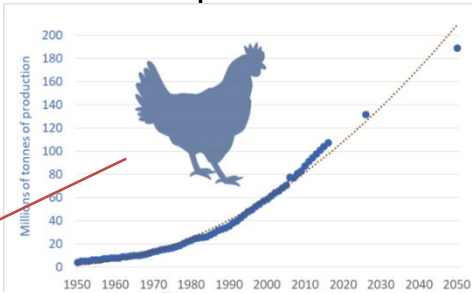
Method

Keratin
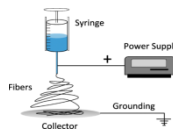
FT-IR, SEM

Adsorption

COD removal

Keratin extracted by sodium bisulphite and urea. Nanofiber PVA/Keratin membrane are produced by electrospin method. SEM and FTIR technigue was used to evaluated morphology.

Results and discussion

The optimum parameters for extraction of keratin were found at Na_2S concentration of 0.95M, 7.64 M Urea and 57.02 0C.
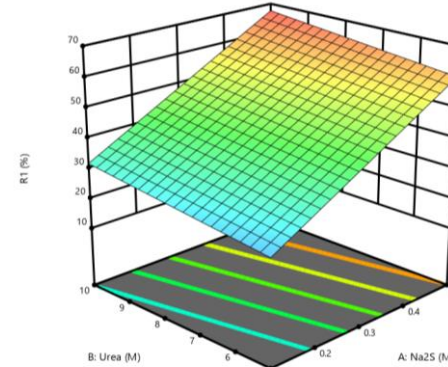
The PVA/Keratin nanofiber exhibite high adsorption capacity
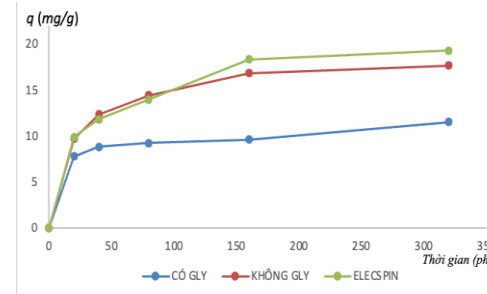
PVA-Keratin nano fiber can reduce the organic load and dyer contaminant in industrial wastewater. The result revealed about 100% removal of COD 60 min for PVA-Keratin nano fiber mat (5 g/L)
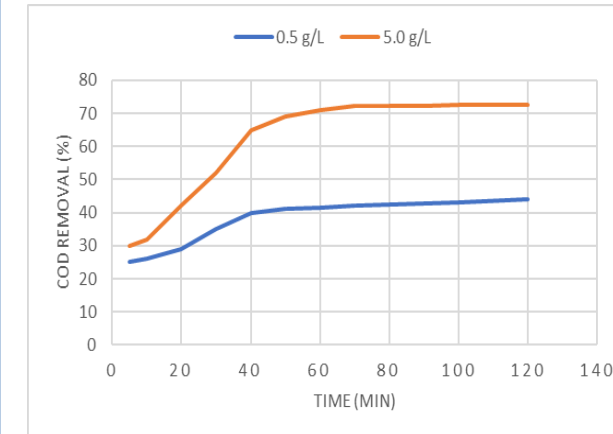
The low-cost natural keratin and the green polymer was successed produce. The PVA/keratin nanofiber has potential use for waste water treatment

Technological adaptions of Japanese thatched house in contemporary roofing process
A case study of the Miyama-Cho Kita cultural heritage thatched village.

Authors: Celine Jamin*, Ayako Fujieda**, and Hirohide Kobayashi*

* Graduate School of Global Environmental Studies, Kyoto University   ** Faculty of Global Culture, Kyoto Seika University

INTRODUCTION Background

This study investigates **the local Japanese thatching culture in our global contemporary context.** It focuses on the rethatching work operated by the professional thatchers of the Miyama Kayabuki Thatcher company *(MKTc),* within the Miyama-Cho Kita village, designated as Important Preservation Districts for Groups of Traditional Buildings. **The study puts a special focus on the contemporary conservation process and technological adaptation** performed by the *MKTc*.

Methodology :

The research data was collected from on-site field surveys and monitoring of the re-roofing work of 3 buildings in Miyama-Cho Kita village from 08/2021 to 11/2021, along with interviews of both village residents and professional thatchers of the *MKTc*.

RESULTS   I) Scopes of conservation work

Complete re-thatching of the northern roof side, **upper 1/3** of the southern side + **Punctual repairs** to the Eastern side.
Last renovation the North = 23years ago.
East side =13 years ago.
House itself is about **150 years old.**

II) Resume of the work process

The roof is divided into **3 sections**. From bottom to top, each removed and rethatched one after the other.
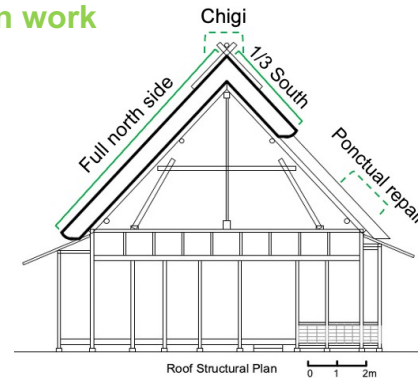
Figure scope of re-roofing work

1 *Removal of old thatch*
2 *2/3 of north re-thatching*
3 *3/3 of north re-thatching*
4 *Placement of metal sheets*
5 *Placement of Chigi parts*
6 *Final cleaning & smoothing*
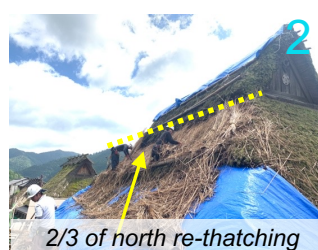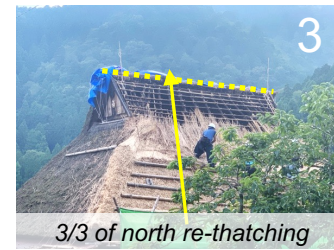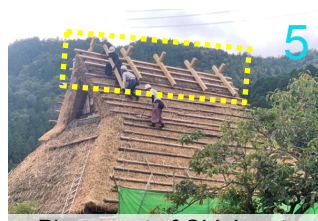
III) Changes and adaptation

2 types of changes were identified: **1) Materials, 2) Tools**.
Within the changes 2 categories : **A)** The reverting to traditional ways
B) Changes brought from contemporary circumstances.

B.1) Material
Use of metal sheets necessary to protect the final layer of thatch from rain infiltration
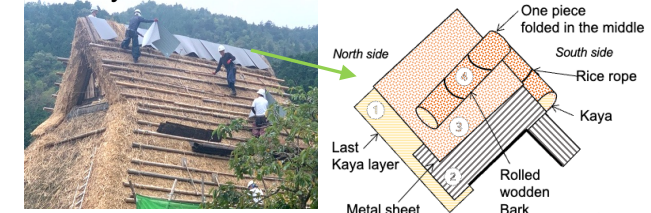
B.2) Tools
For time optimization
Included Modern tools

Change	Cat.	Metal bar Metal wires	A	Bamboo Rice rope	A	Metalic Sheets	B	Electrical Tools	B
			Change to						
Type	Factors	1	Inadequaty for rain / damp envi.	1	Adaquaty for rain / damp envi.	1	Rain permeability	2	Gain of time Monetary implications
Sustainability impacts : - / +		-	Non natural material, Weakness durability (rust under kaya)	+	Natural material, Homogenous Durability	- +	Non natural material, Strenghen durability	+ ¥ -	Support of craft & more work Dangerous

Figure of Comtemporary changes sustainability impacts

DISCUSSION

DISCUSSION : The results of this research produced a detailed rethatching process report, it also exposes some of the technological changes regarding usage of buildings materials & tools .They also demonstrate that the reasoning is not as simple as : modern changes are negative and only traditional natural ways are positive. **Modern implemented changes** happened **through** **necessary factors and** ought to be better acknowledged & **when needed adapted to serve the local thatch sustainability.**

FURTHER WORK : **Continuous recording, monitoring and comparison** of such rethatching experiences are necessary as they contribute better understanding of the shortcomings characteristics especially, to provide solutions for better a **long-term sustainability.**

The Current Situation and Sustainability of the Moken Ethnic Housing Culture

Lalita PHATTHANACHAISUKSIRI

Global Environmental Architecture, Graduate School of Global Environmental Studies, Kyoto University University

BACKGROUND: Moken is one of the 'sea gypsy' ethnic minority groups in Thailand, originally lived a nomadic lifestyle in Thailand's southern region. Throughout time, various factors, such as, **National Park's regulations, tourism, and tsunami disaster in 2003** have affect the Moken lifestyles to transform in various aspect, including their settlement.

METHODOLOGY: This research is conducted by 2 main approaches, Literature review on past studies and data collection at the Moken community in December 2021

FINDINGS: The Moken use materials that are readily **available** in the area, that they can collect, or that are **affordable**. The majority of the materials are natural. However, some artificials materials are now used. For example, nails can be used instead of rattan because they are less expensive and easier to prepare. Plank timber and Jak leaves are also used, but they are less common because they are not typically found in the island and costly. From the interview, the traditional beliefs were not vastly mentioned. Especially, when interviewing people at the age of 18-20 years old*, they only know fews beliefs; beliefs about stair number. Most of the beliefs, significantly those related with land selection, are fading away or are perceived in different views.

*ages are not commonly count among Moken people especially among eldery, only people below 30s can identify their age.

Structure Types	Materials (Past)	Materials (Present)
Main Columns	Wood/ Tree trunks	Wood/ Tree trunks
Supporting Columns	Wood/ Tree trunks and/or Bamboos	Wood/ Tree trunks and/or Bamboos
Beams	Wood/ Tree trunks	Wood/ Tree trunks
Sub-structure (Wall + Roof+ Floor)	Bamboos	Bamboos
Wall	Bamboos and Palm Leaves	Bamboos and Palm Leaves and/or canvas sheet (mainly to cover holes on the structure)
Roof	Bamboos and Palm Leaves and/or canvas sheet (mainly to cover holes on the structure)	Bamboos and Palm Leaves and/or canvas sheet (mainly to cover holes on the structure)
Floor	Bammboos	Bammboos or Timber planks
Stairs	Wood/ Tree trunks and/or Bamboos and/or Timber Planks	Wood/ Tree trunks and/or Bamboos and/or Timber Planks
Joints	Rattan	Nails and/or plastic ropes

Table 1: Materials Usage

Materials	Locations (Past)	Locations (Present)	Costs
Wood/ Tree trunks	The forest on the island and/or nearby island	The forest on the island and/or nearby island	No
Bamboo	On the island	On the island	No
Timber Planks	Not used	Old timber materials from the National Park's bungalow or from wrecked boats. Some houses use the materials that are donated (During Tsunami reconstruction)	No
Palm Leaves (Ko)	On the island	On the island	No
Palm Leaves (Jak)	Bought from mainland	Bought from mainland	Yes
Nails	Not used	Bought from Mainland	Yes
Others: Old Canvas sheets, Plastic rope	Not used	Fetch from the beaches on the island	No

Table 2: Materials Sources

Past	Present
Do not build houses on land with waterways or natural springs. It can cause death.	Valid, but it depends on land availability.
Do not build houses on bumpy land the land otherwise when it rains ghosts will flow into puddles under the house and harm the dwellers	Valid, but it depends on land availability
Entrance stairs need to be odd numbers. A House with an even number of stairs is a ghost house	Valid
If there is a stump on the land, dig out before constructing the house	Subtle to not valid
If there is/are Papaya tree roots, dig out before constructing the house, Moken believes that papaya roots bring misfortune	Not valid
To leave some space between houses for ghosts to pass, otherwise the ghosts will enter houses, causing children to be sick	Valid, but depends on land availability Some people mention this in the sense of "not bothering the neighbors"

Table 3: Beliefs

Fig.1: Jak leaves roof
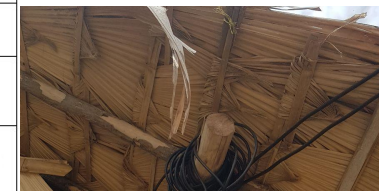
Fig.2: Kor leaves roof
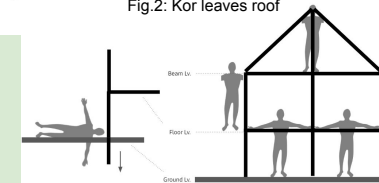
DISCUSSION: We might notice The Moken's materials usage have not changed much, despite the fact that they have transitioned from nomadic dwelling (Boat and temporal Hut) to permanent dwelling (Hut), their material selection continues to revolve around "**availability and affordability factor**," using primarily materials that they can find locally, which makes their traditional housing culture sustainable. However, the traditional beliefs underlying construction methods are fading and being **constrained by limited space**, resulting in shifting of house composition in the village.

Fig.3: Body and House

The database management framework for visualization water quality in digital map of Phu Loc river in Danang city by GIS

Authors: Tran Ha Quan*, Tran Van Quang*, Phan Thi Kim Thuy* and Nguyen Duong Quang Chanh*
* Faculty of Environment, Danang University of Science and Technology

The influence of Intensive aquaculture activity on corrosion acceleration of carbon steel ST 37

Kamarisima*, Hanifah Hasuri, Farah Nabila El Faidah, Pingkan Aditiawati

Microbial Biotechnology Research Group, School of Life Science and Technology, Institut Teknologi Bandung, Indonesia

Introduction

The intensive aquaculture industry has been done for past decade to fulfil the continuous demand of fishery product, especially freshwater fish. This activity cause worsening the water quality of surrounding area by the large amount of organic material. The bad water quality may lead to accelerate microbiologically influenced corrosion on the infrastructure nearby. This study is aimed to investigate the influenced on intensive aquaculture to cause corrosion of carbon steel ST 37

Methodology
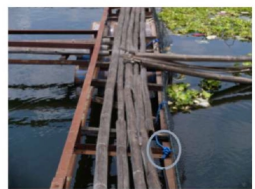
Location: Cirata reservoir, Indonesia

↓

Corrosion Assay

↓

Corrosion behavior (SEM visualization, Corrosion rate, Microbial dynamic)
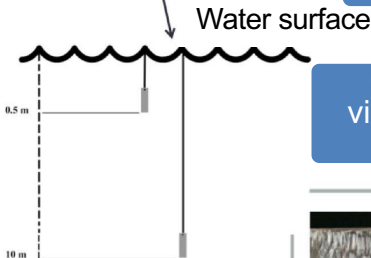
Fig 1. Experimental set-up for corrosion assay in Cirata reservoir

Fig 2. Carbon Steel ST 37 coupon dimension

Results and discussion

Table 1. Coupon visualization after immersion on Cirata reservoir

	Day 0	Day 90	Day 240
0.5 m			
10 m			
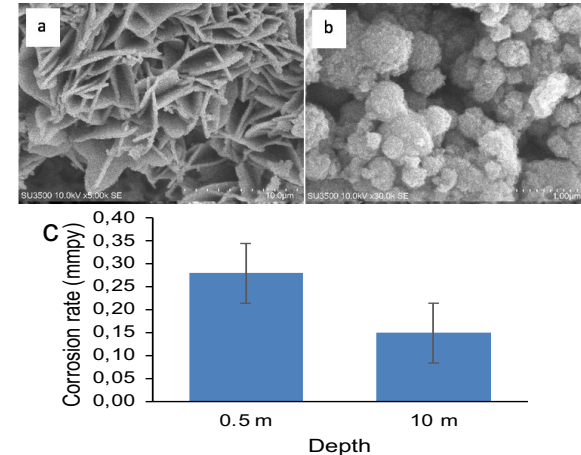
Fig 3. SEM analysis on corrosion product a) 0.5m and b) 10m after 240 days; c) corrosion rate
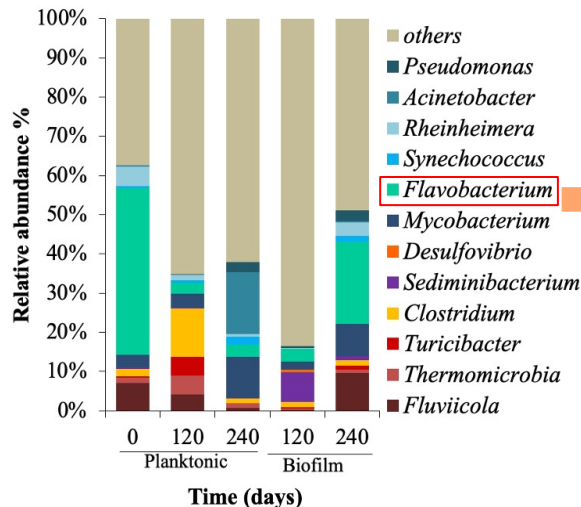
Fig 4. Bacterial dynamics during corrosion assay

others
Pseudomonas
Acinetobacter
Rheinheimera
Synechococcus
Flavobacterium
Mycobacterium
Desulfovibrio
Sediminibacterium
Clostridium
Turicibacter
Thermomicrobia
Fluviicola

Potential Key player for corrosion

↓

Sources from aquaculture waste (Fish gut)
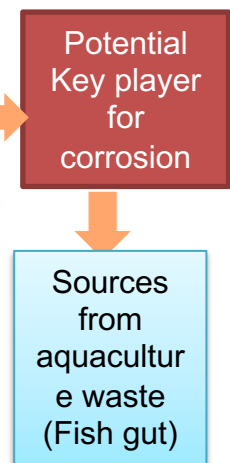
Conclusion

This study confirms the correlation of intensive aquaculture activities with severe corrosion risk on carbon steel. Therefore, further mechanism is needed to reveal the role of *Flavobacterium* to cause microbiologically influenced corrosion and its mitigation.

The Spatial Experiences about Adaptation of International Students in Taiwan

Nandi Linn Thant* and Su Shiuan Ru*

* Graduate School of Global Environmental Studies, Kyoto University
** Department of Landscape and Urban Design, Chaoyang University of Technology

LIFE   SPACE   BUILDINGS   PLAY AGAIN

Living and learning in an unfamiliar socio-cultural and academic environment, the international students are challenged with a number of problems physically and mentally. According to previous research analysis, we found that most of the studies focused on the social environment experiences of the students from the academic point of views. Therefore, in this study, we will analyze about spatial experiences about spaces in daily life which are affected to the international students to adapt a new environment.

Objective

- To understand how the relation between the daily contexts of international students and their psychological assessments affected to the process of adaptation of new environment.

- This study is aimed to be a good support to reduce the living challenges and the negative impacts of daily environment which the international students are faced in daily life.

Research Questions

1. How do the daily routine of international students affected by their environmental surroundings when they move to study in Taiwan?

2. What kind of the features of host country's environmental circumstance impact on the adaptive process of international students?

Methods & Participants

- Interviews were the primary source of data for this study.

- 10 international students from different countries were interviewed.

- Open-ended questions were asked during the semi-structured interviews.

- The average length of the interviews was 60 mins ~ 120 mins.

- The interviews were recorded using a recording device and all audio recordings are transcribed by the researcher.

Interviewee	Country of origin	Gender	Years in Taiwan	Years Attending University	Classification	Chinese Proficiency
Hai	Vietnam	Female	1.5	1.0	Master's	N
Ashley	Mexico	Female	2.5	2.0	Doctoral	N
Eric	Malaysia	Male	3.0	3.0	Bachelor's	Y
Wan	Thailand	Female	5.0	Graduated	Master's	Y
Jerry	China	Male	7.0	Graduated	Master's	Y
Joseph	Philippines	Male	2.0	2.0	Doctoral	N
Kim	Myanmar	Male	1.0	1.0	Doctoral	N
Lin	Myanmar	Male	4.0	4.0	Bachelor's	Y
Chen	Myanmar	Female	5.0	Graduated	Master's	Y
John	Mexico	Male	1.0	1.0	Master's	N

Characteristics of Participants

Data Analysis Process

- Data were analyzed by using an inductive approach.

- Data were compared, contrasted, aggregated and ordered to find common categories.

- The core categories and themes were compiled, summarized and reported.

Results & Discussion
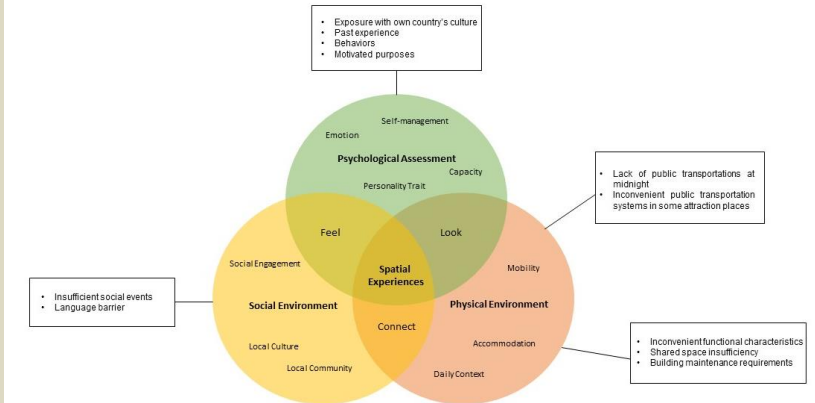
As a result of studies, the spatial experiences about : (1) **Mobility / Reachable Places** (2) **Daily Context** (3) **Integration with local culture and community** affected by the individual psychological assessments of international students. There are three mainissues come out through the data analysis process; **(1) Public transports insufficiency (2) Accommodation functional limitation (3) Less social activities.**

Studies have shown that most of the participants try to communicate with locals, try to know Taiwan's culture and traditions, try to explore surrounding places and try to join the local people' activities and events during their adaptation days. And, they indicated that they were used to with the lifestyle of Taiwan when they can use public transportation efficiently and go wherever they want by themselves. So, mobility is also very important in their stages of adaptation.

Truths and myths about traditional construction in post-earthquake housing recovery

WANG, Jingying*

* School of Architecture, The Chinese University of Hong Kong

Background

It is widely acknowledged that bottom-up post-disaster reconstruction should be encouraged to enhance community resilience. Specifically, the use of traditional building practices in post-disaster reconstruction is highlighted in the Sendai Framework for Disaster Risk Reduction. Yet the definition of traditional construction remains unclear and not all traditional building practices are seismic resistant. A clear definition is required, in order to identify different challenges when implementing different traditional construction systems for post-disaster housing recovery.
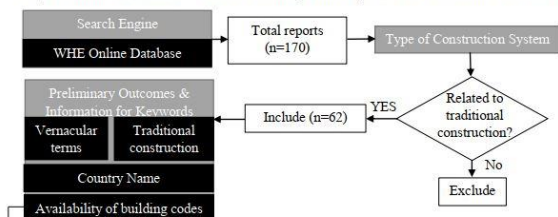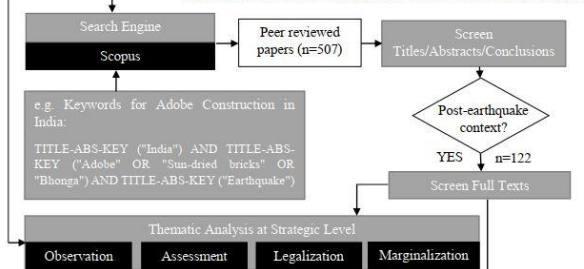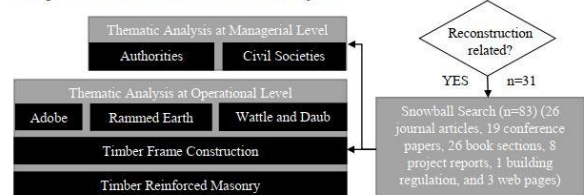
Methodology

Focusing on post-earthquake context, a systematic literature review is conducted on existing studies of traditional construction worldwide, from the Scopus search engine and the World Housing Encyclopedia Online Database.

Results

2011 Japan

1.1 Log Construction

1.2 Timber Frame Construction (Post and Beam)

2011 Japan

2007 Peru

2.1 Adobe Construction
2.2 Rammed Earth

2. Earth 土

1.Timber 木

3. Stone 石

3.1 Stone Masonry

2014 China

4. Hybrid

4.2 Wattle and Daub

4.1 Timber Reinforced Masonry
4.1a. Timber-Framed
4.1b. Timber-Laced
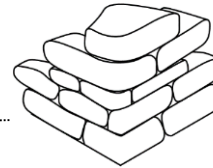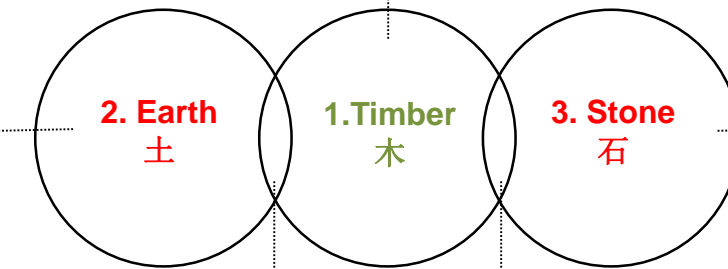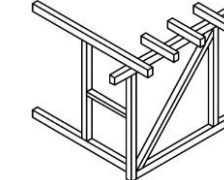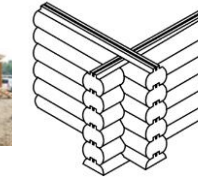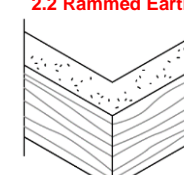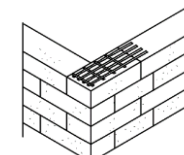
Conclusion

Based on the classification, timber and hybrid structures are generally seismic resistant. The reason lies in the elasticity of timber structures, which can be further strengthened by the stone/earth infill that helps increase the energy dissipation of the system. However, the seismic performance of earth structures and stone/brick structures is generally unsatisfactory and leads to a high death toll in communities.

As a result, different strategies must be taken for different construction systems. Timber and hybrid structures require only standardization of structural components to ensure quicker reconstruction. Yet earth and stone/brick structures require technical retrofitting and sometimes use of foreign materials at a higher budget. Thus, while the former has helped traditional construction gain recognition in post-earthquake reconstruction, the latter sacrifices to lower confidence of affected communities, higher suspicion of public authorities, and greater risks of technology transfer after short-term training of local artisans for housing recovery. Instead of labeling traditional building practices under the same umbrella, the study urges a clear differentiation to specify appropriate reconstruction approaches in accordance with different construction systems.

2001 El Salvador

2005 Kashmir (Pakistan)

2005 Kashmir (Pakistan)

Uncertainties from Applying Exhaust Emission Factors in LCA of Road Transport: A Case Study of Truck Freight and Passenger Cars

Vitoon Chotanapund[1], Vladimir Srezov[2], Ekbordin Winijkul[3], ,Jitti Mungkalasiri[4], Shabbir H. Gheewala[5,6], Trakarn Prapaspongsa[1]

[1]Graduate Program in Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, Faculty of Engineering, Mahidol University, Nakhon Pathom, Thailand, [2]School of Natural Sciences, Faculty of Science and Engineering, Macquarie University, NSW 2109, Australia, [3]Department of Energy, Environment and Climate Change, School of Environment, Resources, and Development, Asian Institute of Technology (AIT), Pathum Thani, Thailand, [4]Technology and Informatics Institute for Sustainability (TIIS), National Metal and Materials Technology Center (MTEC), National Science and Technology Development Agency (NSTDA), Pathum Thani, Thailand, [5]The Joint Graduate School of Energy and Environment (JGSEE), King Mongkut's University of Technology Thonburi, Bangkok, Thailand, [6]Center of Excellence on Energy Technology and Environment, Ministry of Higher Education, Science, Research and Innovation, Ministry of Education, Bangkok, Thailand

BACKGROUND

Road transport causes adverse environmental impacts. Using various exhaust emission calculation methods may lead to different impact assessment results. This study aims to investigate the uncertainties of applying different exhaust emission factors in the life cycle assessment of road transport.

METHODOLOGY

Conduct life cycle assessment of truck freight & medium passenger car by applying different emission factors. Figure 1 shows research framework.

Goal & Scope Definition

System Boundary: truck 7.5-16 t & medium passenger car whole road transport systems
Function Unit: tonne-kilometre (tkm) for truck freight & vehicle-kilometre (vkm) for passenger car

Life cycle inventory (LCI)

Exhaust emissions:
- EMEP/EEA
- PCD-AIT-CCAS
- ecoinvent 3.7

Fuel supply, Vehicle Fleet, Infrastructure and Tyre, brake & road wear (ecoinvent 3.7)

Life cycle impact assessment (LCIA)

18 mid-point impact categories (ReCiPe 2016)	3 end-point impact categories (ReCiPe 2016)

Environmental cost valuation

Interpretation

Figure 1 Research framework

RESULTS & DISCUSSION

- EMEP provided a similar set of emission factors as ecoinvent, while PCD provided fewer parameters and excluded heavy metals and polycyclic aromatic hydrocarbons. Hence, the exhaust emissions from all three approaches were at highly different levels.
- At the mid-point impacts level, it is found that the differences between EMEP/EEA and PCD compared with ecoinvent were 7-15% and 5-60%, respectively. Ozone formation and fine particulate formation were the main categories that were most different.
- The impact valuation (Figure 2) showed that all three approaches yielded similar results, which are:
  - main dominant process is the fuel supply, followed by exhaust emission and infrastructure.
  - the environmental costs of freight transport and passenger cars were 0.45-0.48 THB/tkm (~ 0.01 US$/tkm) and 0.81-0.82 THB/vkm (0.02 US$/vkm), respectively.
- The LCA of road transport systems depends not only on exhaust emissions but also on other processes. The level of uncertainty will depend on the scope of the assessment, which should reflect the specific goals and intended applications.
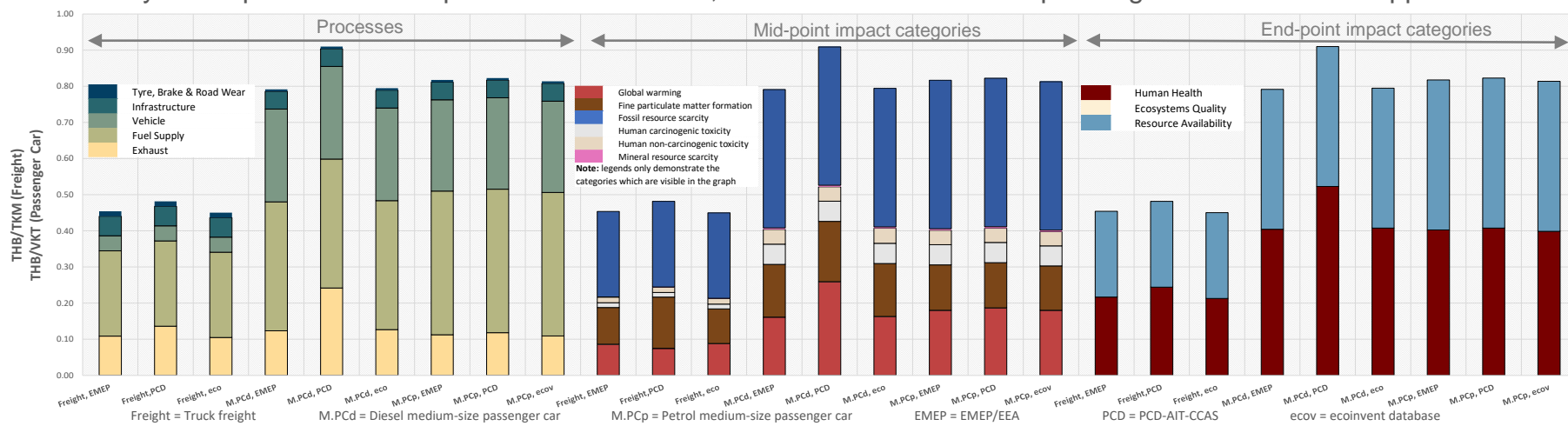
Figure 2 Environmental costs of road transport using various emission factors categorised by processes & impact categories.

Urban plant diversity of Kyoto city: From the perspective of social-economic pattern

Jiaming LI*, Jiefeng KANG** and Shozo SHIBATA*

* Graduate School of Global Environmental Studies, Kyoto University ** Graduate School of Global Environmental Studies, Sophia University

To know more about the authors:
Li (LinkedIn) Kang (ResearchGate)

BACKGROUND

Urban biodiversity is now having a closer relationship with the well-being of citizens. It has become research hotspot in the past 30 years. Currently, studies on the relationship between urban biodiversity and social economic factors can be found mainly in America and Europe, very few could be found in Japan.

Objective: based on Kyoto city, to find out the relationship between urban plant diversity, land utilization and social economic aspects.

METHODOLOGY

Explore the relationship between quadrat biodiversity indexes and socio-economic and land cover factors.

❑ **Field investigation:** set 174 quadrats (size: 20 m x 20 m, see Figure 1) in the built-up area of Kyoto City; record species name and abundance of all woody plants in the quadrats.

❑ **Biodiversity calculation:** calculate indexes including abundance, richness, Shannon index, Simpson index, and evenness of each quadrat.

❑ **Socio-eonomic factors data**: population and its age structure data of each quadrat, including total population, the proportion of children (age < 14) and the elders (age > 65 and > 75), the proportion of females and that of female children and the elders; land price of each quadrat, as index of economic.

❑ **Land cover:** proportion of each land cover type in each quadrat was recorded on site.

❑ **Statistic analysis:** pairwise correlation between socio-economic factors or land cover factors, and biodiversity indexes; then use all subset regression to find "the best model" for predicting each biodiversity index.

Figure 1
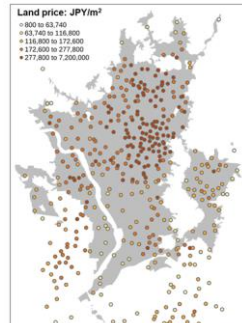
Figure 2

Figure 3

RESULTS & DISCUSSION

1. The pairwise correlation between biodiversity indexes and socio-economic or land cover factors (see Figure 4):

❑ From the perspective of biodiversity indexes, as the indicators for evenness of species distribution, Simpson index and evenness were not correlated with most of the factors;

❑ From the perspective of factors, the proportion of the elders (age > 65 or 75), and the proportion of residential land cover were positively correlated with abundance, richness, and Shannon index, while multi-family residential and commercial-industrial land cover are related to lower biodiversity indexes.
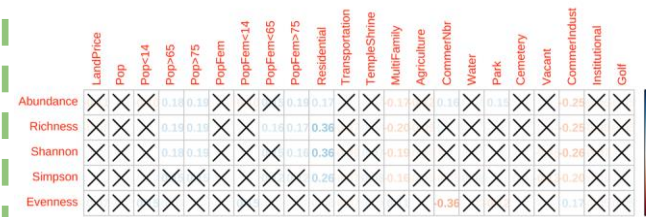
Figure 4
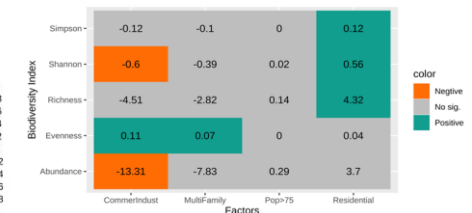
Figure 5

2. All subset regression was applied to the biodiversity indexes and the factors that have correlation with the indexes to get the "best models" for prediction of the indexes. The proportion of the elders, the proportion of land cover residential, multi-family, and commercial or industrial were selected in all the best models. The detailed results see the following figure, the numbers in which refer to correlation coefficients.

Poster Presentations – Natural Resources

A Proposed Spatial Model of Ecological Restoration in Banggai Kepulauan Tropical Rainforest, Indonesia

Authors: Annisa Hasanah*, Supriatna**, Mochamad Indrawan***

*Graduate School of Global Environmental Studies, Kyoto University ** Department of Geography, University of Indonesia
***Research Center for Climate Change, University of Indonesia

BACKGROUND

Forests in Banggai Kepulauan (Bangkep) have long been disturbed by anthropological activities leading to decline in ecosystem structure, functions, benefits and services. Bangkep is group of small islands located between Sulawesi and the Moluccan islands with little explored forests, and home of some point endemic species. One, such as Banggai Crow (Corvus unicolor), has long been declared as critically endangered by IUCN, and survived in primary forest which are increasingly becoming degraded because of deforestation and other human disturbances. Most of Bangkep's land area (50,6%) is legally designated as forest estate. Commercial scaled logging was rampant especially in the late 1980s and even now timber are still harvested. Following series of longer term local conservation outreach, and banking on the province wide government sponsored rehabilitation facilities, members of the local community began replanting the forest trees, even though many of them failed to grow. This study documented the forest rehabilitation measures and based from on the ground experiences emphasize the role local communities could take in ecological restoration.

METHODOLOGY

Ecological restoration model determined by the forest degradation rate. The forest degradation rate identified by spatio-temporal changes in vegetataion cover between years of 1991-2014 using the Landsat 4 TM and OLI data imagery, assessed by Enhanced Vegetation Index (EVI) algorithm. Forest degradation rate was evaluated using on 2 variables: vegetation cover change and existence of local forest tree species. The resulting EVI map contained vegetation cover that was already subjected to supervised classification of local vegetation. Next, change detection analysis was applied to each year of imagery in order to acquire spatio-temporal change in vegetation cover. Sampling was stratified, from undisturbed and disturbed forest areas, with random 35 samples collected from disturbed and 30 samples from undisturbed forests in Bangkep.

Location of Bangkep

RESULT

The last remaining large tracts of primary forest in Bangkep are found in the center part of the western Bangkep. These are not necessarily on steep slopes; but more on higher elevation where densities of the human population and road network is relatively sparse. Rate of forest degradation in Peleng was estimated from change detection analysis that has been ground truthed, thereby including observations of local forest cover that was classified under 3 classes: less degraded, moderately degraded and high degraded. Less degraded forest dominantly exist in western part of the island with area 58.300 ha or 24% from total area. Moderately degraded forests covered 67.400 ha or 28% of land, meanwhile the high degraded forest covered 112.630 ha or 48% of land. Restoration model proposed for each degradation rate then established.

The Ecological Restoration Model

DISCUSSION

The study suggested restoration in the islands should employ different strategies depending on the state of degradation. Forests which have been heavily modified, and are near human settlements and gardens may be enhanced with agroforestry scheme, using pala (Myristicafragrans) and kemiri (Aleuritesmoluccanus) to support local livelihoods. Medium degraded forests that usually occurred in mid elevation, and moderately far from road and settlemets may be intervened with enrichment planting using native and selected non-native trees. Light degraded forests may be intervened with assisted natural regeneration (ANR). Use of local seedling yielded a good growth of trees, because it has similar important abiotic factors such as temperature, humidity and climate. Local seedling give better results rather than seeds that brought from farther away. This imply the need to lessen dependency on government sourced seedlings, and increased local initiatives for locally sourced forest trees seeds.

It is interesting that by protecting the sacred places in the forest, the indigenous people practiced conservation-based local wisdom and this was effective enough to protect the local ecosystem. Conservation measures should therefore support sacred places, and coupled with the application of disaster avoidance to rehabilitate steeper slopes.

This study documented how through longer term support the local people may develop their own conservation capacities. Proof of concept was provided that the local communities were able to rehabilitate their own forests, and as of now on village had already an independently nursery populated by seedlings from the local natural forest only. Whereby government support is appreciated, the local inisiatives were crucial and effective.

Air Quality Study in Japan with CUPI-G (Compact and Useful PM$_{2.5}$ Instrument with Gas Sensors)

Humm Kham Zan Zan Aung[1,2], Jiaru Li[1,3], Yosuke Sakamoto[1,3,4], Kentaro Murano[1], Nanase Kohno[5], Kei Sato[3], Yoshizumi Kajii[1,3,4], and Suwanna Kitpati Boontanon[1,2]

[1]Graduate School of Global Environmental Studies, Kyoto University, Japan, [2]Graduate Program in Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, Faculty of Engineering, Mahidol University, Thailand, [3]Regional Environment Conservation Division, National Institute for Environmental Studies, Japan, [4]Graduate School of Human and Environmental Studies, Kyoto University, Japan, [5]Faculty of Science and Engineering, Kindai University, Japan

Study Background and Objectives

- High density multi-point observations are necessary to understand the source, transport, and sink of air pollutants considering their effects on human health, ecosystem, and climate.
- However, the standard instruments are not always available because of their relatively high cost, large size, large power consumption, and limited temporal resolution.
- Based on the location availability and limited time span to collect data, the three urban and suburban locations were selected to take air quality monitoring.
- The objectives of this study are:
  a) to use the CUPI-G (Compact and Useful PM$_{2.5}$ Instrument with Gas sensors) instrument's potential applicability in urban areas with battery or electricity,
  b) to determine spatiotemporal variations, and
  c) to investigate daily and hourly variations in PM$_{2.5}$ and typical trace gases in relation to meteorological conditions.

Methodology

Labels: AC Plug, IoT board, SIM Card (Back Side), HDMI Cable, Raspberry Pi A+ (CPU), GPS Antenna Connector, GPS Antenna, Electrochemical Sensors, Temp. & Humidity Sensor, AC100-240V Cable (10m), LAN Adaptor, PM$_{2.5}$ Sensor and its Spare behind the Chemical Sensors

PM$_{2.5}$ Sensor
(Nagoya University and Panasonic Corporation)
+
Electrochemical Sensors (Alphasense, UK) for pollutant gases (CO, O$_x$, NO$_2$, NO)
CO-B4, NO-B4, NO$_2$-B43F, O$_x$-B431

1) Calibration of the CUPI-G with standard instruments,
2) Air quality monitoring at three different urban/ suburban locations (Kyoto, Osaka, and Tsukuba) for two weeks respectively and,

Kyoto — 京都大学 KYOTO UNIVERSITY
Osaka — 近畿大学 KINDAI UNIVERSITY
Tsukuba — National Institute for Environmental Studies, Japan

1) Comparison among three sites.

Discussion and Conclusion

Correlation between Standard Instrument and CUPI-G

CO	NO	NO$_2$	O$_x$
r = 0.58, p<0.001	r = 0.4, p< 0.001	r = 0.48, p< 0.001	r = 0.8, p< 0.001
Strong Positive	Moderate Positive	Moderate Positive	Very strong Positive

- Highest O$_3$ concentration was found in Kyoto among three locations.
- According to the data, CO and NO concentrations were the largest in Osaka.
- In Tsukuba, the strongest PM$_{2.5}$ and NO$_2$ concentrations were observed.
- In Osaka, CO, NO, and O$_3$ concentrations were discovered highest at once on 12th August because electricity blackout was occurred for approximately 6 hours and the instrument maloperation happened for a while .
- For further study, the comparison among the three points will be examined in detail to specify major pollutants to help future mitigation policies.

Acknowledgement

Results

Kyoto
Jun 01 to Jun 14

Kyoto	Mean ± Standard Deviation
Temperature (°C)	23.484 ± 2.446
Humidity (%)	55.183 ± 11.015
PM$_{2.5}$ (µg/m^3)	4.438 ± 2.992
CO (ppb)	351.985 ± 31.853
NO (ppb)	0.436 ± 0.136
NO$_2$ (ppb)	1.911 ± 0.612
O$_3$ (ppb)	33.127 ± 11.034

Osaka
Aug 05 to Aug 19

Osaka	Mean ± Standard Deviation
Temperature (°C)	31.902 ± 2.734
Humidity (%)	63.474 ± 10.954
PM$_{2.5}$ (µg/m^3)	7.269 ± 4.282
CO (ppb)	388.029 ± 40.730
NO (ppb)	0.568 ± 0.130
NO$_2$ (ppb)	3.509 ± 0.683
O$_3$ (ppb)	30.450 ± 11.509

Tsukuba
Aug 22 to Sep 02

Tsukuba	Mean ± Standard Deviation
Temperature (°C)	26.569 ± 3.326
Humidity (%)	76.423 ± 12.110
PM$_{2.5}$ (µg/m^3)	9.530 ± 8.811
CO (ppb)	363.842 ± 37.817
NO (ppb)	0.354 ± 0.108
NO$_2$ (ppb)	3.560 ± 0.742
O$_3$ (ppb)	26.066 ± 9.311
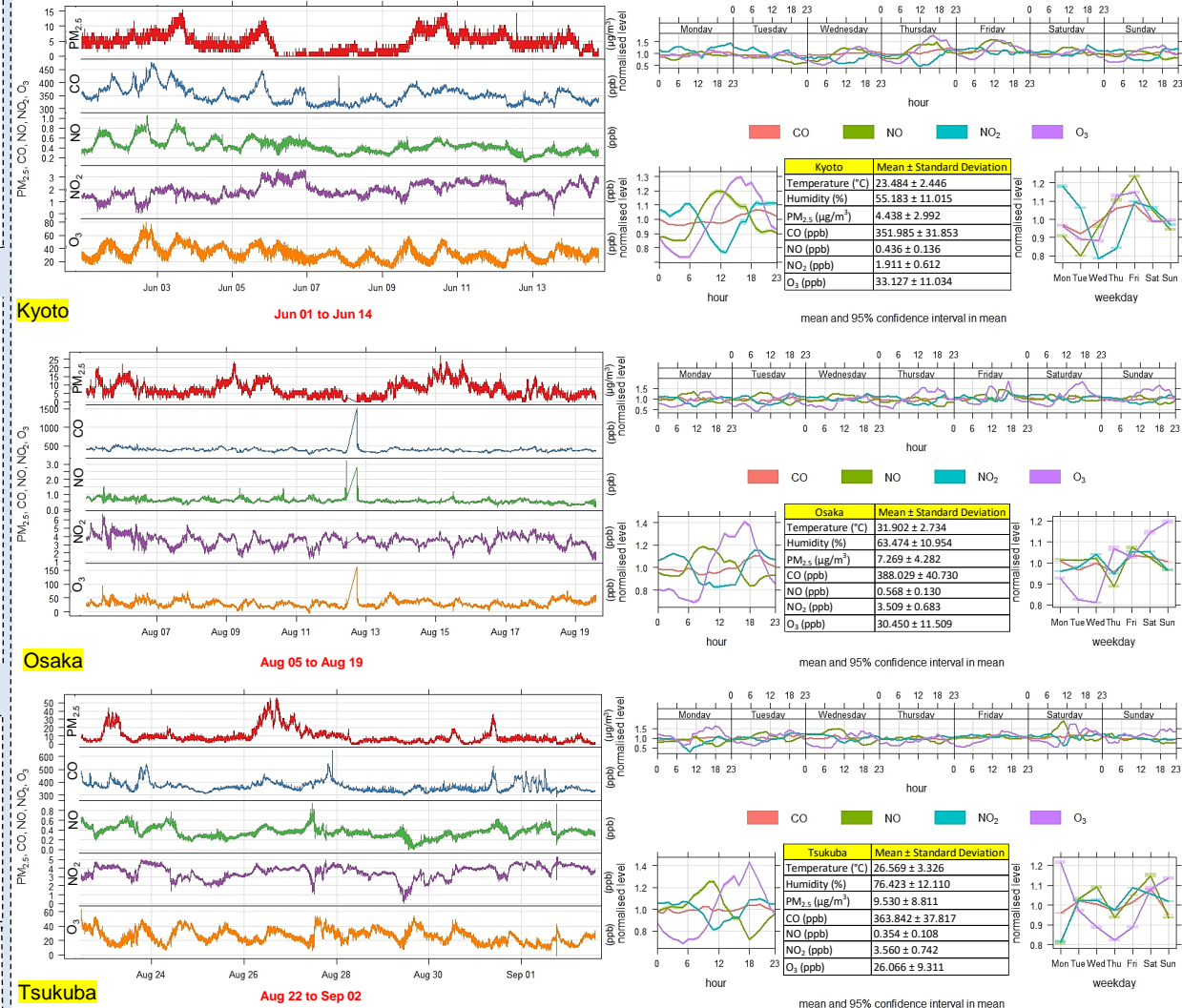
Assessing the Vu - Gia Thu Bon river basin's sustainability using the water stress index

Authors: Mai Thi Thuy Duong*, Vo Ngoc Duong*, Tran Thi Viet Nga**,

*The University of Danang – University of Science and Technology, Viet Nam.
**Hanoi University of Civil Engineering, Viet Nam.

Background and Objectives

The rapid increase in water demand will cause stress on water resources in the dry season in 11 out of 16 river basins in Vietnam. Competition for water demand in many different industries is increasing in the context of poor water quality. Moreover, the impacts of climate change have created more water challenges and increase the need to manage water resources more efficiently.

Methodology

1. Scope of study

- Watershed Delineation
  - Water resources (WR) (Mike She)
  - The water use (WU)
    - domestic water use (W_{SH}) (Standard; Population)
    - industrial water use (W_{CN}) (Standard; acreage)
    - agricultural water use (W_{NN}) (Standard; acreage)
  - Environmental Water Requirements (ERW)
    - TT 64/2017/TT-BTNMT (1354/QĐ-BTNMT)

2. Calculate

$WU = W_{SH} + W_{CN} + W_{NN}$

WSI

3. Trend forecast

- A water resources forecast (WR)
- The water use forecast (WU)
- ERW

Water stress index (WSI) = $\dfrac{WU}{WR-EWR}$ (Smaktin, et al. 2004)

▷ The MIKE SHE model was used to simulate the hydrological regime.
▷ Using ArcGIS 10.7 and ArcHydro as tools in Watershed Delineation for calculations.
▷ Data collection: population, industries, agriculture, and services (in 2020 and planning to 2030). Data on rainfall (42 years - at 16 different rain gauge station), evaporation, groundwater,…

Conclusion

▷ The study also considered the amount of water allocated to maintain the ecosystem as well as the distribution of surface water combined with groundwater. The water shortage occurs seriously in the dry season, with a WSI period higher than 1.
▷ With the change of rainfall in an unfavorable direction, water scarcity will become even more serious in 2030.
▷ Have both technical and management measures to help limit the increase in salinity and ensure water supply.

Results and Discussion

1 – Watershed Delineation

VU GIA THU BON RIVER BASIN

2 – Water stress index

The water scarcity situation is severse during the period from March to May. WSI exceeds 1 times, seriously affecting the exploitation at Water Treatment Plants.

WSI — Regions
— Environmentally safe
— Moderately exploited
- - - Environmentally water stressed
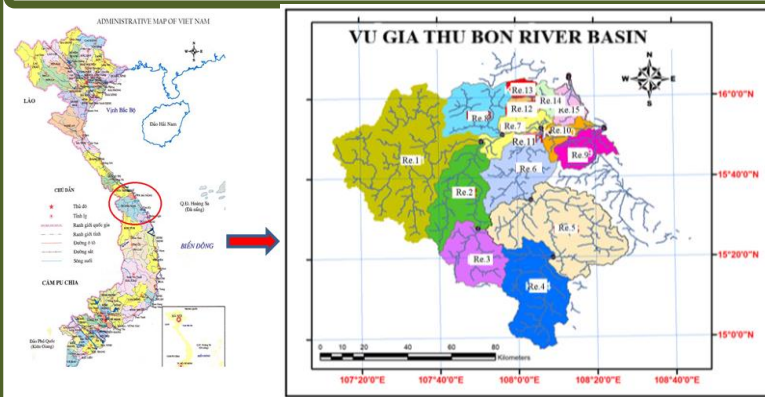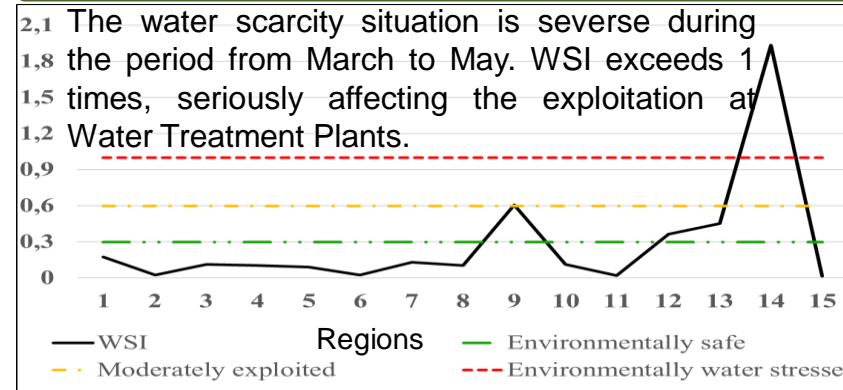
3 - Prediction of WSI in the future

— Water resources
- - - Water use
— WSI
— Environmentally safe
— Moderately exploited
— Environmentally water stressed
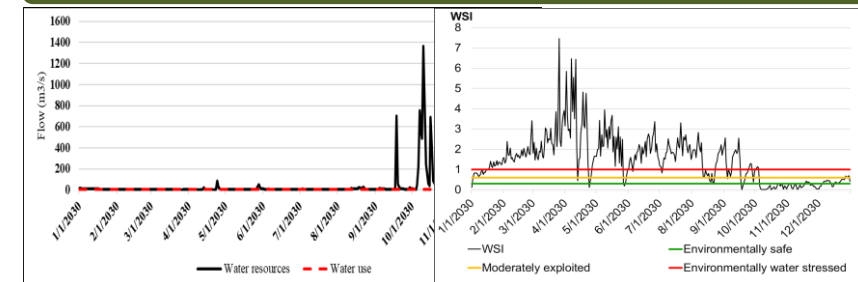
With the scenario of climate change RCP4.5, in 2030, the water shortage will happen earlier and longer time, from the beginning of February until September.

Case Analysis on the Development Process through Collaboration among Multiple Rural Communities

Authors: Hiroki YAMAMOTO*, Satoshi HOSHINO** and Kenichiro ONITSUKA**

* Graduate School of Agriculture, Kyoto University ** Department of Global Environmental Studies, Kyoto University

Background
Population decline, weakening of community→Collaborating among multiple communities(ex. Rural RMO)
Not enough knowledge of "how to proceed and support such community development"

Methodology
"Inochi-no-Sato" project (Kyoto Prefectural Government)=Pioneer of community cooperation
・The process of community development through this project→31 items (broken down)
・charted as a directed graph using IRS analysis method (developed in Educational Technology)
・we clarified the developing process based on connection of each item and direction of arrow

Result
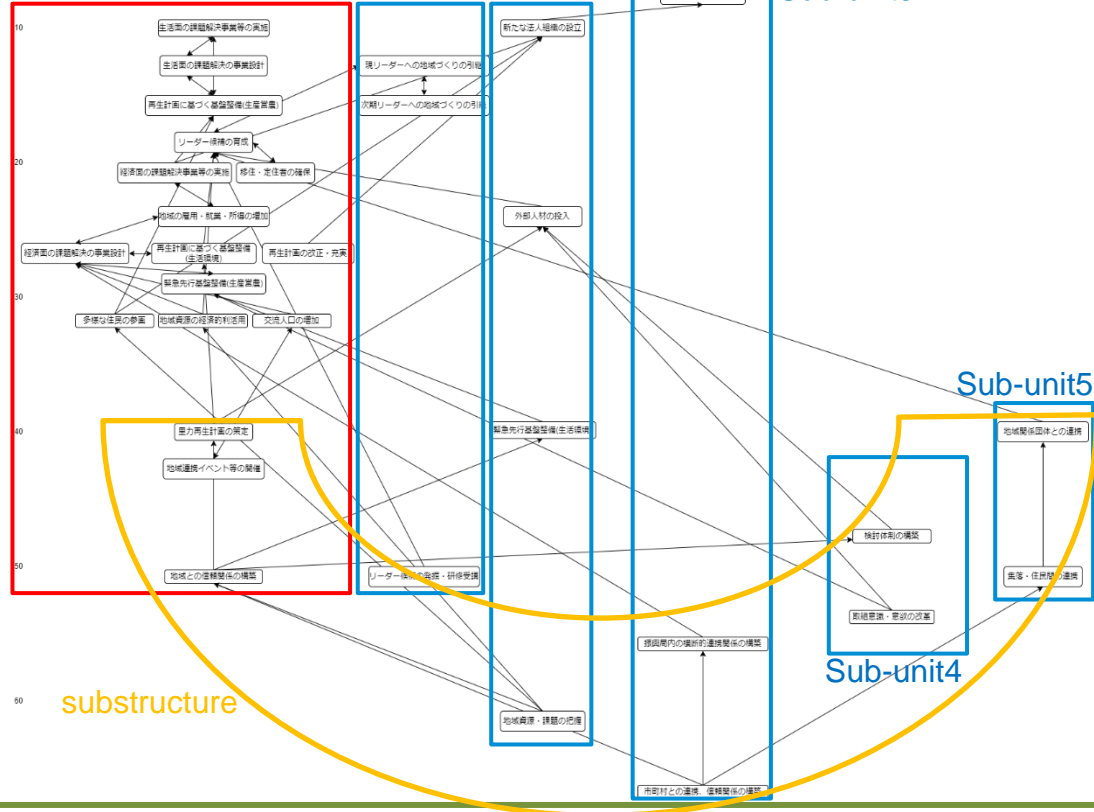
Discussion
・community development→ "mainstream" and "sub-units"
　　Mainstream : the main flow based on the concrete revitalization plan
　　Sub-units : related to the different parts of the mainstream
・starting point of the mainstream : "Building relationship of trust to the community"
→**SUGGESTION** : trust between support organizations and communities is necessary to community development
・sub-unit 1 "Training of leaders for regional development" flows into the mainstream
→**SUGGESTION** : growing leaders is a central element of community development along with the mainstream
・sub-unit 2 "The difference of the approach to the development"
　　Initial stage of rural development = infrastructure development (HARD)
　　Late stage = organizational change of the community　　　　　　(SOFT)
・sub-unit 3 "Support system of the government"
・sub-unit 4 "Change of the mind of residents"
・sub-unit 5 "Cooperation of organization at the region"
・the bottom of the graph : "substructure"
　　Some preparatory items are gathered and forming substructure
　　4 parts : "Building relationship of trust" "Support system" "Change of residents' mind"
　　　　　　"Cooperation"
　　Each of them contributes to the different stage of the mainstream

Comparison of Heavy Metals in Aerosol and their Enrichment Factors at Observation Heights

Cathleen Simatupang[1,2], Kanitthika Santhaweesuk[1], Prapat Pongkiatkul[3], Vladimir Strezov[2], Narin Boontanon[1], Ranjna Jindal[1], Suwanna Kitpati Boontanon[1,4]

[1]Graduate Program in Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, Faculty of Engineering, Mahidol University, [2]Department of Earth & Environmental Sciences, Faculty of Science & Engineering, Macquarie University, [3]Department of Environmental Engineering, King Mongkut's University of Technology Thonburi, [4]Graduate School of Global Environmental Studies, Kyoto University

Background information

Toxic heavy metal in particulate matter (PM) result in major global health concern, as various harmful chemicals are thus present in the atmosphere. The objective of this study is to determine the concentration of heavy metals in $PM_{2.5}$ at 2 different elevations at Mahidol University, Salaya campus, and to examine their Enrichment factors (EF).

Methodology

$PM_{2.5}$ collection

Rooftop (15m)

Parking space (2 m)

ICP-MS Digestion

1. Weight samples
2. Heat samples
3. Sample separation
6. Calibration & Validation
5. ICP Analysis
4. Total volume

Acknowledgement
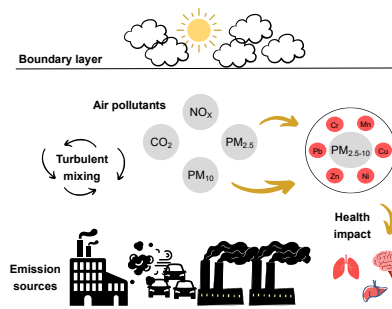
Results
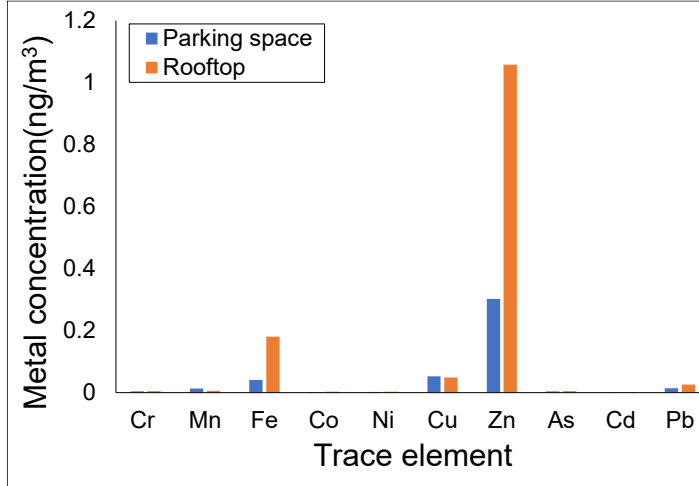
Parking space ng/m³		Rooftop ng/m³	
Zn	0.30238 ± 0.05636	Zn	1.05778 ± 0.59786
Cu	0.05262 ± 0.02859	Fe	0.18054 ± 0.11129
Fe	0.04003 ± 0.01814	Pb	0.02537 ± 0.00844
Pb	0.01370 ± 0.00463	Cu	0.04866 ± 0.04295
Mn	0.01251 ± 0.01874	Mn	0.00528 ± 0.00430
Cr	0.00354 ± 0.00137	Cr	0.00483 ± 0.00458
As	0.00339 ± 0.00304	As	0.00439 ± 0.00172
Ni	0.00163 ± 0.00065	Co	0.00313 ± 0.00723
Cd	0.00058 ± 0.00064	Ni	0.00287 ± 0.00222
Co	0.00014 ± 0.00009	Cd	0.00061 ± 0.00058

Increasing

- The toxic heavy metals in the parking space showed higher concentration than the trace elements on the rooftop.

- The EF values in the parking space were found to be in the following order:
  Zn > Cu > Pb > Mn > Cr > As > Ni > Cd > Co

Conclusion

- Mean concentrations of trace elements below the WHO standard
- The EF revealed significant differences in parking space and rooftop
- Vehicle emissions might be one of the potential sources

COMPARISON OF SUPPORT VECTOR MACHINES AND RANDOM FORESTS IN HILLY LAND COVER CLASSIFICATION APPROACH ON SENTINEL-1 DATA

Muhamad Samsul Maarif 1*, Novia Zora Hagnas 2*, Bambang Hendro Trisasongko 3*, Dyah Retno Panuju 4*

*Department of Soil Science and Land Resources, IPB University
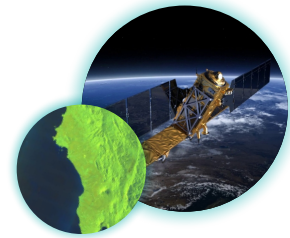
Background

Monitoring through classification model within passive sensor is often obstructed by climatic conditions. Clouds and fog can disturb objects, moreover in mountainous or hilly areas. Sentinel-1 could be operated in all weather conditions. On the other hand, the Sentinel-1 data could be processed through machine-learning, such as Support Vector Machines (SVM) and Random Forests (RF) to compatibility with modified classification.

Methodology

Study Area
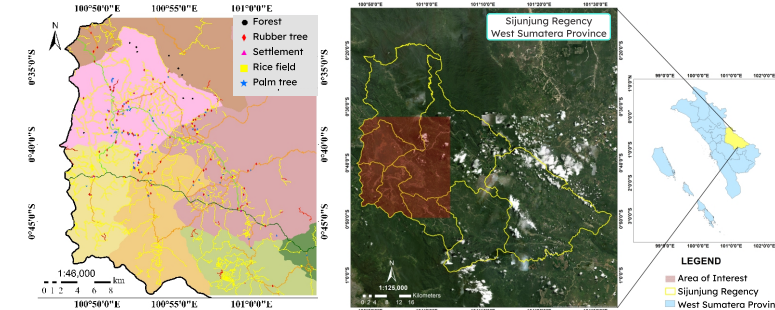
Methods

1. Field Observations
2. Sentinel-1 Pre-processing
3. Polarimetric Decomposition
4. Pixel value extraction
5. Land Cover Classification
6. Accuracy assessment; confusion matrix

Land Cover Classification
- Support Vector Machines (SVM)
  - Linear Kernel
  - Non-linear Kernel
    - Radial Basis Function
- Random Forests (RF)
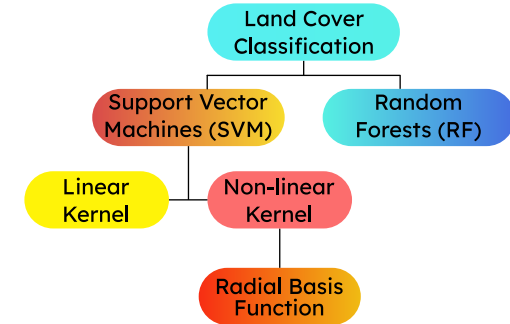
Result and Discussion

Dry Season (June 11th 2021)

(a) SVM Linier   (b) SVM RBF   (c) RF

Rainy Season (November 14th 2021)

(a) SVM Linier   (b) SVM RBF   (c) RF

Legend:
Forest | Rice field | Settlement
Rubber tree | Palm tree

RF classifier accuracy test results

Land Cover	ntree 350 (Dry Season)		ntree 750 (Rainy Season)	
	User's Accuracy (%)	Producer's Accuracy (%)	User's Accuracy (%)	Producer's Accuracy (%)
Forest	39.2	64.9	44.2	75.8
Rubber tree	78.6	62.5	80.7	63.9
Settlement	80.1	87.6	77.1	84.9
Rice field	30.6	56.4	34.3	55.5
Palm tree	58.9	61.1	54.0	58.3

SVM classifier accuracy test results

Land Cover	User's Accuracy (%)				Producer's accuracy (%)			
	Dry Season		Rainy Season		Dry Season		Rainy Season	
	SVM Linier	SVM RBF	SVM Linier	SVM RBF	SVM Linier	SVM RBF	SVM Linier	SVM RBF
Forest	0	82.4	0	65	0	63.6	0	59.1
Rubber tree	53.3	54.7	56.9	57.2	84.7	89.3	85.9	90.8
Settlement	87.8	89.8	79.3	82.1	72.9	74.6	68.7	82.1
Rice field	0	63.6	0	53.6	0	5.3	0	15.0
Palm tree	47.3	55.2	41.5	50.8	46.4	45.7	42.1	34.5

Accuracy of RF with various ntree's value

Accuracy of SVM with various 'cost' value

Comparison of Classifier Accuracy
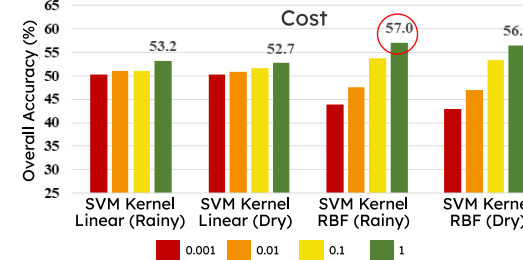
For RF, the optimum n tree value in rainy season, is that in 750, while in the dry season, 350.

For SVM, the optimum cost value is that in 1 with the highest accuracy of 57% by the RBF kernel.

Machine learning modeling shows that RF has better performance than SVM, with an overall accuracy of 64.8% in the rainy season and 63.7% in the dry season.

Drone Use and Spatial Interpolation of Soil Geochemical Properties at Different Horizons and Land Covers in Northern Kyoto Prefecture

KARIMA Afifa[1*] SHIBTA Makoto[1,2], INOUE Tamami[1], FUNAKAWA Shinya[1,2]

[1] Graduate School of Agriculture, Kyoto University, [2] Graduate School of Global Environmental Studies, Kyoto University,[*] afifa.karima.83v@st.kyoto-u.ac.jp

Background

In soil and natural resource studies, subsurface soil properties and land cover types are crucial factors to investigate.

The objectives are to **visualize** soil geochemical properties in Kamiseya, Northern Kyoto, and **compare** the fitness of the spatial interpolation methods.

Methodology

1. Sampling:

DJI Inspire 1

Land cover

Elevation (m.asl)

Value
480
430

0 55 110 220
m

Fig 1. Processed drone images
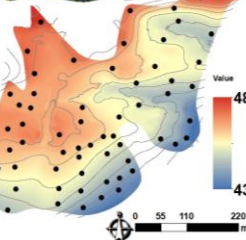
2. Geochemical properties:

Surface (0-5 cm)

Subsurface (30-40 cm)

Fig 2. Soil profile

✓ Total Carbon **(TC)**

✓ Total Nitrogen **(TN)**

✓ pH

3. Spatial interpolations:

Ordinary Kriging **(OK)**

Use a semivariogram function to examine the spatial distribution

vs

Inverse Distance Weighing **(IDW)**

Weigh the interpolating point by the inverse of its distance

Results & Discussion

Land covers are categorized as coniferous forests, broadleaf forests, paddy fields, and grassland.

Besides the continuous land cover, changes were observed in 24 points from paddy fields to forests and grassland.

Table 1. Comparison of the interpolation method's cross-validation

Method	Variable	Depth (cm)	Correlation r_s	Efficiency R^2	Error RMSE	SE
OK	TC	0-5	0.94**	0.838	28.03	3.50
		30-40	0.89**	0.859	33.98	4.25
	TN	0-5	0.99**	0.980	1.73	0.22
		30-40	0.05	0.004	4.34	0.54
	pH	0-5	0.65**	0.527	0.41	0.05
		30-40	1.00**	1.000	0.01	0.00
IDW	TC	0-5	0.22*	0.081	57.37	7.17
		30-40	0.11	0.005	58.17	7.26
	TN	0-5	0.28**	0.171	4.97	0.62
		30-40	0.12	0.002	4.39	0.55
	pH	0-5	0.65**	0.501	0.42	0.05
		30-40	0.63**	0.357	0.37	0.05

** p-value < 0.05, * 0.05 < p-value < 0.1

The average concentration of TC and TN on the surface were 118 gC/kg and 6.9 gN/kg, while those on the subsurface were 74 gC/kg and 3.9 gN/kg, respectively. Soil pH ranged from 4.3 to 6.6.

TC and TN in former paddy fields were 1.5 times lower than in continuous forests which regularly had higher organic matter accumulation.

OK's prediction and actual value have positive, moderate to strong(r_s), and fairly significant relation (p-value < 0.1) (Table 1.).

The OK method showed better fitness than IDW, with higher R^2 (near 1), lower RMSE, and SE values (near 0).

IDW was less efficient based on the statistical comparison (Table 1.). Unlike OK, the IDW method only provides RMSE and Mean Error.

TC   TN   pH

0-5 cm

OK

IDW

TC (g/Kg)
Value
285,68

14,60

TN (g/Kg)
Value
33,12

1,55

pH
Value
6,50

4,27

30-40 cm

OK

IDW

TC (g/kg)
Value
272,82

6,57

TN (g/Kg)
Value
25,31

0,19

pH
Value
6,56

4,38

0 125 250   500
m
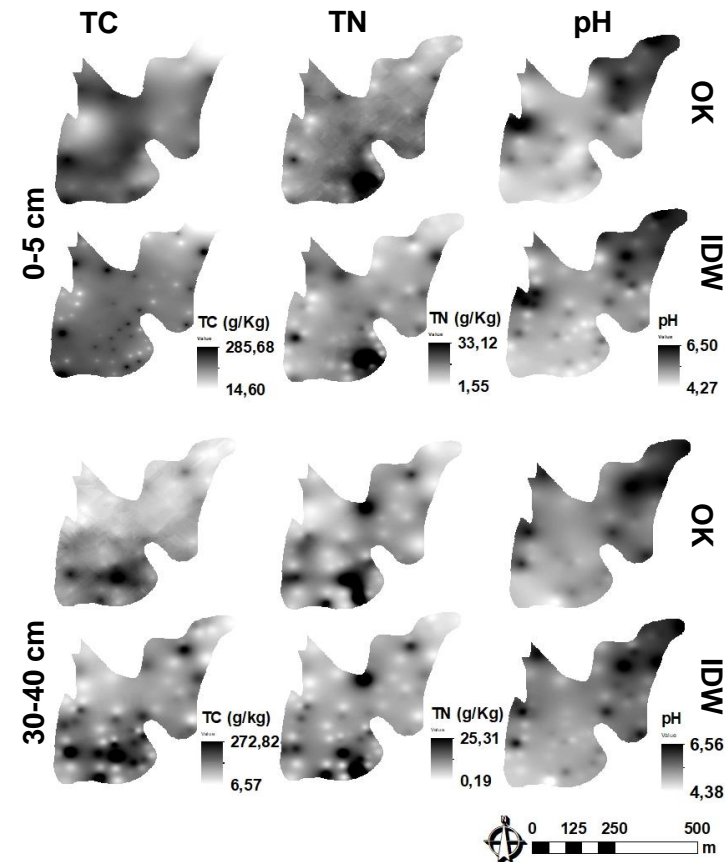
Fig 3. Spatial distribution map of soil geochemical properties

Conclusions

Land cover changes

TC and TN concentrations were lower in disturbed areas like paddy fields, even though they changed into forests and grassland.

Distribution map

Visualized higher TC and TN on the surface and forests, while pH indicates the opposite.

Spatial interpolations comparison

The OK method was better at predicting the spatial distribution of soil geochemical properties in Kamiseya.

It was supported by R^2 (near to 1), lower RMSE, and SE values.

Estimation of Soil Erosion Potential and Sedimentation in Marikina River Basin, Philippines

Authors: Jan Joseph V. Dida*, Cristino L. Tiburan Jr.*, and Izuru Saizen **

* Institute of Renewable Natural Resources, College of Forestry and Natural Resources, University of the Philippines Los Baños ** Laboratory of Regional Planning, Graduate School of Global Environmental Studies, Kyoto University

Background

- In the Philippines, soil erosion has been labeled as the country's worst environmental problem (Schmitt, 2007). Soil erosion has been shown to affect the downstream areas of a watershed.

- Given the effects of upland activities in the acceleration of soil erosion, there is the need to understand soil erosion dynamics inside the watershed.

- One of the watersheds that is affected by soil erosion is the Marikina River Basin which spans across the National Capital Region.

Methodology

- Marikina River Basin has a total area of around 54,325 hectares.

- It has an estimated population of 7.5 million according to 2010 census.

- Majority of the land cover (around 30%) is built up.
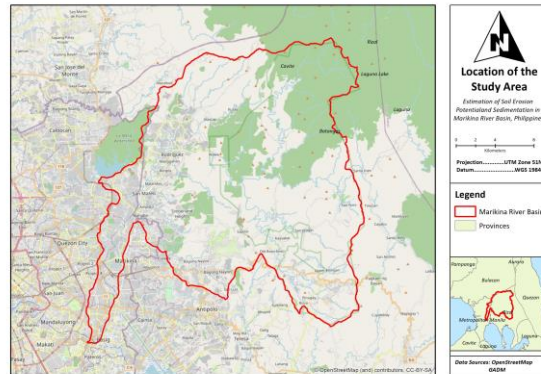
Figure 1. Location of the study area.
Base map: © OpenStreetMap contributors.

Figure 2. Flow of Activities

Table 1. Data sources of factors used in the soil erosion potential estimation.

Factor	Source
Rainfall Erosivity	DOST-PAGASA
Soil Erodibility	DA-BSWM
Topographic Factor	ASTER DEM
Crop Management	ESRI 2020
Support Practice	Default value (1)

Results and Discussion

- The most dominant land use/land cover (LULC) is forest/trees followed by built up.

- Total estimated sediment export for year 2020 is around 1,009,055 Tons.

- High soil loss potential values are present in bare grounds and steep slopes.
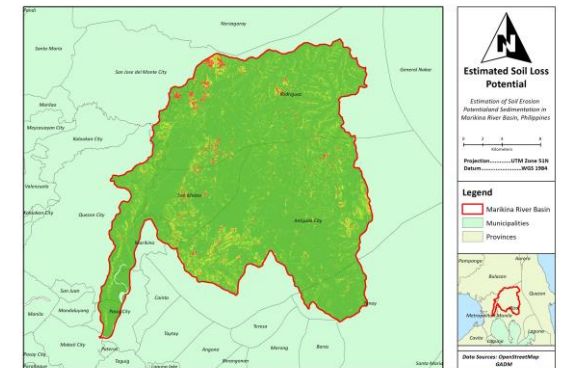
Figure 3 Soil Loss Potential in MRB.

Fate of nitrogen from methane fermentation waste fluid in paddy soils with contrasting soil texture

Authors: BUI Ngoc Tan[1,5], SHIBATA Matoko[1,2], MATSUBARA Keisuke[3], MATOH Toru[3], FUKUSHIMA Keitaro[4], FUNAKAWA Shinya[1,2]

[1] Graduate school of global environmental studies, Kyoto University; [2] Graduate of Agriculture, Kyoto University;
[3] Kyoto Agriculture Research Institute (KARI) Co. Ltd.; [4] 4Faculty of Food and Agricultural Sciences, Fukushima University; [5] Vietnam National University of Agriculture.

BACKGROUND

Methane fermentation waste (MFW) has been used as a fertilizer for rice (Chen et al., 2013; Ren et al., 2020); however, excess MFW application causes environmental pollution, such as nitrogen (N) leaching, volatilization, or denitrification (Nkoa., 2014; Cheng et al., 2018). Soil texture (clayey or sandy) influences N dynamic and plant growth (Luce et al., 2014; Soinne et al., 2020), but the effect of it on the N fate from MFW application has been unclarified. This study focuses on understanding the impact of MFW on N fate in contrasting soil textures, which could provide suitable doses for rice yield and minimize the N loss to the environment.

MATERIALS AND METHODS

A pot (1/5000a) experiment was conducted in the greenhouse with:

five fertilizer treatments, and

- 0N   : Control without N fertilizer.
- 1N-Chemical : 200 mg N /pot (200mg NH_4-N)
- 0.5N-MFW   : 100 mg N /pot (70mg NH_4-N)
- 1N-MFW   : 200 mg N /pot (140mg NH_4-N)
- 2N-MFW   : 400 mg N /pot (280mg NH_4-N)

20% of NH_4-N was replaced by $^{15}NH_4Cl$ for tracing the fate of inorganic N (inorg.N).

two types of soil.

Parameters	Sandy soil	Clayey soil
Soil texture	9.5% clay, 71.3% sand, 19.2% silt	30.4% clay, 13.1% sand, 56.6% silt
NH_4-N (mg/kg)	5.4	4.8
NO_3-N (mg/kg)	9.1	6.4
Total C (g/kg)	19	22
Total N (g/kg)	1.5	2.1

RESULTS AND DISCUSSION

Rice biomass
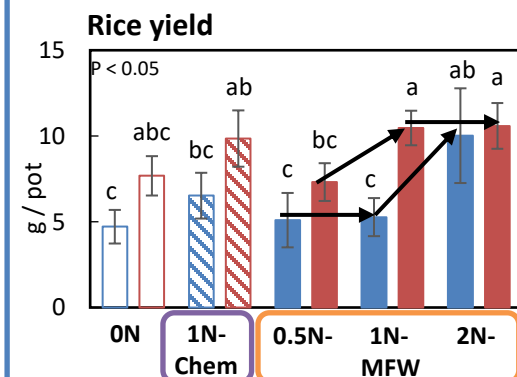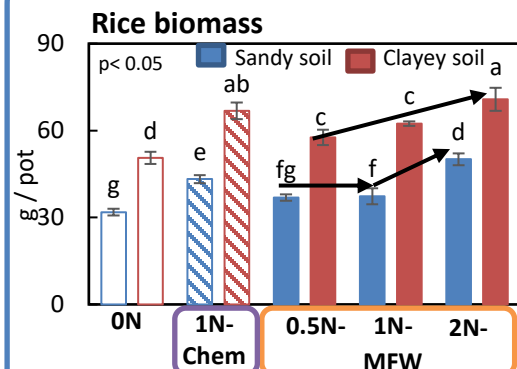
Rice yield

Higher MFW rate increased rice biomass and yield, but the pattern was different for each soil type.

Comparison between MFW and chemical fertilizer:
Biomass: 1N-MFW < 1N-Chem
Rice yield: 1N-MFW = 1N-Chem

N uptake by plant from different treatments

Total N uptake

Inorg.N uptake from fertilizer
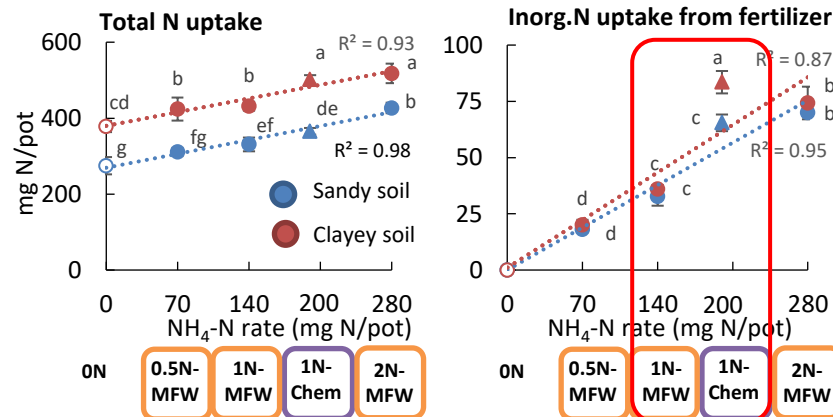
Total N uptake: CL > SL,
N uptake increased linearly for both soil types.

Inorg. N uptake:
CL = SL for MFW;
1N-Chem > 1N-MFW.

N in leachate from different treatments

Total dissolved N (org. N + inorg. N)

Inorg.N derived from fertilizer
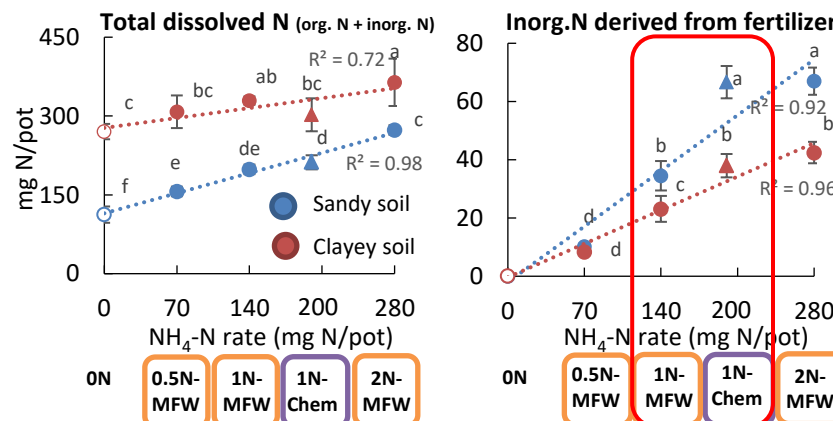
Total dissolved N leaching: CL > SL.

Inorg. N fertilizer leaching: SL> CL;
1N-Chem > 1N-MFW.

CONCLUSIONS

- Higher clay content in clayey soil enhanced N retention, increasing N uptake by the plant, and reducing the leaching of N compared to sandy soil.

- 1N-MFW and 2N-MFW are recommended in rice cultivation for clayey and sandy soil, respectively.
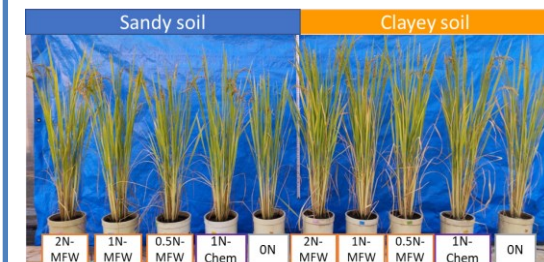
The fate of N derived from inorg.N_fertilizer in treatments

Soil	Fer.	Ndffi (%)		
		plant	leachate	soil
SL	0N	-	-	-
	1N-Chem	32 [b]	33 [a]	10 [cd]
	0.5N-MFW	25 [cd]	14 [cd]	10 [cd]
	1N-MFW	22 [d]	23 [b]	9 [d]
	2N-MFW	24 [cd]	23 [b]	8 [d]
CL	0N	-	-	-
	1N-Chem	41 [a]	19 [bc]	17 [a]
	0.5N-MFW	28 [c]	12 [d]	16 [a]
	1N-MFW	25 [cd]	16 [cd]	13 [b]
	2N-MFW	26 [cd]	15 [cd]	11 [bc]

Genetic diversity of Phaeanthus vietnamensis Ban evaluated by RAPD and ISSR markers

Authors: Ngo Vu Bao Tran 1*, LHT Diem Suong 2*, Nguyen Minh Ly 3* and Mai Xuan Cuong 4**

* Department of Biotechnology, Faculty of Biology & Environmental Science, University of Science & Education – The University of Danang,
** Graduate Institude of Biomedical Science, Division of Biotechnology, Chang Gung University, Taiwan

1 Introduction

Phaeanthus vietnamensis Ban is an endemic species included in the Vietnam Red Data Book; scattered in the central Vietnam: Thua Thien – Hue province, Da Nang city and Quang Nam province.

● Distribution area of *Phaeanthus vietnamensis* Ban medicinal plant in Vietnam.

The chemical compounds with biological activity in this plant

POLYPHENOL◇
ALKALOIDS◇
ESSENTIAL OILS◇

The area of natural forest decreased. Slow sexual reproduction. With the advent of new biotechnological techniques are promoted with higher accuracy, shortening the breeding cycle compared to classical breeding techniques. Scientists have carried out clonal propagation this plant, but there are still many difficulties in in vitro propagation. Determining the genetic diversity of *P. vietnamensis* Ban is essential, but there are no studies on this yet.

Application of ISSR and RAPD molecular markers to determine genetic diversity of Phaeanthus vietnamensis Ban population allows to detect polymorphisms of DNA fragments by using single primers containing random nucleotide sequences as the basis for this work. conservation, maintenance and rational use of *P. vietnamensis* Ban.

2 Method

DNA extracted with CTAB method → PCR methodology → Agarose gel electrophoresis → Data processing method
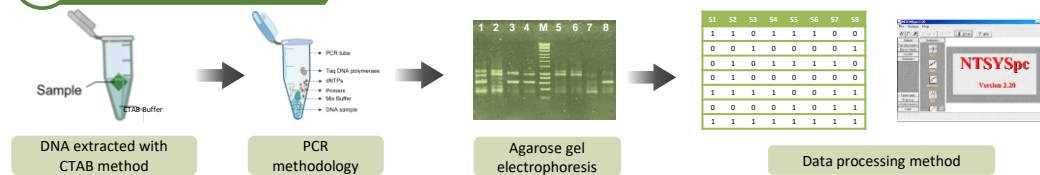
3 Results

Efficacy of RAPD and ISSR primers in genetic diversity assessment

Number	Primer names	ISSR markers					
		Band	Number of loci detected	Monomorphic loci	Polymorphic loci	PPB (%)	PIC
6	ISSR51	129	16	0	16	100	0.32
7	ISSR59	156	22	1	21	95.4	0.29
8	ISSR64	130	24	0	24	100	0.26
Total		415	62	1			
Medium / ISSR primers		138.3	20.6		20.3	98.5	0.29
Band total (RAPD + ISSR) markers		1191	187	2	185		
Medium / (RAPD + ISSR) primers		94.5	22.8		137.6	98.9	0.28

Tree diagram of the individuals of upper study amplified

Fig 1. RAPD primers

Fig 2. ISSR primers

Fig 3. RAPD & ISSR primers
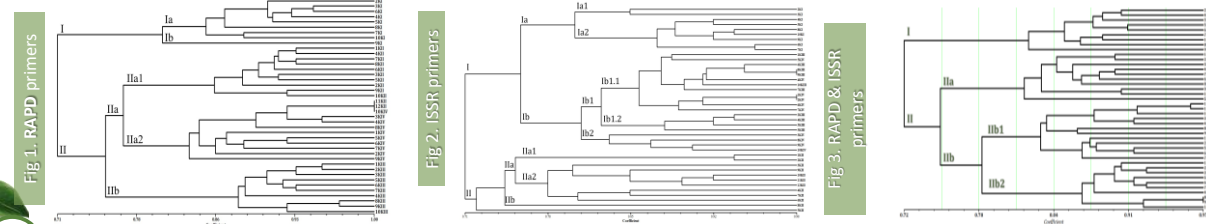
4 Discussion

❖ Polymorphism study based on RAPD and ISSR markers by statistical genetic diversity coefficients based on high PIC index (average 0.26 for RAPD marker and 0.29 for ISSR marker).

❖ The results of the genetic tree analysis showed great diversity among individuals in the population. The cause may be due to the variation in the reproductive process, leading to the difference in genetic characteristics between plants of the same origin. With the ISSR primer, plants of different ages were located almost in distinct groups.

❖ The results of analyzing the genetic chart of the P. vietnamensis Ban population based on RAPD and ISSR markers showed that the 4 ages belonging to the population could be classified into 4 distinct groups. Compared with RAPD and association histograms, the ISSR histogram separating individuals is not as clear.

❖ The more markers used, the more effective the assessment of genetic diversity.

How vulnerable the coconut industry is to pest infestation? : A Multivariate Forecasting of Copra Prices in the Philippines

Jonathan Camilo S. Rosales*, Veronica I. Castillo*, Luisito C. Abueg*, and Amelia L. Bello*

* Department of Economics, College of Economics and Management, University of the Philippines Los Baños

Background

- Coconut industry is highly vulnerable to natural hazards such as pest infestation.

- From the year 2010 to 2014, the 'cocolisap' infestation severely affected the coconut industry.

- Price forecasting would guide farmers and policymakers in maintaining stability in the coconut market.

- This study attempts to identify whether natural hazards such as cocolisap pest infestation affects the domestic price of copra in the Philippines.

Methodology
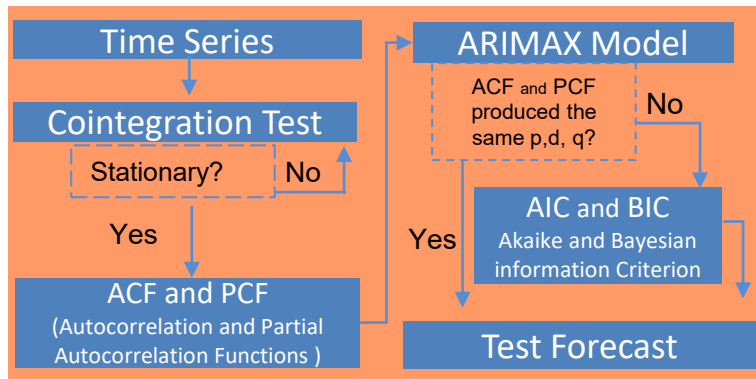
Figiure 1. ARIMAX Model Flowchart

- This study used 2010-2020 monthly time-series data on domestic copra prices, and other factors affecting copra prices (United Coconut Association of the Philippines Inc., and Exchange Rates UK)

- The model mainly aims incorporates shock dummy variables, including 'cocolisap' infestation.

- ARIMA incorporates the own lagged or autoregressive values AR, the differencing process I, that makes the variables stationary denotes, and moving average values of the error terms MA in a time-series model.

Results and Discussion

- Cocolisap infestation (-) negatively affects the after-mill gate prices of copra.

- There is a lagged effect between policy pronouncement and the effect on the price. Partly due to implementation and the effects being realized on the next harvest.

Table 1. Copra Price Forecasting Regression Results

	Coefficient
Copra Exports	-0.00002[ns] (0.00005)
Covid19	1.5541[ns] (7.117)
Exchange Rate	-1.16* (0.629)
Cocolisap	**-12.73*** (3.275)**
Palm Kernel Oil Price	0.0102*** (0.02)
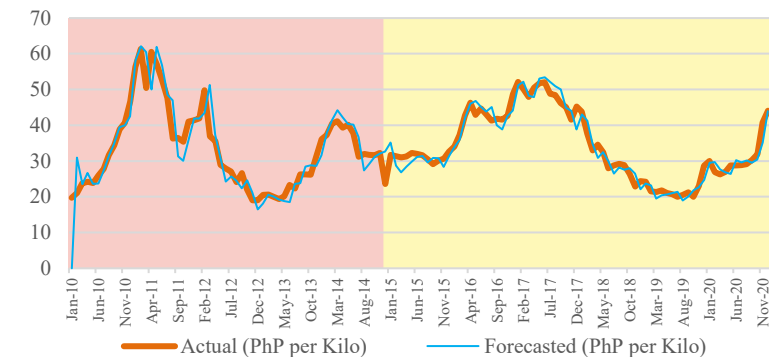
Figure 2. Actual and Forecasted Domestic Price of Copra

The results of the study point toward reorienting efforts in securing a consistent supply amidst pest infestation.

Microplastic Sources in The Atmosphere and their Relation to Human Health: A Review

Luthfi Aditya P*, Annida Fauziyyatul A*, Rizki Nur A*, Akmal Hisyam N*, Maria Venita DL*, Ana Turyanti*

* Department of Geophysics and Meteorology, IPB University, Bogor, Indonesia

Introduction

- Existing plastic waste can be decomposed into very small sizes (5 mm - 100 nm) or referred to as **microplastics (MPs)**[1]
- **Microplastics (MPs)** that comes after the decomposition of plastic product has become a problem that concern the whole because it's negative impact[2]
- It is necessary to understand the sources of **MPs** pollutant in the atmosphere, considering that **MPs** particles in the air are very easily inhaled by humans

Objectives

- To identify the sources of **microplastic (MPs)** pollutants in the atmosphere and their impact on human health

Source of MPs in the Atmosphere

- The polymer components that dominate the atmosphere are:
  a. *Polyethylene terephthalate (PET)*
  b. *Polypropylene* (PP)
  c. *Polyethylene* (PE)
  d. *Polystyrene (PS)*[5]

Fig 2. *The different plastic types Illustration*

- The main source of **MPs** in the atmosphere can be made possible from ***textile clothing*** produced by mechanical abrasion and damage to textile clothing or the like such as pillows, blankets, and curtains[6]
- In addition to synthetic textiles, MPs in the air can also come from: ***degradation of large plastics, waste in landfills or incineration, industrial emissions, particles released from traffic, dust re-suspension, and wind transport***[5]

Methods

The method used is a Literature Review with several criteria such as:
- **keywords** on search ("*sources of microplastics in the atmosphere*" & "*the impact of microplastics on humans*"),
- **Years** of journal publication (2015 – now)
- **Scopus** indexed journal (Q1)
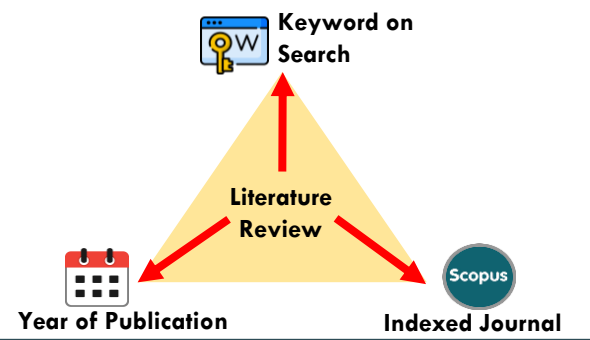
MPs Transport
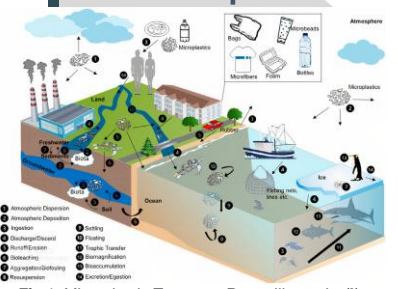
Fig 1. *Microplastic Transport Route Illustration*[3]

Transport of MPs in the air is influenced by several factors originating from human exposure, including: *vertical pollution concentration gradient, wind velocity, wind direction, precipitation, temperature*[4]

Impact of MPs on Human Health

- **MPs** that are deposited and transported in the atmosphere if they fall through the rain will have an impact on **biota** and **the environment**, **including humans**[7]
- **MPs** in the air will be inhaled by humans and cause health problems such as:
  a. lung cancer,
  b. immediate bronchial reactions (asthma-like),
  c. diffuse interstitial fibrosis and granulomas with fiber inclusions (extrinsic allergic alveolitis, chronic pneumonia),
  d. (chronic bronchitis), &
  e. interalveolar septa lesions (pneumothorax)[7,8]
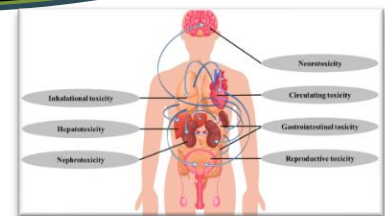
Fig 3. *Toxic effects of atmospheric microplastics on different organs and systems*[8]

Conclusion

The main source of **MPs** in the atmosphere can be made possible from textile clothing produced, other sources come from the use of goods made of plastic both as wrappers and human daily supplies. MPs in the air will be inhaled by humans and cause health problems especially respiratory and cardiovascular tract. *(Full reference can be accessed at https://ipb.link/mps-kyotosymp-ref)*

Participatory varietal selection (PVS) of the soybean improved lines for year-round soybean production in the northeast Thailand

Pisuttibhum Haisirikul *, Tidarat Monkham *, Sanit Lodthong *, Sompong Chankaew *, and Jirawat Sanitchon *

* Department of Agronomy, Faculty of Agriculture, Khon Kaen University

Introduction

Thailand's major soybean production area lies in the northern region, followed by the northeast and central areas. In past years, soybean cropping systems across Thailand involved the alternate transfer of soybean seeds in the rainy season in upland areas of the north and the dry season in the lowland paddy fields of the north, central and northeast regions (after rice harvesting).

The limited number of recommended soybean varieties is a major constraint in promoting soybean production for a particular area. Two soybean breeding lines, 35*SJ-32 and 223*LH-85 were identified as new soybean varieties with wide adaptability in a duo-environment of soybean production in the northeast region of Thailand with average grain yield across 10 environments (from 2016 to 2019) approximately 1,943 and 1,942 kg/ha, respectively which higher than in commercial varieties, CM60 (1,705 kg/ha) and SJ5 (1,542 kg/ha). Those genotypes may be grown within a rotational cropping system in a duo-environment (wet and dry season) of soybean production in Thailand's northeast region (Sritongtae et al., 2021).

Fig 1 Famer planting soybean in paddy filed with direct seeding and seed broadcasting in Northeast Thailand
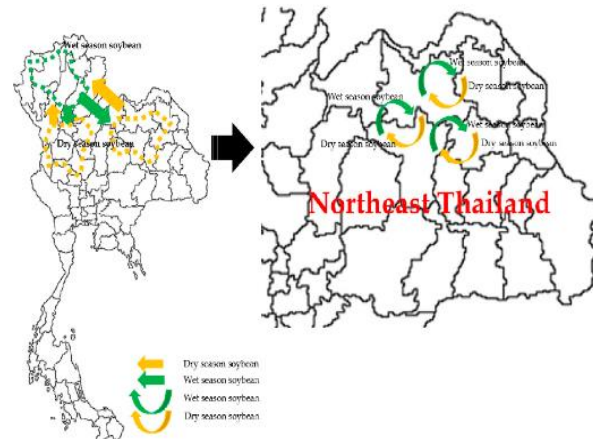
Fig 2 Duo-locations of soybean cropping production areas among national regions (left) and within Northeast Thailand

Sritongtae et al, (2021)

Methodology

This research activity was conducted on farmer filed. The Two soybean breeding lines 223* LH-85 and 35*SJ-32 together with CM60 and SJ5 varieties were planted in the farmer field during the rainy and dry growing season in 2019 to 2021 at Udon Thani and Khon Kaen Provinces under farmer practice. The PVS activity was conducted at the harvesting stage (R7-R8). A Focus group of 20 - 30 experienced soybean growers Was invited to participate in the selection. Farmers were asked to put a score of preference which was categorized into three levels for each varieties/lines as well as asked for the reason for score marking. The preferred scores were divided into very satisfied, moderately satisfied, and unsatisfied, along with farmers interviewed for their reason.

Fig 3 Participatory varietal selection (PVS) activity at Udon Thani and Khon Kaen Provinces.

Result and discussion

As a result of this activity, soybean promising line **35*SJ-32** showed high performance for this PVS followed by 223*LH-85, SJ5, and CM60. The results supported lines 35*SJ32 to be claimed as promising lines for further plant variety registration and extension to farmers.

223* LH-85   35*SJ-32

Fig 4 Plant type of two soybean promising lines

Fig 5 Fresh and dry pod of 35*SJ-32

Public Opinion in Planning Documents: Making the Case for an Institutional Assimilation of Social Sustainability

Noussayba Rahmouni*, Izuru Saizen*

*Graduate School of Global Environmental Studies, Kyoto University

Background

"Moroccans want everything [schools, hospitals, roads, etc.], but not on their property." (interview, 2022)

Main observation:
- Uneffective public participation;
- Deliberate withdrawal of residents from urban decion-making for the public interest.
- Poor consideration of social sustainibility in planning documents.

Methodology

- **Policy Analysis**, namely planning documents.
- **Interviews** with historian academics, planners and politicians.

Results

- The **precolonial link** between people and the urban through informal institutions was **severed**.
- The colonial territorial governance structure has been **adopted by local actors** and continues to guide development.
- The productive conditions of colonialism as a critical juncture in the history of planning in Morocco continue to reproduce a constraining path for urban development from which **people are inherently excluded**.

Discussion

An institutionalist analysis of the history of territorial planning in Morocco showing the evolution of the link between people and the territory.

Aleniation of public opinion as planning is institutionalized as a state practice.

Establishment of a state urban policies implemented through state led planning documents.

Limited non-institutional reforms. Continuity of colonial urban laws of centralisation and alienation.

Territorial Divisions

«Useful» Morocco	«Useless» Morocco
Civil Regions	Military Regions
Circonscription	Cercles
Annexe	Annexe
Poste	Poste

Regions	
Urban	Rural
Prefectures	Provinces
Municipalities	Municipalities
Arrondissements	

Urban governance

Regulated by central and local informal urban institutions.

- Urban planning as the main state policy.
- Marginalisation of orginal urban institutions and Creation of «modern» ones.

- Institution of «modern» formal territorial administrations.
- Duality of control between the elected council and the appointed oficials.

Political Link

1912   1956

Non-Territorial	Protectorate institution	Territorial	Independence	Territorial
Sultan as the governor of people, not land.		Territorial divisions to rule people through territories.		

STUDY ON THE ECOLOGICAL CHARACTERISTICS AND CHEMICAL COMPOSITIONS OF *JASMINUM SUBTRIPLINERVE* BLUME. IN CENTRAL VIETNAM

Authors: Nguyen Duy Ngoc Tan*, Nguyen Ho Lam* and Hitoshi Shinjo**
* University of Agriculture and Forestry, Hue University ** Graduate School of Global Environmental Studies, Kyoto University

INTRODUCTION

Jasminum subtriplinerve Blume. (JSP), belongs to the family of Jasmine (Oleaceae). JSP is one of the valuable non-timber forest products from nature. The herbal JSP has a slightly bitter, acrid taste, non-toxic. The plant can live and adapt well in many different topography types and ecological regions. However, so far, studies on these aspects in the Central Vietnam are very limited. In particular, the analysis of the relationships between the distribution and chemical compositions has not been studied. Therefore, the recommendation on the planting area of the JSP to ensure the growth, development and chemical composition has not been implemented.

Fig. 1. Jasminum subtriplinerve plant

METHODOLOGY

+ Climate data: collect from http://www.worldclim.org/ with a resolution of 1.0 km^2.

+ Soil samples analyzing: At each site, soil samples are taken at depth of 0-25 cm to analyze the physical and chemical properties of the soil.

+ Analyzing chemical compositions: At each site, about 2.0 kg of fresh plant of JSP was collected. *Analyzing methods:* The chemical compositions are analyzed at Center Pharmaceutical Research Institute, Vietnam.

+ Analyzing the relationships Pearson correlation was applied for analyzing the relationships between soil, ecological characteristics and chemical compositions

RESULTS

Chemical compositions

The average total flavonoid content was 2.84 (*Tab.1*), in which the highest site was QT-HU (6.15) and the lowest was at HP-QT (1.04). The average acteoside content was 0.12, in which the highest site at QT-HU (0.31) was lowest at BS-QN and CN-QT (0.06).

Soil properties

The pH (KCl) at the sampling sites ranges from ranges from 4.29 - 6.65 (*Tab.1*), the soil is mainly acidic. N total average at both depths is 0.07 %. The site with the highest total N was CN-QT (0.13 %). The BS-QN site had the lowest total N concentration (0.02%).

Table 2: Analysis results of Pearson correlation (0-25 cm)

Items (%)	pH$_{Kd}$	Total N (%)	Total P (%)	Total K (%)
Total Flavonoid	-0.054	0.199	0.054	-0.603
Extractable substance	-0.044	-0.322	-0.465	-0.460
Acteoside	-0.511	-0.168	-0.144	-0.311

Note: No significant correlations were found.

The correlations between soil properties & chemical composition

The results (*Tab.2*) showed that there was no significant correlation with soil properties and chemical composition. On the other hand, the correlation between chemical composition and geographical altitude, rainfall, and average annual temperature did not also have a significant correlation.

DISCUSSION

In Central VietNam, JSP mainly grow and develop in the plains and midlands from an altitude of less than 200m, yearly rainfall of 2000-2600 mm, average temperature of 25-26°C. The main types of soil are mainly in Clay and Loamy sand. Among soil types, the chemical composition of JSP is highest on degraded gray soil and grows well under the forest canopy. This study has determined that the chemical composition is not strongly correlated with soil. Thus, there may be ecological factors soil affecting the chemical composition. The study of these factors need further study.

Table 1: Studied site information, Topography, climate, Physico-chemical soil properties, Chemical compositions

CODE	* Place name	Topography and climate			Physico-chemical soil properties (%) ***						Chemical compositions (%)		
		Elevation	Total rainfall	Average Temp	** Soil clasification	pH$_{Kd}$	Total N	Total P	Total K	Humidity	Total Flavonoid	Extractable substance	Acteoside
BS-QN	Binh Sa, Thang Binh, QN	3	1977	26.1	Sand	6.05	0.02	0.04	0.02	9,39	2,26	22,22	0,06
BP-QN	Binh Phu, Thang Binh, QN	29	1970	25.1	Clay	4.47	0.1	0.04	0.1	7,73	2,73	16,16	0,14
CN-QT	Cam Nghia, Cam Lo, QT	145	2184	25.0	Clay	4.89	0.13	0.06	0.13	7,58	1,34	14,55	0,06
HP-QT	Hai Phu, Hai Lang, QT	18	2378	25.5	LS	4.35	0.05	0.47	0.05	8,04	1,04	15,23	0,07
HV-HU	Huong Van, Huong Tra, TTH	8	2566	25.5	SCL	6.65	0.08	0.06	0.08	8,80	2,51	17,44	0,08
XL-HU	Xuan Loc, Phu Loc, TTH	11	2548	25.8	LS	4.39	0.05	0.02	0.05	10,63	2,46	25,89	0,18
QT-HU	Quang Thai, Quang Dien, TTH	7	2546	25.4	Sand	5.01	0.03	0.05	0.03	9,30	6,15	25,74	0,31
HH-HU	Hong Ha, A Luoi, TTH	63	2347	25.4	CL	4.49	0.09	0.02	0.09	8,46	4,39	23,18	0,09
VN-QB	Van Ninh, Quang Ninh, QB	11	2165	25.6	SCL	4.29	0.05	0.08	0.05	8,50	2,72	17,53	0,15
AVERAGE		33	2297	25.5		4.95	0.07	0.09	0.07	8.71	2.84	19.77	0.13

** QN: Quang Nam, QT: Quang Tri, TTH: Thua Thien Hue, QB: Quang Binh ; ** SCL: Sandy clay loam, LS: Loam sandy, CL: Clay loam; *** Depth of soil: 0-25 cm*

TEMPORAL DYNAMICS AND PREDICTION OF LAND USE AND LAND COVER CHANGE FOR SAIJO CITY, EHIME PREFECTURE, JAPAN, USING CA-ANN MODEL

Thanakon Sukuman[1,2], Trakarn Prapaspongsa[2], Izuru Saizen[1]

[1]Graduate School of Global Environmental Studies, Kyoto University [2]Department of Civil and Environmental Engineering, Faculty of Engineering, Mahidol University

1. Background

Human activity, city planning **policy**, and **population** are **important drivers** of change on the **earth's land cover**. This study investigated the LULC change of Saijo City, which has been influenced by continuous **population decline**, the change of land use **regulations**, and **socioeconomic** transformation

2. Methodology

- Remote sensing and geographical information system
- ArcGIS: **Supervised Classification** of LULC (Land Use/Land Cover)
- QGIS: **MOLUSCLE** Plugin:
  - **Cellular Automata-Artificial Neural Networks**
  - LULC data from **1990-2020**
  - **Explanatory** spatial variables
  - **Validation** of simulated map with actual map in 2020
- **Analyse** and **predict** LULC trend (**Fig.1**)
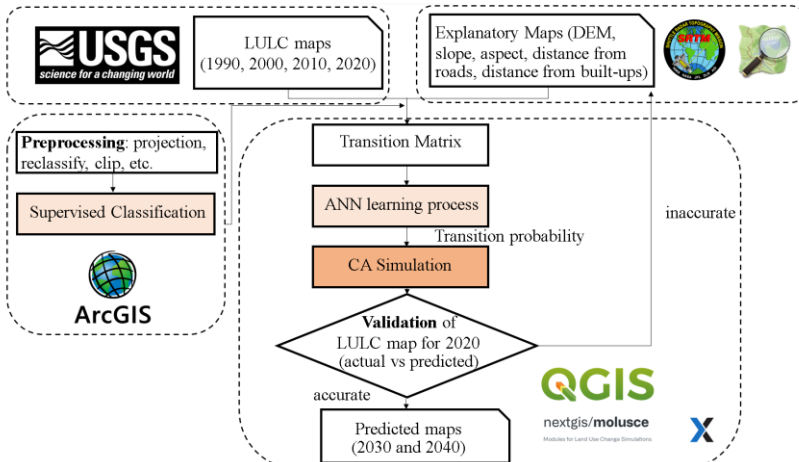
Fig. 1 Research methodological framework

3. Results & Discussions

- **Built-up** is a significant **driver** of LULC change
- From **1990-2020**, **barren land** category has the largest rate of change to other LULC types with a **decline** of **16.9 km^2**
  - A significant **increase** of **forest** area with **10.2 km^2** which **replaces** the **barren** area.
- Future projection of **2030** and **2040** reveals
  - A steady **increasing** trend of **crop land**
  - A slight **decrease** in **forest** area
  - A **static** change of **built-up** area (**Fig.2 & 3**)
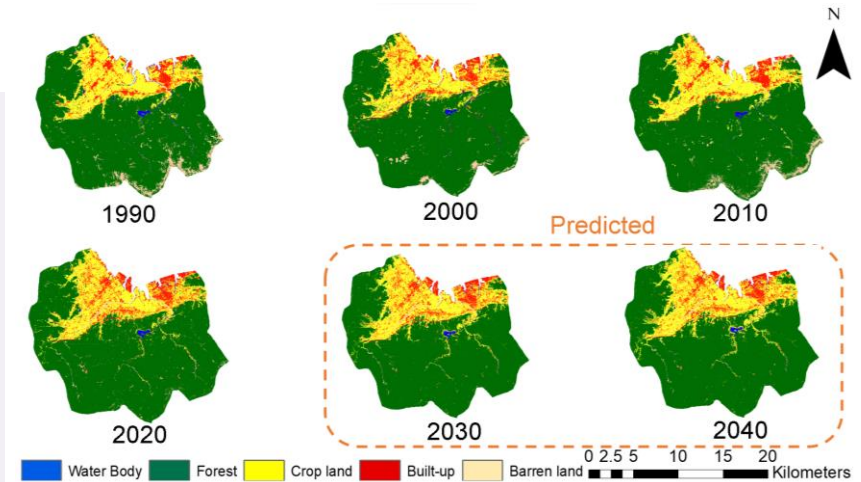
Fig. 2 LULC maps over 1990-2040
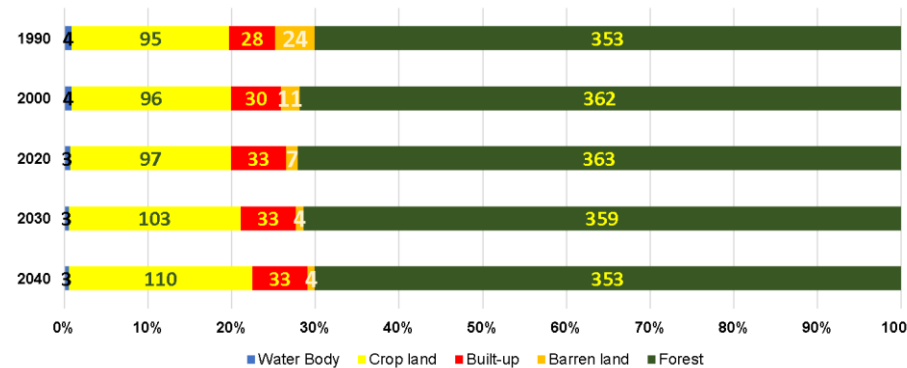
Fig. 3 LULC share (%) and area (km^2) over 1990-2040

- The **replacement** of **barren land** with **forest** reflects a **shift of occupation** of Saijo residents due to increasing lumber **imports**
- The **projected** increase of **crop land** is a positive sign for the **future** of Saijo agricultural sector
- The **decreasing** trend for **forest** area may raise a concern in natural **resource conservation**
- The **stagnant expansion** of **built-up** areas represents the characteristics of **rural area** and **saturated development** of Saijo economics.

THE IMPORTANCE OF SEA TOLL CONNECTIVITY TO SUPPORT
REGIONAL ECONOMIC DEVELOPMENT IN THE MALUKU ARCHIPELAGO AREA, INDONESIA

Authors: Nur Hidayah Djaimin*, Izuru Saizen *

* Graduate School of Global Environmental Studies, Kyoto University

1. Background

- Sea toll program in Indonesia was firstly implemented in 2015 with 6 routes, in 2022 there are 33 sea toll trajectory, 6 routes in the Maluku Islands
- Maluku is an archipelago province located in east Indonesia with 1340 islands → connectivity between islands is important to support economic growth and reduce the price disparities between western and eastern Indonesia

HOW MUCH THE CONNECTIVITY BETWEEN ISLANDS?
WHY SEA TOLL IS IMPORTANT FOR ARCHIPELAGO AREA?
DOES IT AFFECT THE PRICE?

2. Methodology

1. Graph Theory for degree of connectivity was used to measure the level of connectivity between islands based on data from marine and sea transportation network from pioneer ships line → mapping the spatial distribution using QGIS
2. Regional *GDP (gross domestic product)* in sub-sector marine and ferry transportation was used to measure the percentage of contribution for the Regional Economic Growth in each area.
3. Compare the basic price before and after the implementation of sea toll and why it is important by using literature review.

3. Result & Discussion

TABLE 1. MATRIX OF DIRECT PIONEER SHIPS NETWORK CONNECTIVITY

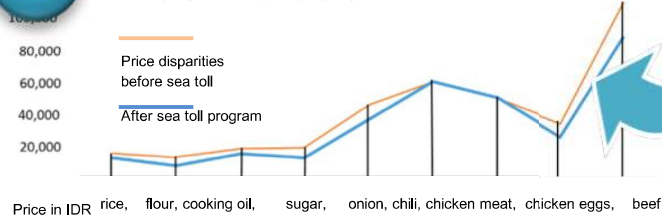| No	PORTS IN EACH CITIES/ REGENCIES	1	2	3	4	5	6	7	8	9	10	11	Aij
1	AMBON	0	1	0	1	1	1	1	0	0	1	1	7
2	TUAL	1	0	1	1	1	1	0	1	1	1	0	8
3	ARU	0	1	0	0	0	0	0	0	0	1	0	2
4	BURU	1	1	0	0	0	1	0	0	0	0	0	3
5	CENTRAL MALUKU	1	1	0	0	0	1	0	0	1	1	1	6
6	EAST SERAM	1	1	0	0	1	0	0	0	0	0	0	3
7	SOUTH BURU	1	0	0	1	0	0	0	0	0	1	0	3
8	SOUTHEAST MALUKU	0	1	0	0	0	0	0	0	0	0	0	1
9	SOUTHWEST MALUKU	0	1	0	0	1	0	0	0	0	1	0	3
10	TANIMBAR ISLANDS	1	1	1	0	1	0	1	0	1	0	0	5
11	WEST SERAM	1	0	0	0	1	0	0	0	0	0	0	2
	Aij	7	8	2	3	6	3	2	1	3	5	2	42

Deg (i) : Connectivity index in port i , A_{ij} : Adjacency matrix (i and j), A_{ji}: Adjacency matrix (j and i), A_{ij} = 1 if port I is connected to port j, and 0 otherwise

$$Deg(i) = \sum_j \frac{A_{ij} + A_{ji}}{2}$$

Tovar et al.2015. "Container port competitiveness and connectivity: The Canary Islands main ports case"

FIGURE 3. CONTRIBUTION OF SUB-SECTOR MARINE AND FERRY TRANSPORTATION TO THE GDP TRANSPORTATION SECTOR

Price disparities before sea toll

After sea toll program

Price in IDR   rice,   flour, cooking oil,   sugar,   onion, chili, chicken meat,   chicken eggs,   beef

1 USD = IDR 15,570.55 (28 Oct 2022)

data from : Iqbal, Nur Hasan, et al (2020) Sea Transportation Journal Vol. 22 (2020) 1–12

#After sea toll program, there is an expansion of the sea transportation network in the hinterland area for loading and unloading of goods in cargo vessels, it also affects the market price

FIGURE 1. CONTRIBUTION OF SUB-SECTOR MARINE AND FERRY TRANSPORTATION TO THE GDP TRANSPORTATION SECTOR

■ Sub-Sector Marine Transportation   ■ River, Lake,and Ferry Transport

	2017	2018	2019	2020	2021
Marine	18%	18%	18%	18%	17%
Ferry	10%	10%	10%	9%	9%
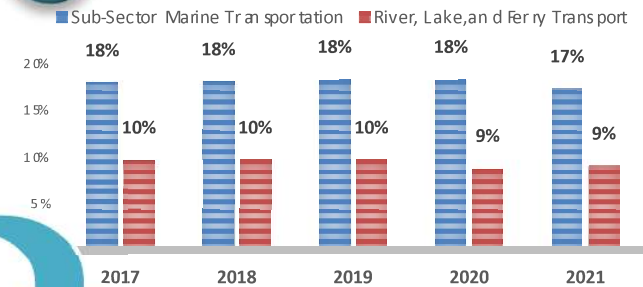
FIGURE 2. DEGREE OF CONNECTIVITY IN EACH AREA BASED ON THE GRAPH THEORY OF TRANSPORTATION

High :> 0,80
Medium : 0,44 – 0,80
Low : <0,44

.... Before toll program
——— After toll program

📍 Integrated port after toll program

🔴 Index connectivity
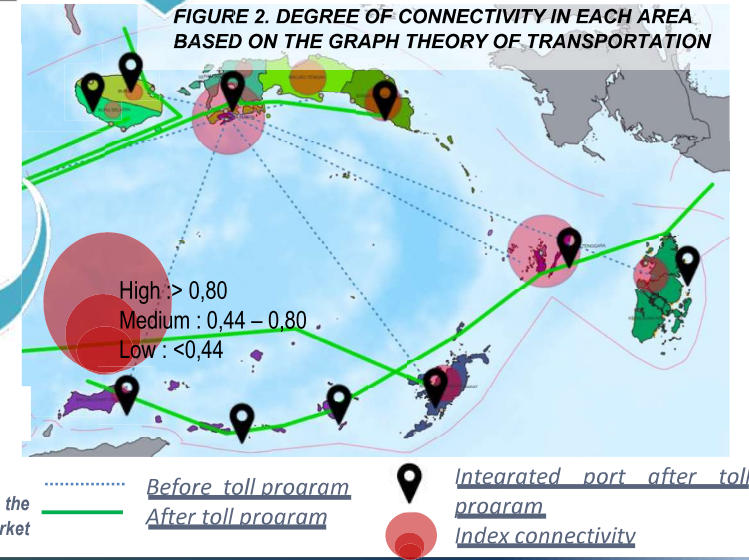
Ultramafic forests soil properties and soil organic carbon sequestration potential

Jenielyn T. Padrones*, Marizajiell Galang**, Ma. Ellenita G. De Castro***, and Nelson M. Pampolina***

*Institute of Renewable Natural Resources, College of Forestry and Natural Resources, University of the Philippines (CFNR,UPLB), Los Baños, Philippines; **CFNR,UPLB; ***Forest Biological Sciences, CFNR,UPLB

Introduction

Study area

- ❖ Soils are the world's largest carbon storage.
- ❖ The potential of the overlying soil in ultramafic forests in sequestering carbon has not been studied in details.
- ❖ Study areas:
  - ◉ Rio Tuba, Bataraza (Early Cretaceous ophiolite)
  - ◉ Sitio Magarwak Puerto Princesa (Late Eocene ophiolite)

Methods

Soil physical properties:
1. Soil texture determination- Hydrometer meter
2. Soil bulk density and particle density measurement

Soil Organic Carbon/ Organic Matter content (SOC/SOM) - Walkley-Black method
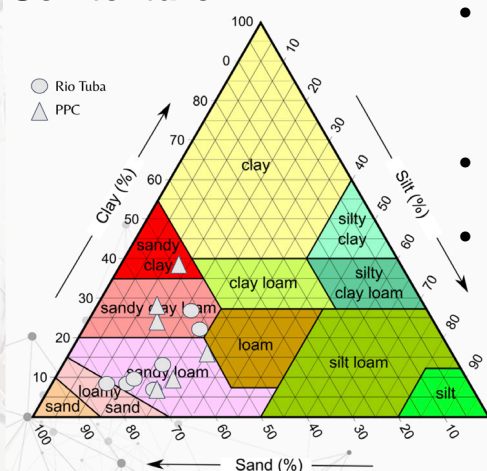

1. texture   **2. BD and PD**   **SOC/SOM**

R&D cont.

Results and Discussion

Densities and Porosity

Soil Layer	Sample Code	PD	BD	Soil Porosity
Topsoil	RTN-Plot 1-RZ2	2.56	0.88	65.68
	RTN-Plot 2-RZ1	2.86	0.66	76.86
	RTN-Plot 2-RZ2	2.86	0.66	76.86
	RTN-Plot 5-RZ1	3.03	0.97	68.00
	PPC Plot 1 S 0-20	3.23	1.21	62.36
	PPC Plot 2 S 0-20	2.38	0.91	61.88
	PPC Plot 3 S 0-20	2.33	0.81	65.22
	PPC Plot 4 S 0-20	3.13	1.03	67.11
	PPC Plot 5 S 0-20	2.38	0.93	60.77
Subsoil	RTN Plot 2 S 21-50	3.13	1.16	63.04
	RTN Plot 3 S 21-50	3.13	1.06	66.04
	RTN Plot 4 S 21-50	3.23	1.11	65.49
	PPC Plot 4 S 21-40	2.94	1.01	65.64

- higher PD values reflect heavy minerals content (i.e. magnetite)

PD = Particle density, BD= Bulk Density

Soil texture

○ Rio Tuba
△ PPC

- Textural classes are mainly composed of either sandy loam or sandy clay loam
- Topsoil samples have >20% clay.
- One of the key elements influencing soil carbon sequestration is clay soil texture, as clay content affects how well soils sequester carbon (Goncalves et al., 2017 and references therein).

SOC/SOM

Soil Layer	Sample Code	%OC	%OM
Topsoil	RTN-Plot 1-RZ2	7.32	12.59
	RTN-Plot 2-RZ1	5.07	8.72
	RTN-Plot 2-RZ2	7.02	12.08
	RTN-Plot 5-RZ1	8.32	14.30
	PPC Plot 1 S 0-20	4.44	7.63
	PPC Plot 2 S 0-20	5.93	10.21
	PPC Plot 3 S 0-20	6.40	11.01
	PPC Plot 4 S 0-20	5.53	9.52
	PPC Plot 5 S 0-20	6.06	10.43
Subsoil	RTN Plot 2 S 21-50	4.44	7.64
	RTN Plot 3 S 21-50	4.44	7.63
	RTN Plot 4 S 21-50	3.65	6.28
	PPC Plot 4 S 21-40	4.38	7.53
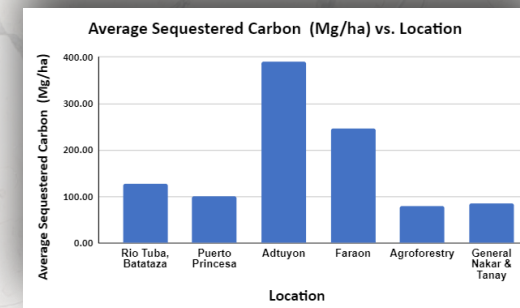
- **Total SOC for PPC:**
  - Topsoil: 111.02 Mg/ha
  - Subsoil: 88.46 Mg/ha
- **Total SOC for Rio Tuba:**
- **higher stored SOC**
  - Topsoil: 113.30 Mg/ha
  - Subsoil: 140.41 Mg/ha

Average Sequestered Carbon (Mg/ha) vs. Location

SOC in the study areas are relatively higher compared values of sequestered CO_2 from gathered data to different related studies and researches (Lasco et al., 2017; Dela Cruz, 2010; Salang, 2010).

Understanding the relationship between snowcover and water scarcity in villages of Ladakh, India

Authors: Kumar Tusharkanti*, Izuru Saizen*

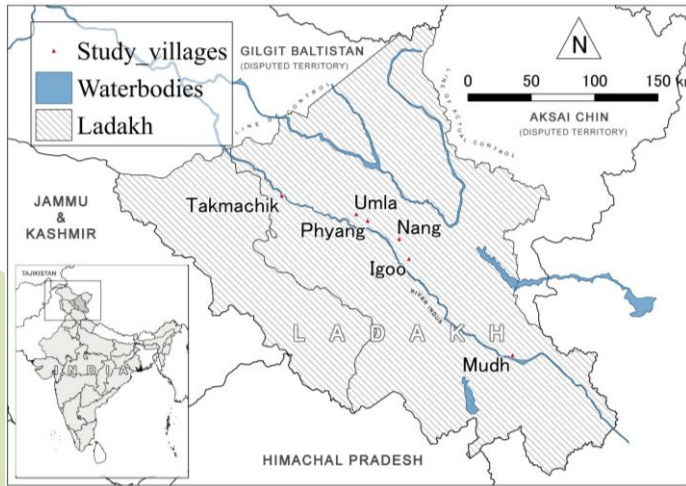* Graduate School of Global Environmental Studies, Kyoto University

Fig. 1: Map of ladakh showing location of study villages

1 *Study area and issues:* **Ladakh** is a high mountain cold desert region in Northern India; Availability of water in villages is scarce & depends upon amount of winter snowfall.

- Owing to their topography, the amount of snowfall received varies for each village and this affects their water availability.

3 *Methodology:*

1. Six villages were identified → their watershed boundaries were marked using DEM data on QGIS.
2. Two field study conducted in Oct-Nov 2021 and June-July 2022.
3. Google Earth Engine →snowcover maps & time series data were generated (Oct 2021-Oct 2022).
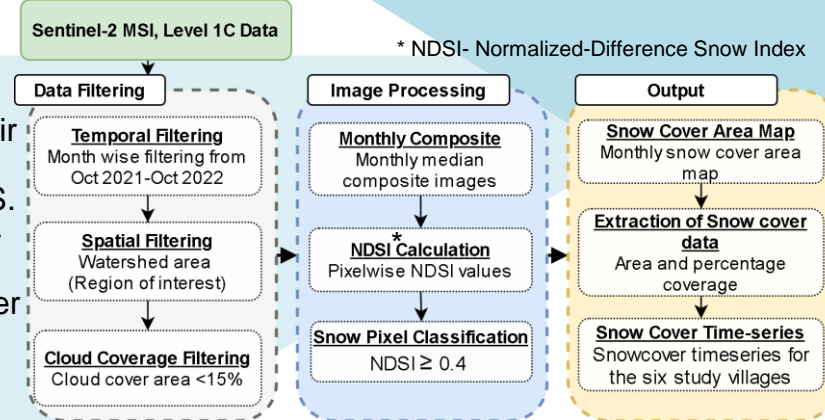
* NDSI- Normalized-Difference Snow Index

Fig. 2: Process flowchart followed on Google Earth Engine

2 *Objective: To understand the change in snow cover of the watersheds in relation to the water availability in corresponding villages*

Snowcover Area Time Series Chart

Fig. 4: Time-series chart for the six study villages

Legend: Takmachik, Umla, Phyang, Nang, Igoo, Mudh

4 *Results:*

SNOW — Month: Oct 2021 snow cover: 23%
SNOW — Month: Dec 2021 snow cover: 39%
SNOW — Month: Feb 2022 snow cover: 74%
SNOW — Month: Apr 2022 snow cover: 35%
SNOW — Month: Jun 2022 snow cover: 09%
SNOW — Month: Aug 2022 snow cover: 01%
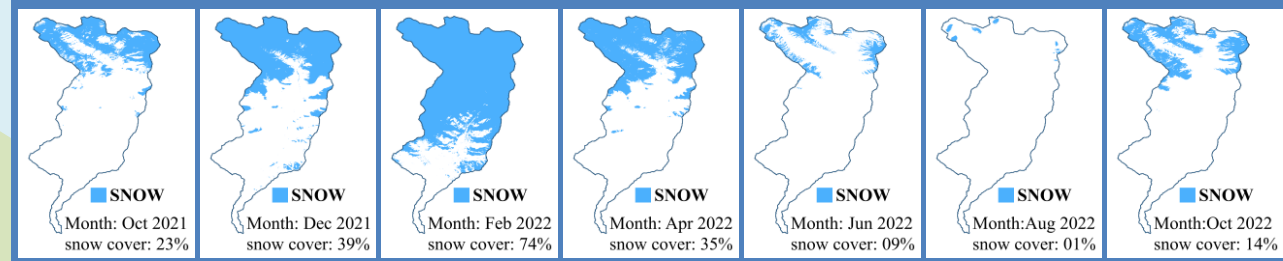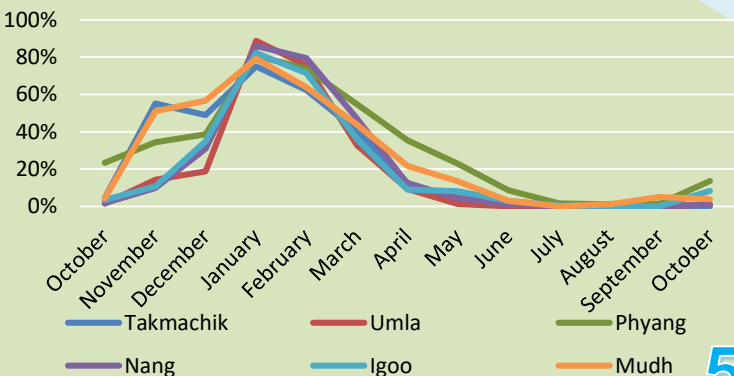SNOW — Month: Oct 2022 snow cover: 14%

Fig. 3: Example for snowcover maps generated for Phyang village

1. Snowcover time-series show that village Phyang retains snow cover for a longer period
2. Field survey results also show that Phyang has better water availability compared to other study villages

5 *Future work: A longer time series can be used to explain the water scarcity in the villages.*