Kyoto University International ONLINE Symposium 2020 on Education and Research in Global Environmental Studies in Asia

POSTERS

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Poster Presentations- Science and Technology

Liquid Fuel Cell Using Polyoxometalates and Ferric Chloride as Catalyst for Conversion from Carbohydrates to Electricity

Authors: Fan Xu*, Huan Li*, Yueling Liu** and Qi Jing**

* Tsinghua Shenzhen International Graduate School, Tsinghua University

Background

Bioenergy has been recognized as a key contributor to a sustainable society because of annual great yield of biomass and biomass waste. Biomass can be converted to heat, electricity or fuels through different approaches including direct incineration, liquefaction, pyrolysis, gasification and anaerobic digestion. Compared with these conventional ways, fuel cells can convert biomass to electricity with higher energy efficiencies.

A novel liquid catalyzed fuel cell (LCFC) was also proposed with the assistance of polyoxymetalates (POMs), and it performed well in generating electricity with nature polymeric biomasses. LCFCs share a similar structure with liquid redox fuel cells, and POMs work as both homogeneous catalysts and charge carriers in catholyte and anolyte.

The conversion from biomass to electricity in a LCFC includes three main steps13. Biomass was first oxidized by a type of POM (noted as POM-I) in anolyte, and then the reduced POM-I was re-oxidized during the cell reaction between anolyte and catholyte. In catholyte, oxygen was directly supplied or another kind of POM (noted as POM-II, relatively higher electrode potential than POM-I) was used as the electron carrier between oxygen and cathode. POMs are fine catalysts for the oxidation of biomass and the hydrolysis of macromolecule organics. Moreover, unlike other fuel cells, LCFCs use POMs for homogeneous catalysis instead of loading noble metal catalysts and they are insensitive to most contaminants. The current LCFCs use POMs as catalysts, which are commonly complex, toxic and relatively expensive.

Hence, in this study, Lewis acids were introduced as co-catalysts, aiming to replace most POMs and also enhance the degradation of complex carbohydrates.

Methodology

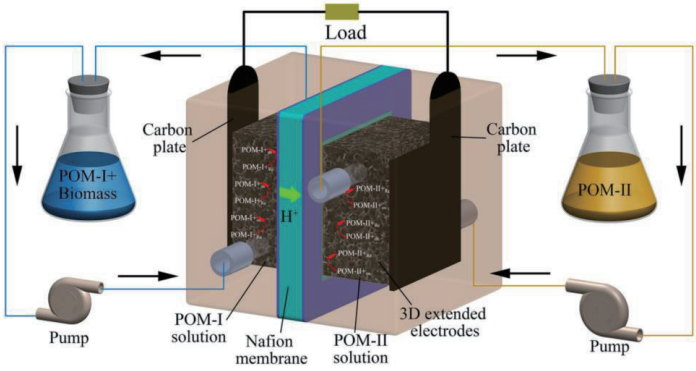
Construction and operation of LCFC. The structure of the LCFC studied herein combined some features of PEMFCs and redox flow batteries (Fig.).

The anolyte used phosphomolybdic acid ($H_3PMo_{12}O_{40}$, PMo_{12}) or phosphotungstic acid ($H_3PW_{12}O_{40}$, PW_{12}) as POM-I.

The catholyte used non-Keggin-type molybdovanadophosphoric acid ($H_{12}P_3Mo_{18}V_7O_{85}$, $P_3Mo_{18}V_7$) as POM-II.

Characterize the performance of the LCFC. Linear sweep voltammetry analysis was carried out to check the performance of the LCFC.

Measurement of biomass degradation and products. During continuous operation of the LCFC, total organic carbon (TOC) of anolyte was analyzed at intervals using a TOC.



Results and Discussion

Performance of the LCFC using POM as catalysts. The fluctuation of ambient temperature impacted the output power density of the LCFC, because higher temperatures can accelerate the redox reaction between POM-I and POM-II in the cell. The temperature for POM catalyzed reactions was usually higher than 60 ℃, and thus the oxidation of biomass was carried out in a water bath of 85-95 ℃ while the cell reaction run at ambient temperature of 23-25 ℃ in the following tests.

The addition of phosphoric acid increased the proton concentration in the anolyte and enhanced the proton transfer rate, and accordingly increased the out power density. However, when phosphoric acid concentration reached a high level of 2.0 mol/L, the further increase of phosphoric acid concentration cannot push the out power effectively. It was mainly attributed to high concentration of phosphoric acid would increase the viscosity of the solution and the corresponding internal resistance of the cell. Therefore, at most 3.0 mol/L phosphoric acid was applied to the LCFC.

Furthermore, the output power density was also improved with the increasing flow rate of anolyte, because more reduced POM-I flowed past the proton exchange membrane and the 3D extended electrode in a certain time. In fact, the maximum output power density was almost proportional to the flow rate of anolyte.

The initial concentration of glucose in the anolyte would directly determine the output power density. The elevation of the initial glucose concentration improved the output power density significantly, and the relation between glucose concentration and the maximum of output power density almost followed an apparent linear type. During the same reaction time, the reduction rates of POM-I almost kept unchanged and thus higher glucose concentration produced more reduced POM-I for the subsequent cell reaction. However, excessive high concentration would result in the precipitation of glucose, and accordingly increase the internal resistance and even obstructed the cell.

Improve LCFC by using ferric chloride to replace most POM-I. Three Lewis acids were tested including $FeCl_3$, $VOSO_4$ and $CuSO_4$. Their concentrations were all 1.00 mol/L while the concentration of PW_{12} was only 0.06 mol/L. The ion pair of Fe^{2+} and Fe^{3+} exhibited the best output power density. Moreover, $FeCl_3$ is the cheapest and easily available. Thus, $FeCl_3$ was used for the further tests.

Five conditions were analyzed including $FeCl_3$ combining PMo_{12}, $FeCl_3$ combining PW_{12}, PMo_{12}, PW_{12} and $FeCl_3$. The results verified that the replacement of POM-I by $FeCl_3$ kept the LCFC at the same level.

The improved LCFC can decompose glucose effectively. The improved LCFC can obtain the same performance with the raw LCFC only using PMo_{12} as catalyst when they utilized starch as the fuel. For cellulose, the added $FeCl_3$ increased the maximum power density of the LCFC by 57% from 0.46 to 0.72 mW/cm^2 and the open-circuit voltage by 18%. The effect of Lewis acids on starch was not exhibited, while the added $FeCl_3$ accelerated the hydrolysis of cellulose significantly. Besides that, the improved LCFC only need 20% of POM-I compared with the raw LCFC.

For practical application, the current open-circuit voltages (OCVs) were still low, possibly because the crossover of degradation products of biomass or ferric ions through Nafion membrane. To solve the problem, new types of proton exchange membrane could be applied in the future.

Complete degradation of carbohydrates. The decrease of TOC in the anolyte verified a conversion from soluble biomass (glucose or starch) to carbon dioxide that escaped to air. In 21 days, more than 93% of glucose and starch were completely decomposed in the LCFC. The redox reaction between POM-I and glucose or starch was relatively slow. From this point of view, the current density of the cell should be determined by the degradation rate of glucose or starch. Furthermore, the degradation rates of glucose and starch were almost the same, indicating the hydrolysis of starch to glucose was not the rate-limit step while the oxidation of glucose was relatively slow. Although the hydrolysis rate of cellulose was obviously slow, the hydrolysate of cellulose is also glucose and it would be also oxidized completely in the continuous LCFC.

The results showed that there was no glucose in the final anolyte, indicating that all the glucose were hydrolyzed into small molecules or oxidized completely to CO_2 and H_2O.

Ammonia-Mediated Bromate Inhibition during Ozonation Promotes the Toxicity Due to Organic Byproduct Transformation

Lu-Lin Yang*, Qian-Yuan Wu*, Ye Du*

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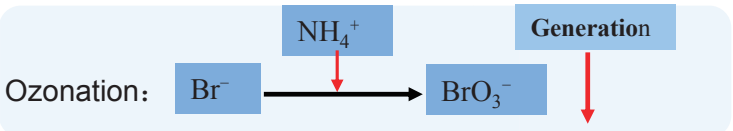
Background

- Ozonation is widely used in water treatment.
- The formation of bromate has received widespread attention during ozonation.
- Adding ammonia (NH_4^+) is often used to inhibit bromate.



Objectives

Elucidating the influence of adding NH_4^+ as a typical bromate control processes during ozonation on the formation of organic byproducts, cytotoxicity and genotoxicity.

Methodology

The ozonation treated simulated drinking water after being concentrated by solid phase extraction(SPE) was used to perform toxicity assays.

- Cell: Chinese hamster ovary cells (CHO-k1)
- Cytotoxicity evaluation method： CCK8 detection.
- Genotoxicity evaluation method ： DNA damage （pH2AX detection）

Results and discussion

Toxicities assessment

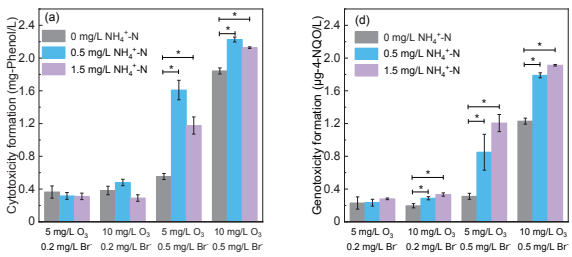


Figure 1. Influence of ammonia (NH_4^+) on (a) cytotoxicity formation and (b) genotoxicity formation of organic byproducts during ozonation in the presence of bromide

- In the presence of 0.5 mg/L of Br^-, NH_4^+ increased the cytotoxicity and genotoxicity formation significantly (p<0.05).

Byproduct Formation

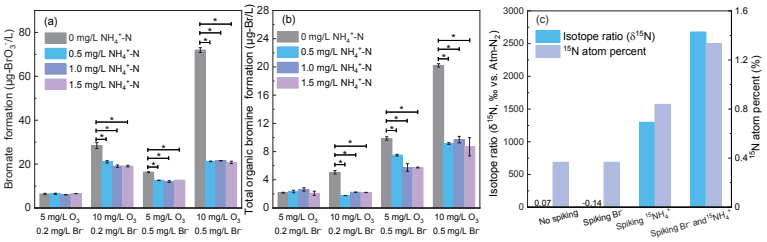


Figure 2. Influence of NH_4^+ on (a) bromate, (b) total organic bromine (TOBr) formation and (c) Isotope ratio ($\delta^{15}N$) and ^{15}N atom percentage in NOM during ozonation

- Under the conditions of more than 5 mg/L of O_3 or more than 0.2 mg/L of Br^-, adding 0.5 mg/L of NH_4^+–N significantly inhibited bromate and the TOBr formation.
- The $^{15}NH_4^+$ and Br^- increased the ^{15}N atom percentage, verifying the enhanced formation of nitrogenous byproducts in the presence of both Br^- and NH_4^+

Conclusion

- Adding NH_4^+ was effective for inhibiting bromate and TOBr formation.
- The formation of cytotoxicity and genotoxicity increased significantly during ozonation when NH_4^+ added.
- When NH_4^+ and Br^- coexisted during ozonation, the formation of brominated nitrogenous byproducts were enhanced. These byproducts might be partially responsible for the toxicity increase.

Reference

- Qian-Yuan Wu, Lu-Lin Yang et al., Ammonia-Mediated Bromate Inhibition during Ozonation Promotes the Toxicity Due to Organic Byproduct Transformation *Environmental Science & Technology* **2020** *54* (14), 8926-8937

Facile assembled N, S-codoped corn straw biochar loaded Bi_2WO_6 with the enhanced electron-rich feature for the efficient photocatalytic removal of ciprofloxacin and Cr(VI)

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Agricultural waste of corn straw produced in 2015 was almost 1.02 billion tons in china. The direct burning of agricultural wastes in countryside is now strictly forbidden in China. Preparing composite matrials using corn straw is beneficial to achieving the green treatment by reuse of agricultural wastes based on the concept "waste to resource". Biochar (BC) of corn straw is a new way of resource utilization, and has been extensively studied because of its low cost, large specific surface area, and high carbon content. N doping has recently caught the attention of researchers who try to tune the conductivity of the BC, whereas S doping is able to stimulate efficient chemical reactivity. Besides, the catalyst with N, S co-doping exhibited better photocatalytic activity when compared with those with solely N or S doping because of a synergistic effect. Herein, incorporating Bi_2WO_6 into the NSBC was conducted to build the new structure for the Bi_2WO_6/NSBC, in which the NSBC played a crucial role of transferring electrons and supporting.

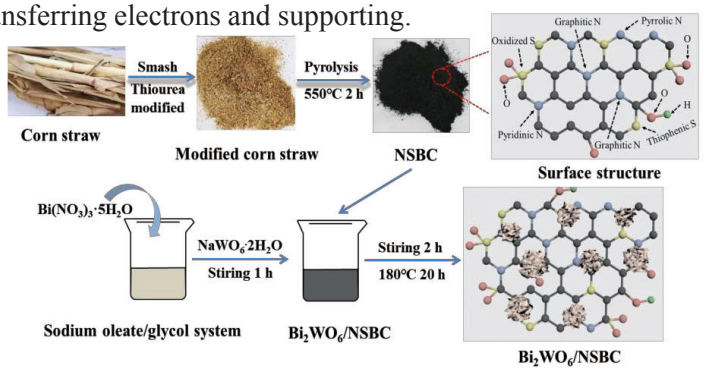

Fig. 1. Schematic representation of the fabrication of Bi_2WO_6/NSBC

The NSBC was obtained by pyrolysis. The Bi_2WO_6/NSBC was produced by solvothermal reaction after mixing the NSBC (Fig. 1).

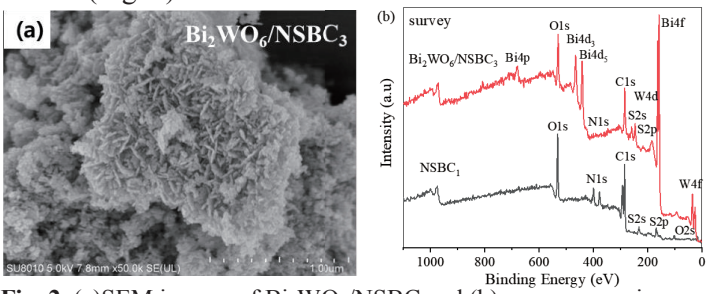

Fig. 2. (a)SEM images of Bi_2WO_6/NSBC and (b) survey scanning spectra

Flower-like particles were seen in the SEM images of the Bi_2WO_6/NSBC$_3$ (Fig. 2a), indicating that the NSBC provides more active sites for loading Bi_2WO_6 and also accelerates the transportation of photoinduced carriers. In this case, photocatalytic activity was enhanced.

With the survey scanning spectra (Fig. 2b), the presence of Bi, W, O, N, C, and S in Bi_2WO_6/NSBC$_3$ was displayed.

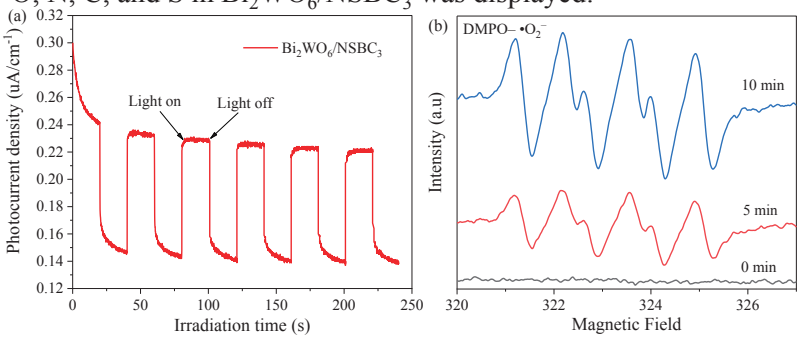

Fig. 3. (a) Transient photocurrent responses and (b) ESR spectra of DMPO-$\bullet O_2^-$ for Bi_2WO_6/NSBC$_3$ under visible light irradiation.

The photocurrent of Bi_2WO_6/NSBC$_3$ continued to rise and fall during the cycle without significant deviation, indicating a repeated photocurrent response (Fig. 3a). In the dark condition, the signal of the DMPO-$\bullet O_2^-$ didn't appear, which proves that the $\bullet O_2^-$ radicals are not generated in the dark. With the time increase of visible-light irradiation, the intensive $\bullet O_2^-$ signal was observed and increased, and it is shown that with visible-light irradiation more electrons are transported to the surface of Bi_2WO_6/NSBC$_3$ and then reduce O_2 into $\bullet O_2^-$ (Fig. 3b).

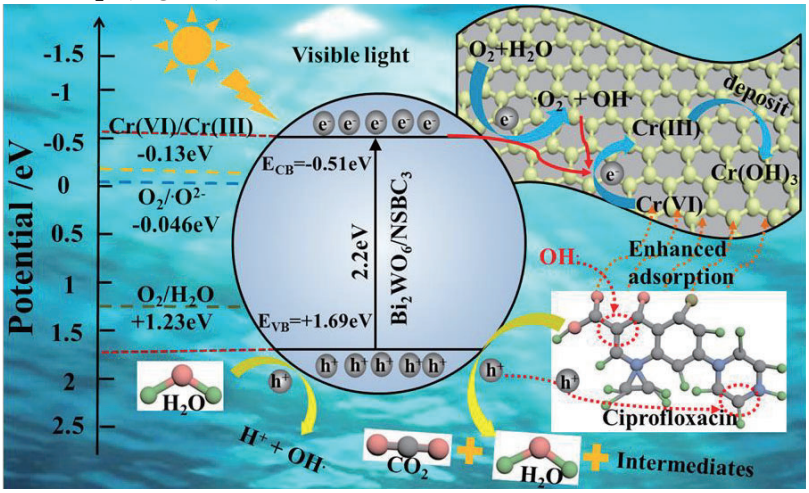

Fig. 4. Mechanism diagram for photocatalytic removal of CIP and Cr(VI) on Bi_2WO_6/NSBC$_3$ under visible-light irradiation.

Based on aforementioned analysis, the N, S co-doping BC as supporting is an electron transporter with excellent conductivity, which facilitates the effective migration of electron-holes and inhibits the recombination of photogenerated charge carriers (Fig. 4). The enhanced photocatalytic performance is ascribed to the synergistic effects of Bi_2WO_6 and NSBC, because of higher separation and migration efficiency of photoinduced carriers.

Facet effects of In_2O_3 on the photocatalytic degradation of Perfluorooctanoic Acid

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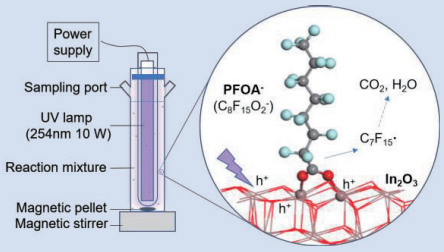
Introduction

Perfluorooctanoic Acid (PFOA) has raised significant health concerns due to its high ecotoxicological risks and resistance to conventional water treatment processes. Our previous studies have demonstrated that photocatalytic approach can effectively degrade PFOA. However, the crystal structure of photocatalysts can affect the degradation efficiency. In order to reveal such effects, three types of In_2O_3 with different facets exposures were synthesized and tested to compare their distinct behavior in PFOA degradation. This work will provide some references for photocatalysts design to get higher decontamination efficiency.



Methodology

Three types of In_2O_3 (C-In_2O_3-P, H-In_2O_3-L, and H-In_2O_3-R) were synthesized through hydrothermal method. XRD, SEM, HRTEM, and SAED were used for material characterization. Photocatalytic experiments were conducted with 20 mg/L PFOA and 0.5 g/L catalyst mixed together under 254nm UV light irradiation after 30 min's dark adsorption. HPLC, IC, LS-MS were used to detect PFOA, F-, and intermediate products, respectively. TBA (tert butyl alcohol) and ammonia oxalate ($(NH_4)_2C_2O_4$) were chosen as quenching agents to identify the major reactive species through trapping experiment.

Results and Discussion

- **Different In_2O_3 show distinct performance in both adsorption and defluorination processes**

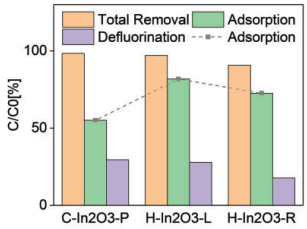


Fig.1 Removal rate of PFOA and defluorination rate after 60 min's irradiation. Adsorption rate refers to the removal rate of PFOA after 30 min's adsorption in dark condition.

C-In_2O_3-P shown lower adsorption rate (≈50%) than H-In_2O_3-L and H-In_2O_3-R (70-82%), while the defluorination rate of C-In_2O_3-P is slightly higher than H-In_2O_3-L and much higher than H-In_2O_3-R.

- **Facet exposures of In_2O_3 should be a major factor for PFOA degradation**

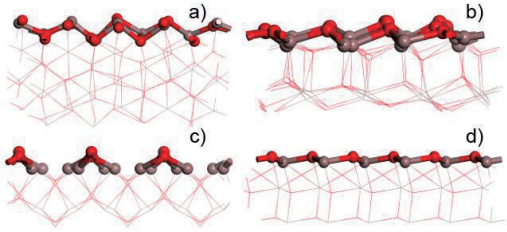


Fig.2 Side images of (211), (222) lattice planes of In_2O_3 in cubic phase (a, b), and (110), (012) lattice planes of In_2O_3 in hexagonal phase (c, d)

Due to the differences of atomic configurations and surface electronic structure between different crystal facets, the catalysts with different facet exposures can lead to distinct photocatalytic degradation performance.

Conclusions

- All In_2O_3 we synthesized in this study show high adsorption rate (over 50%) of PFOA
- Crystal facets can both affect the adsorption and oxidation reaction during the photocatalytic degradation process of PFOA

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Horizontal and Vertical Distributions of Microplastics in Chao Phraya River Estuary, Thailand

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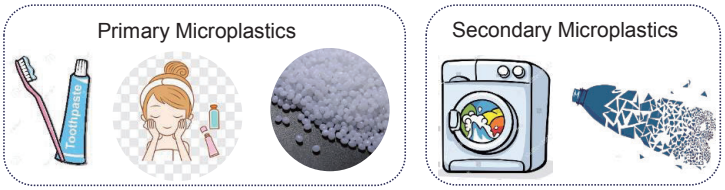
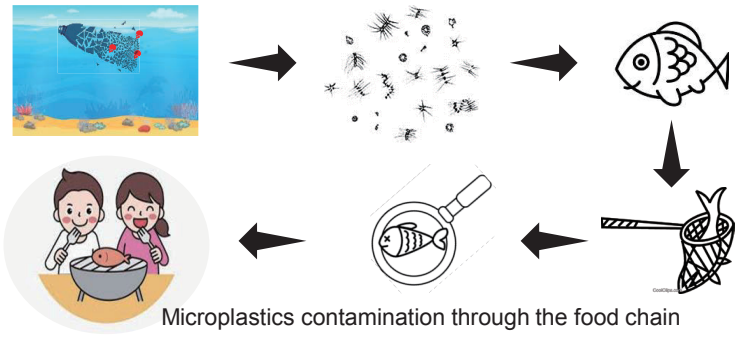
INTRODUCTION

- Microplastics (MPs) in aquatic environment are anthropogenic emerging pollutant and one of the pressing issues to ecosystems nowadays.



- Thailand was ranked top six mismanaged plastic waste producers to sea.
- Estuaries are identified as MPs hotspots due to discharge of mismanaged plastic waste transported along with the river discharge.
- Distribution pattern of MPs in estuaries is poorly characterized globally, although it is an extensive nursery ground for the aquatic organisms between the freshwater, and seawater environments.



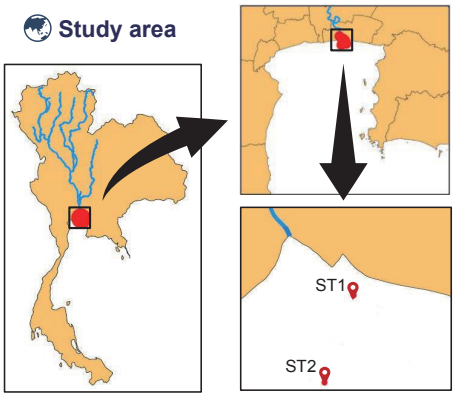
Microplastics contamination through the food chain

OBJECTIVES

- To investigate the horizontal and vertical distributions of MPs in Chao Phraya River Estuary, Thailand.

METHODOLOGY

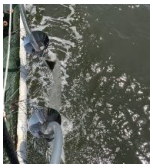
Study area



Sample collection

Manta net (335 µm)

Horizontal sample



Submersible pumps and filter bags (330 µm)

Vertical samples (1m and 4m)

Sample treatment

Organic digestion ($30\%H_2O_2$)

Density separation (NaCl solution)

Sample analysis

Physical characterization (Microscope)

Chemical characterization (FTIR)

RESULTS AND DICUSSION

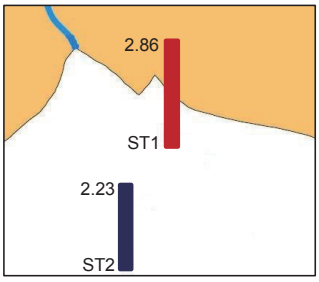


Fig.1 Horizontal distribution of MPs in study area (particles/m^3)

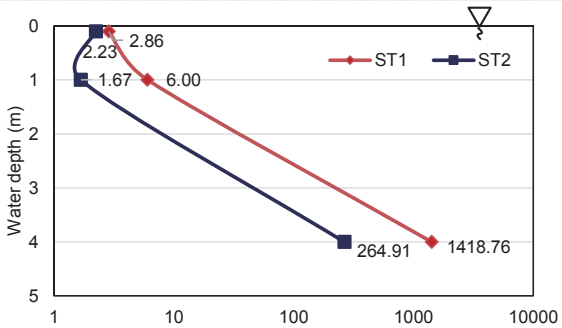


Fig.2 Vertical distribution of MPs in study area (particles/m^3)

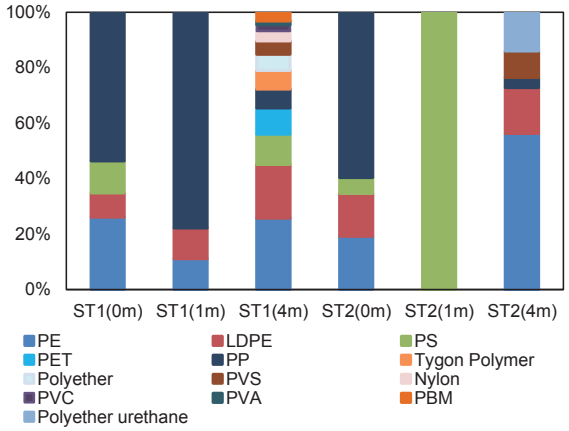


Fig.3 Proportion of chemical composition of MPs in study area

- Various types of polymers were found from the vertical samples at 4m depth than the horizontal samples especially near the river mouth (ST1).

Conclusion

- MPs were detected in all samples collected from the study area.
- Vertical abundance of MPs at 4m is higher two orders of magnitude than horizontals.
- MPs transported along with the river discharged were settled near the river mouth and resuspended again in water column that caused accumulation of MPs in estuary.
- Effective MPs pollution prevention is needed for the aquatic organisms and connected food chain in the study area.

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Evaluation of Fecal Contamination and Exposure Action Research in A Peri-urban Slum in Lusaka, Zambia

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* Graduate School of Global Environmental Studies, Kyoto University
** Graduate School of Asian and African Area Studies, Kyoto University
*** Graduate School of Health Sciences, Hokkaido University
**** Integrated Water Resources Management Centre, University of Zambia

INTRODUCTION

Slum residents have diarrheal risk due to
- Overpopulated
- Poor sanitation condition

Action research is effective in health promotion in low-income settings *(Whitehead et al., 2003)*

Objective
To conduct a participatory workshop about measuring fecal contamination by slum residents and evaluate the effects of the workshop

METHODS

①study background

Study area: Chawama compound, Lusaka city, Zambia
Date: Oct 26th & 27th 2019

② workshop on fecal contamination survey

Participants：residents (around 20 years old)
Day 1：5 people, Day 2：7 people

Indicator：coliform group
- Sampling, dilution (SWAB kit)
- culture （SHIBATA test paper）

workshop program

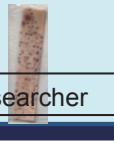
Day1	Day2
General introduction	Count the results & report
Make a list & ranking of media	Show the graph from reporting
Select media & sampling	Compare ranking & results
Treatment & culture	Set up action scenarios
	Estimate & make graph of exposure
	Consider health improvement methods

Activities by facilitators
Activities by participants

③ Validity of participants' survey results

Test paper results by:

participants **VS** researcher



RESULTS & DISCUSSION

① participants' awareness change from rankings

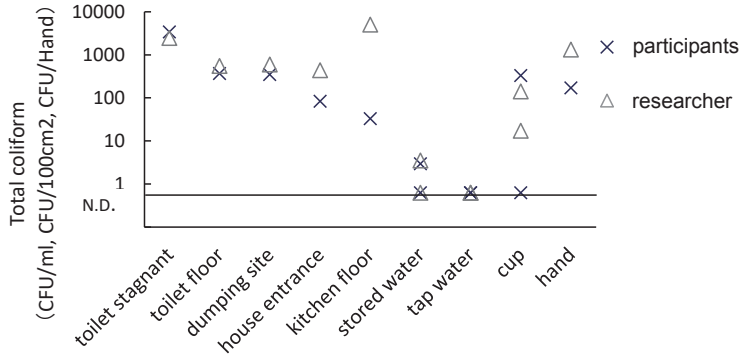
	Day1 (expected ranking)	Day2(measured ranking)
1.	Water in container	Kitchen floor
2.	Uncovered food	Toilet floor
3.	Unwashed hands	Dumping site
4.	Toilet	House entrance
5.	Kitchen Floor	Cup
6.	Tap water	Hand
7.	Dumping site	Stagnant water
8.	House floor	Tap water
9.	Ground	Ground
10.	Shoes (backside)	Uncovered food
11.	Well water	Well water
12.	Laundry water	Water in container
13.		Shoes (backside)
14.		Laundry water

Direct media　Indirect media

Figure 1 Day1 & Day2 rankings show the level of risk by participants

Based on the differences of rankings, participants realized the importance of exposure from both indirect and direct media.

② Validity of participants' survey results



※The units are water samples(CFU/ml), floor samples(CFU/100cm²) and cup and hand (CFU/media)

Figure 2 faecal contamination level by each media

By comparing the survey results, participants could understand and measure fecal contamination.

CONCLUSION

- The participants could realize the importance of fecal exposure by measuring fecal contamination in their living environment by themselves.
- The methodology of this workshop could confirm participants' awareness change, but difficult to discuss the health improvement planning.

Acknowledgements This study was funded by KAKENHI 19H02274. We would like to thank study participants and local partners for their great support in contributing to this study.

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Occurrence of antimicrobial-resistant *Escherichia coli* in wastewater treatment plants and a fecal sludge treatment plant in Bangkok, Thailand

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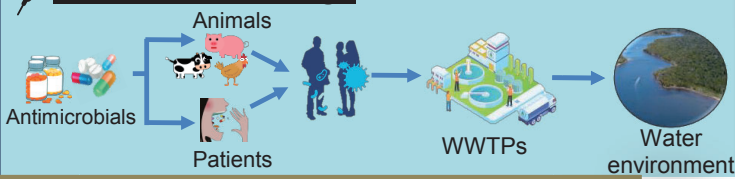
BACKGROUND INFORMATION

Antimicrobial resistance (AMR)?

- Ability of microorganisms (bacteria, viruses, and some parasites) to stop an antimicrobial treatment.
- As a result, standard treatments become ineffective.

How AMR spreading?



Causes of AMR?

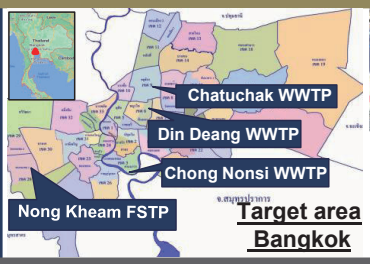
WHO: Antimicrobial resistant bacteria have become a critical health concern in the world.

World Health Organization

OBJECTIVES

- To investigate the **city profile** of antimicrobial resistant (AMR) *E.coli* based on human waste in wastewater treatment plants (WWTPs) and a fecal sludge treatment plant (FSTP).
- To examine **treatment efficiency** of **AMR *E.coli*** along a wastewater treatment process.

MATERIALS AND METHOD



Testing of AMR *E. coli* concentration and collecting isolates for WGS

Sample collections → Filtration → AMR *E.coli* culture on different 4 conditions; (Filter method)

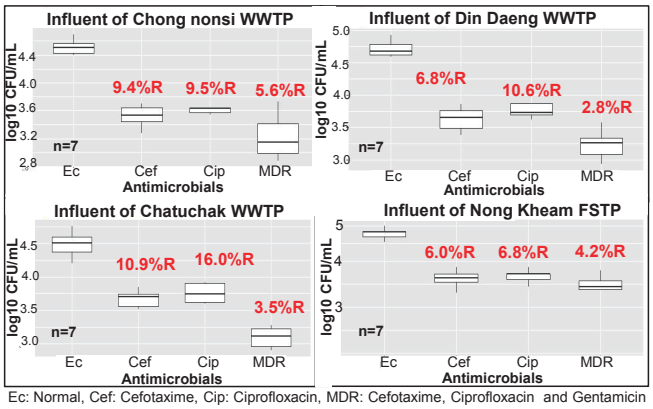
(a) CHROMagar
(b) CHROMagar + Cefotaxime
(c) CHROMagar + Ciprofloxacin
(d) CHROMagar + **Cefotaxime + Ciprofloxacin + Gentamicin (MDR)**

Isolation *E. coli* and AMR *E.coli* → *E.coli* and AMR *E.coli* colony counting

O.D measurement → Centrifuge pellet → DNA extraction → Whole-genome sequencing

RESULTS AND DISCUSSION

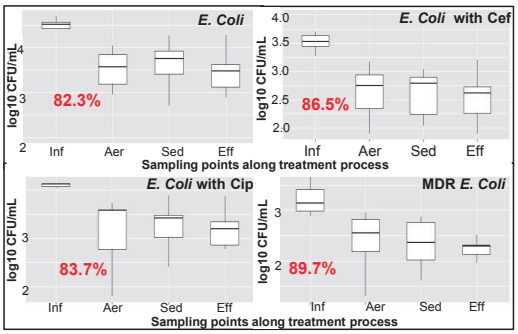
- City profile of AMR *E. coli*

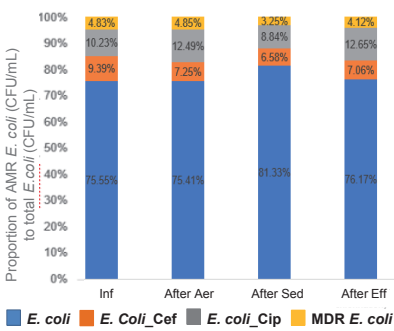


Ec: Normal, Cef: Cefotaxime, Cip: Ciprofloxacin, MDR: Cefotaxime, Ciprofloxacin and Gentamicin

- A total of *E. coli* isolated were resistant with Cefotaxime, Ciprofloxacin and MDR in influent of WWTPs and FSTP.
- The percentage of resistant *E. coli* in Ciprofloxacin higher than Cefotaxime and MDR.
- Population of Bangkok have produce AMR *E.coli* and MDR *E. coli* in WWTPs and a FSTP showed as in the table.

- Removal efficiency of AMR *E. coli* of Chong Nonsi WWTP





Inf: Influent, Aer: After Aeration, Sed: After Sedimentation, Eff: After Chlorination

Amount of AMR *E. coli* and MDR *E.coli* could removed by treatment process. However, the proportion along process can not change by treatment process.

Influent loading of WWTPs in Bangkok City

Unit	*E. coli*	*E. Coli*_Cef	*E. coli*_Cip	MDR *E. coli*
CFU/day of BKK	1.11×10^{17}	1.25×10^{16}	1.72×10^{16}	4.74×10^{15}

Population: 8,833,400 capita (Source: BANGKOK METROPOLITAN, 2019)

Influent loading of Nong Khame FSTP

Unit	*E. coli*	*E. coli*_Cef	*E. coli*_Cip	MDR *E. coli*
CFU/day	5.18E+13	3.53E+12	3.99E+12	1.92E+12

CONCLUSIONS

- Influent of WWTPs and FSTP resulted as 3,880 CFU/ml and 3,490 CFU/ml of AMR *E. coli* in 322,000 m^3/day (in average) and 5,000 m^3/day, respectively. It indicated that has potential to environmental risk.
- This study was found the treatment efficiency of Chong Nonsi WWTP for AMR *E. coli* in average was 80%.

Risk assessment for the mercury polluted site near a pesticide plant in Changsha, Hunan, China

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1. Background

Risk assessment based on the **total amount** of pollutants is an intuitive and simple method that has been applied to heavy metal contaminated sites in early stages. However, as with the development of a deeper understanding of environmental behaviour and ecological effect of pollutants, the inadequacy of this method has become increasingly apparent. Since the method does not take into consideration the differences in environmental effectiveness and biological availability between various chemical forms of metals, the method often overestimates the potential risk.

2. Methodology

i) "Delayed geochemical hazard" (DGH) is a kind of serious ecological and environment hazard caused by long-term accumulated pollutants including heavy metals and organic compounds that reactivated suddenly and released sharply from stable species to active ones in soil or sediment system due to the changes of physicochemical conditions (such as temperature, pH, oxidation-reduction potential (Eh), moisture, organic matter content, etc.) or the decrease of environmental capacity.

ii) We have done lots of soil column experiments simulating changes of these conditions to investigate the changes among chemical species of mercury based on Tessier method (a sequential extraction procedure method). The result showed the changing trend is **non-linear**, and could be explained by digital DGH model. →

Metal adsorption/desorption at L site:

$$Me + L_i \underset{k_{di}}{\overset{k_{ai}}{\rightleftharpoons}} MeL_i$$

Kinetic:

$$\frac{d\{MeL_i\}}{dt} = -k_{di}\{MeL_i\} + k_{ai}[Me]$$

At the local equilibrium:

$$k_{di}\{MeL_i\} = k_{ai}[Me] \quad \boxed{K_{pi}} = \{MeL_i\}/[Me]$$

$$k_{ai} = k_{di} * K_{pi}$$

$f(\{MeL_i\}, pH)^*$ = $1/f'(C)$ **Non-linear**

DGH digital model:

"Total releasable content of the pollutant" (TRCP), C

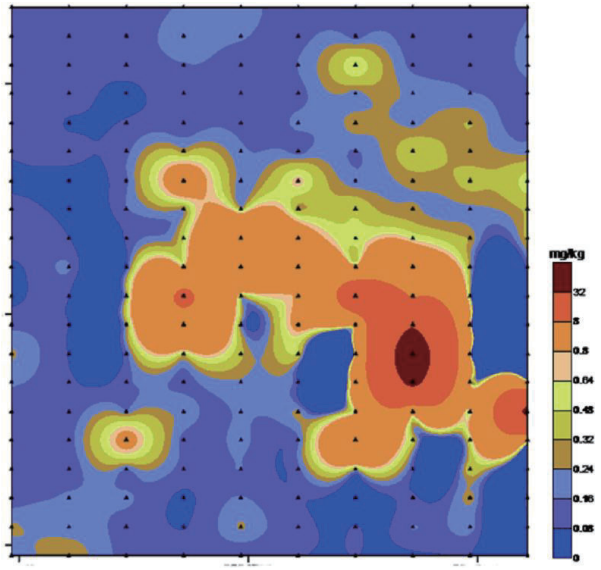
"Total concentration of active species" (TCAS), Q

$$Q = a_0 + a_1 C + a_2 C^2 + a_3 C^3 + \cdots$$

Critical point of burst: $Q'' = 0$

* Peng L, Liu P, Feng X, et al. Geochimica et Cosmochimica Acta, 2018, 224: 282-300.

3. Results and discussion



Max total Hg: 44.3 mg kg^{-1}
Extractable Hg (Tessier method): [5.9,9.7]%

In consideration of the availability of fractions in the Tessier method, the path $Hg_{E+C+F+O+R} \rightarrow Hg_{E+C+O}$ was used as an example:

$$Y=0.1500X^3-0.3491X^2+0.5012X \ (n=20, R^2=0.985) \quad (1)$$

This is one path of DGH and we used this path to characterize the studied area, because in this path, chain reactions from $Hg_{E+C+F+O+R} \rightarrow Hg_{E+C+O}$ would lead to some mobile fractions of mercury when DGH happens. We let the second derivative of Eq. (1) be zero. Thus, the calculated $TRCP_{Hg}$ is equal to 0.776 mg kg^{-1}.

We fitted all the potential paths of DGH and the calculated $TRCP_{Hg}$ ranging from **0.764 - 0.810 mg kg^{-1}** to give a gist for the assessment. According the data, the percentage of total Hg beyond $TRCP_{Hg}$ in the study area was **10.5% (ranging from 10.0% - 10.5%)** classified as **low-risk** for both DGH.

Exposure risk assessment based on urinary bisphenol A levels in the general Chinese population

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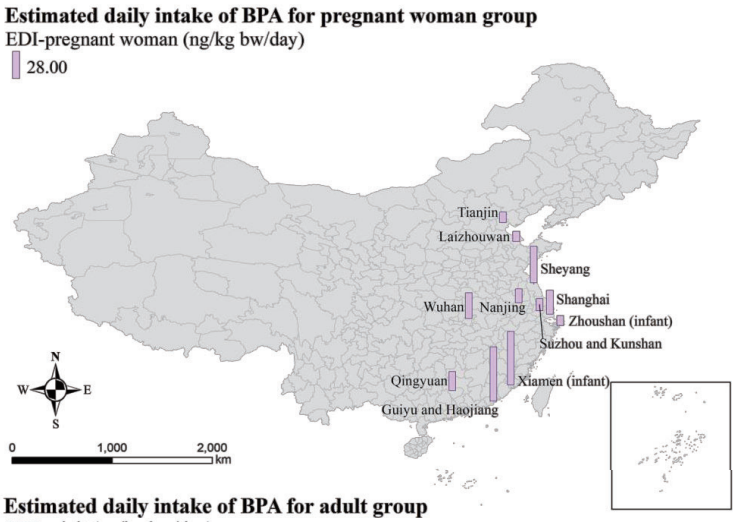
Background

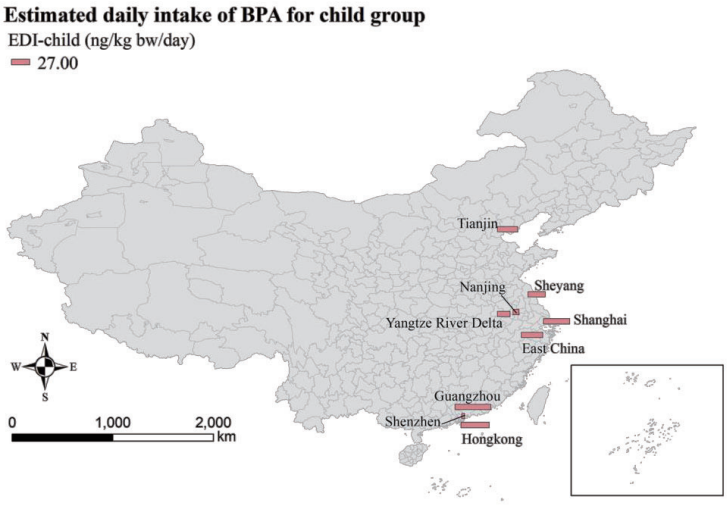
- Bisphenol A (BPA) is known as an endocrine disrupting compound that may cause adverse effects on wildlife as well as human beings. BPA is an industrial chemical widely used in various products for human purposes, resulting in its widespread exposure to humans [1]. To estimate its latest adverse effect on humans, it is quite important to know its human exposure levels. In order to evaluate the current exposure risks of BPA to Chinese population, a simple method was adopted to calculate BPA daily intake levels of different populations in China base on their urinary excretions.

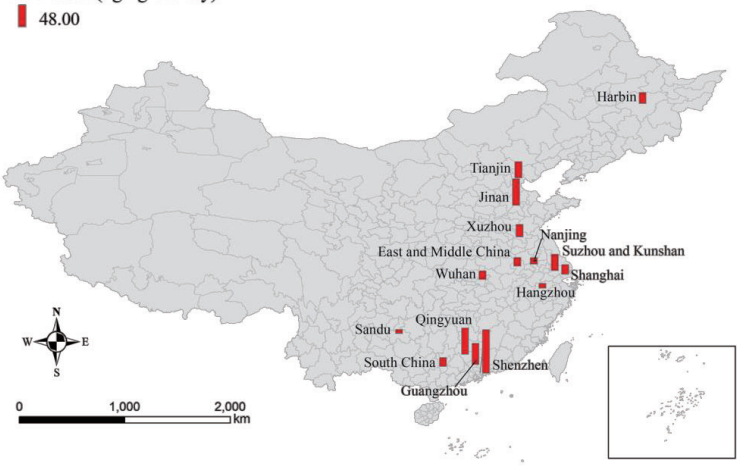
Methodology

- A systematic review of published literatures was conducted to collected related data.
- In total, 57 studies reporting urinary BPA concentration in general Chinese were deemed eligible for our exposure level estimation. The included studies published between 2009 and 2020 covered 31811 urine samples (the sample sizes ranged from 15 to 3423) from 24 regions. Sampling time ranged from 1998 to 2019.
- Calculation method of estimated daily intake (ng/kg bw/day) of BPA is shown in equation (1).
- EDI=Urinary BPA concentration (ng/mL)*urinary output (mL/day)/body weight (kg) —— (1)

Results and Discussion







- The results showed that average EDI of infants (sample size 88), pregnant women (sample size 9163), children (sample size 5905) and adults (sample size 16655) were 30.92±22.70, 24.85±9.40, 34.13±20.65, 22.48±16.21 ng/kg bw/day, respectively (details were shown in figures).
- Overall, the current average EDIs of BPA among the four populations are two to three orders of magnitude lower than the tolerable daily intake dose prescribed by the United States Environmental Protection Agency (50 μg/kg bw/day) and the temporary tolerable daily intake provided by European Food Safety Authority (4 μg/kg bw/day) [1] suggesting that Chinese population are not at high risk for BPA exposure.

Reference: [1] Huang R, Liu Z, Yuan S, et al. Worldwide human daily intakes … and its risk analysis[J]. Environmental Pollution, 2017, 230: 143-152.

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Inundation Predictability by Classifying Rainfall Patterns Using Machine Learning

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** Division of Field Engineering for the Environment, Faculty of Engineering, Hokkaido University, Japan

Background

- Malaysia's floods are usually due to monsoon rainfall. (refer Fig 1.)
- Past researches has proven machine learning could be a great alternative method to forecast rainfall. (refer Fig 2.)
- Flood forecast has become a necessity to prevent future losses.
- Seamless flood risk assessment can be proposed from rainfall analysis and flood modeling.

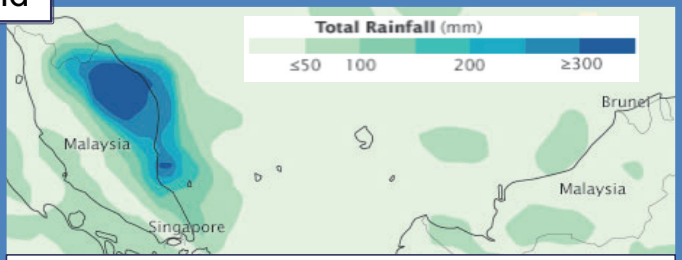


Fig. 1: Malaysia cumulative rainfall for 14 days (Dec 24, 2012 – Jan 6, 2013) during severe flood. Rainfall measurements from TRMM satellite. (Courtesy of NASA earth observatory)

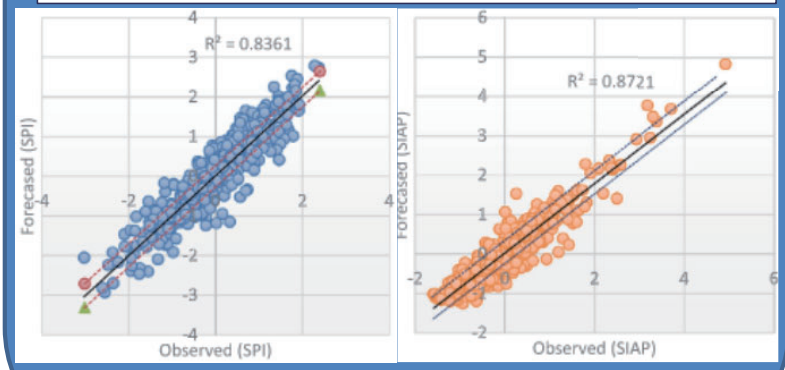
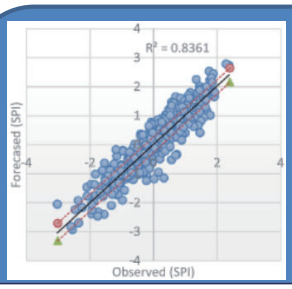


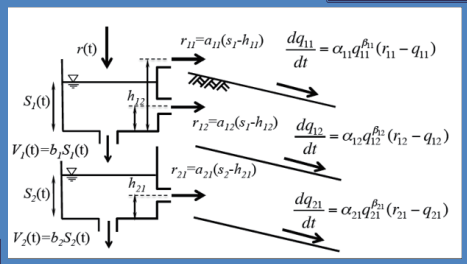
Fig. 2 : Scatter plot of observed and forecasted SPI & SIAP for W-2A model. (Khan, M. M. H., Muhammad, N. S., & El-Shafie, A. (2020))

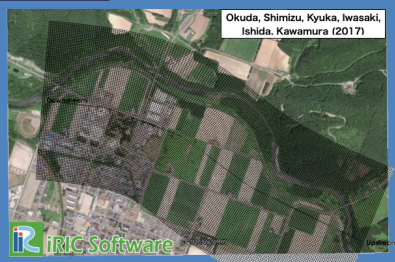
Objectives

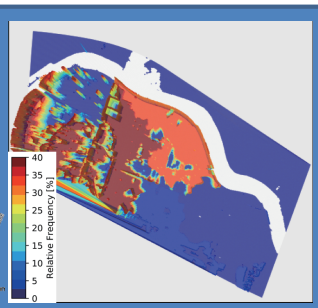
1. Classify rainfall patterns using machine learning.
2. Assess the optimal machine learning method to forecast rainfall.
3. Analyze the type of flood patterns according to the forecasted rainfall patterns.
4. Propose a seamless flood risk assessment from rainfall forecasting to flood modeling to better understand the possibilities of flood patterns.

Methodology



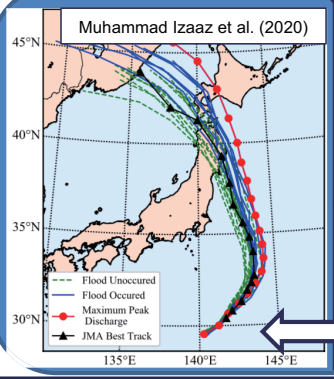






Rainfall Forecast and Validation using Machine Learning → Rainfall-runoff calculations → Flood modeling → Flood risk assessment

Results & Discussion



Machine learning has proven to have high accuracy to forecast rainfall at Malaysia

At Japan, we used ensemble forecast to predict the typhoon path. What about Malaysia?

Water level and riverbed formation has low uncertainty.

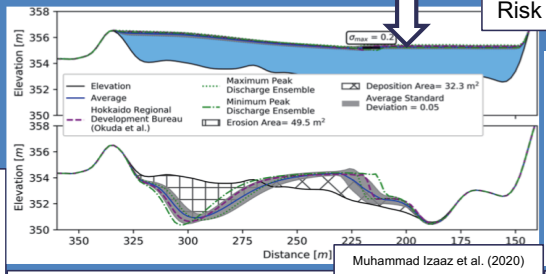


Fig. 3 : Distribution of water level & riverbed formation at river cross-section using ensemble forecast.

Risk based decision can be made prior flood

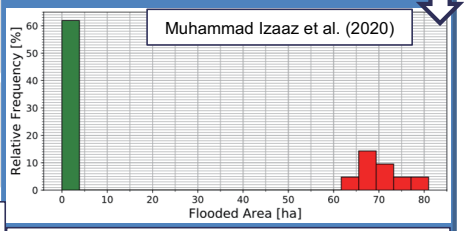


Fig. 4 : Relative frequency of flooding and flooded area.

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Sewage Sampling Strategy Reflecting the Fluctuation of Sewage Characteristics During a Day

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** Hanoi University of Science and Technology *** Hue University of Science

Background

Sewage sample

- WWTP construction
- Env. risk management
- WW mgmt. planning

Problem: Accuracy of sewage quality estimates calculated from measured data = Unknown

- Sampling at infrequent intervals (once/day, semi-daily, semi-weekly…)
- Fluctuate of wastewater from house also affect sampling…

Objective: To find a sewage sampling strategy reflecting the fluctuation of sewage characteristics

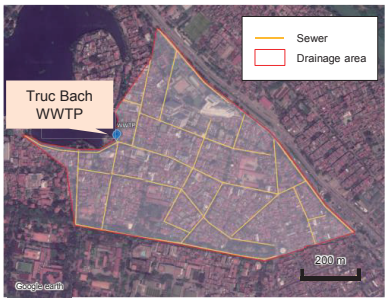
Conclusion

Results indicated that

- No difference in accuracy of representative sewage quality estimation between SS 1 & 2.
- Nighttime samples are not necessary for increasing the representativeness of the data.
- SS 3 marked the highest accuracy, possibly being more effective by relating the peak time periods to a sample number.

Materials & Methods

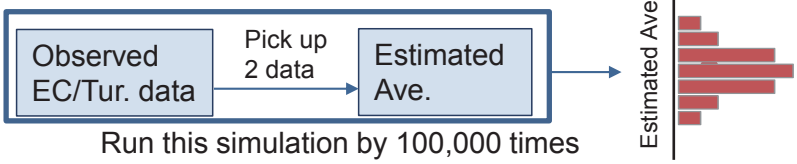
Study site: Outlet of a sewer network in Hanoi, Vietnam



Survey duration
12 ~ 20 Nov. in 2019
(no rainy day)

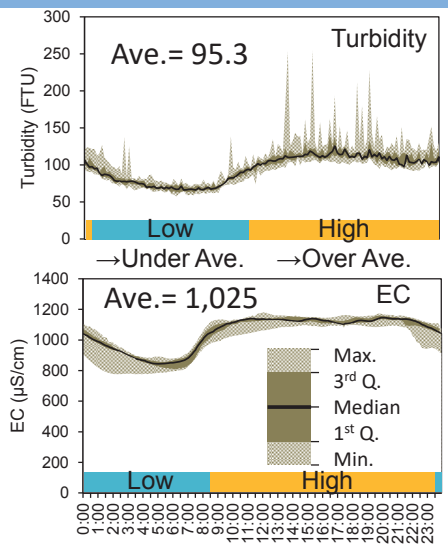
Sampling parameters
Turbidity & EC by sensors
Data logging every 5 min.
→ 2,800 data each

1. Find a trend of sewage fluctuation by making distribution of EC & turbidity for each time of 24 h
2. Define the sampling strategies
3. Run the simulation shown below



Results & Discussion

Fluctuation of sewage characteristics

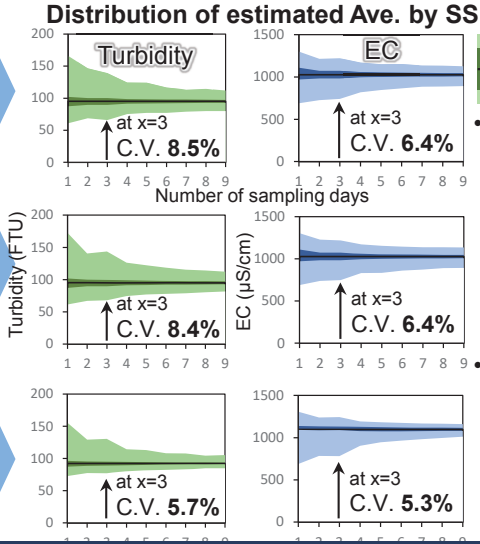


Sampling strategy (SS) reflecting the fluctuation of sewage characteristics

Sampling Strategy 1
Get 2 samples from 24 hours

Sampling Strategy 2
Get 2 from working time
2 sample

Sampling Strategy 3
Get 1 from High & Low



- Less difference in variation of distribution between SS 1 & 2.
  → Nighttime samples are not necessary for increasing the representativeness of the sewage data.
- SS 3 marked the smallest variation of distribution (≒ the highest accuracy sewage quality estimation).

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Development of Calcium Oxide Impregnated with Silver Nanoparticles As Heterogeneous Catalyst for Transesterification of Crude Rice Bran Oil

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** Department of Civil & Environmental Engineering, Faculty of Engineering, Mahidol University, Thailand

Background

Biodiesel is one of the alternative fuel derived mainly from plant-based oils and has been extensively manufactured either in a pure form (B-100) or blended with petroleum diesel.

Challenges of biodiesel development:

- Expensive vegetable oils (60-70% of the production cost)
- Homogeneous catalyst drawbacks

Alternative approach:

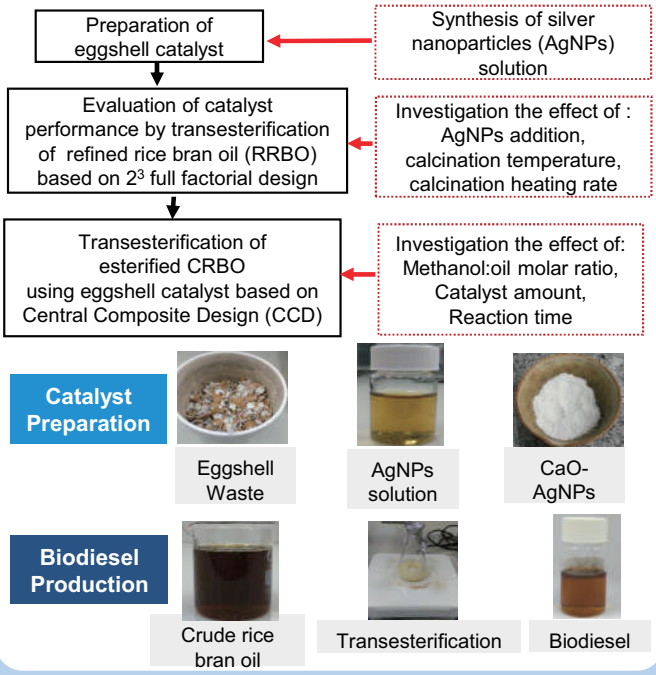
- Use of **inedible oils** such as crude rice bran oil

- Development of **heterogeneous catalyst**, enhanced with **nanoparticles** addition.

Objectives

The research aims to prepare the heterogeneous catalyst made from eggshell waste supported with silver nanoparticles (AgNPs) for biodiesel production from crude rice bran oil (CRBO).

Methodology



Conclusion

- The performance of catalyst prepared from eggshell waste was tested by transesterification of RRBO. It was observed that the addition of AgNPs and calcination heating rate had a major influence on the biodiesel yield.
- The transesterification of esterified CRBO was conducted using CaO-AgNPs catalyst and obtained maximum biodiesel yield of 88.5%.
- The assessment of catalyst reusability indicated that the catalyst performance declined gradually after being recycled and reused for five consecutive cycles.

Results and Discussion

Experimental results for catalyst preparation based on 2^3 factorial design

Run	X_1 AgNPs	X_2 °C	X_3 °C/Min.	Biodiesel yield (%) Exp.	Pred.
1	without AgNPs	800	5	89	89.06
2	with AgNPs	800	5	92	91.94
3	without AgNPs	1000	5	89	88.94
4	with AgNPs	1000	5	92	92.06
5	without AgNPs	800	10	87	86.94
6	with AgNPs	800	10	88.5	88.56
7	without AgNPs	1000	10	86	86.06
8	with AgNPs	1000	10	88	87.94

Coefficient	Value	P-Value
b_0 Constant	88.9375	0.000
Linear		
b_1 (X_1)	1.1875	0.033
b_2 (X_2)	-0.1875	0.204
b_3 (X_3)	-1.5625	0.025
Interaction		
b_{12} (X_1X_2)	0.0625	0.5
b_{13} (X_1X_3)	-0.3125	0.125
b_{23} (X_2X_3)	-0.1875	0.204
R^2	0.999	
R^2 adj	0.993	
SE	0.177	

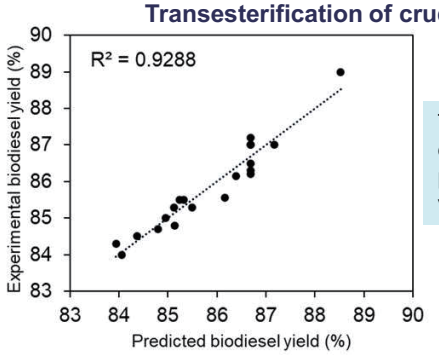
The addition of AgNPs & calcination heating rate showed a significant effect on the biodiesel yield

Regression model

$$Y = 88.937 + 1.187 X_1 - 0.187 X_2 - 1.562 X_3 - 0.0635 X_1X_2 - 0.312 X_1X_3 - 0.187 X_2X_3$$

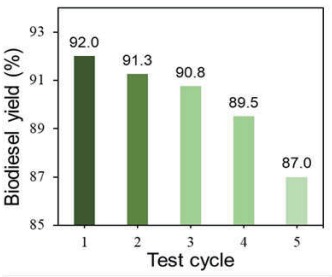
Note: X_1= Addition of AgNPs, X_2= Calcination Temperature, X_3= Calcination heating rate

Transesterification of crude rice bran oil



The results of transesterification of esterified CRBO showed that the percentage of biodiesel yield varied between 83.9 to 89%.

Assessment of catalyst reusability



Experimental tests were conducted for five consecutive cycles for the transesterification of CRBO.

The results indicated that the prepared catalyst can be reused up to five times with a 5 % loss in the 5th run

References

Bet-Moushoul, E., Farhadi, K., Mansourpanah, Y., Nikbakht, A. M., Molaei, R., & Forough, M. (2016). Application of CaO-based/Au nanoparticles as heterogeneous nanocatalysts in biodiesel production. Fuel, 164, 119–127.

Environmental Friendly Biopolymer Membrane for Wastewater Treatment

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Background

- Membrane technology has been widely developed in wastewater treatment field due to the exploration of new membrane materials.
- Natural based polymer is an alternative to replace synthetic polymer based membranes as they are derived from fossil fuels which brings concern to the effect on environment.
- Chitosan derived from crustacean chitin (crab and shrimp shell wastes) emerges as potential green candidate for the removal of pollutants from wastewater.

Methodology

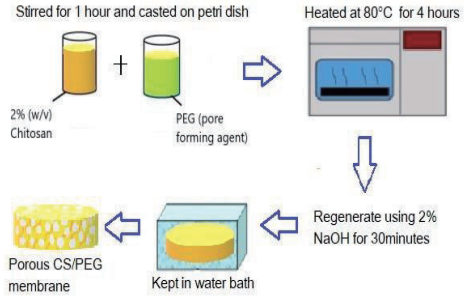


Table 1
Composition of CS:PEG

CS/ PEG	CS (%)	PEG (%)
100/0	100	0
80/20	80	20
75/25	75	25
70/30	70	30
65/35	65	35

Results and Discussions

❖ Macroscopic view of membranes

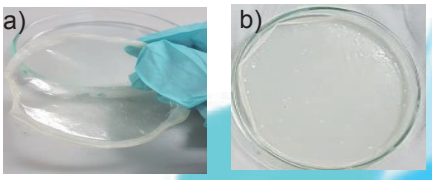


Figure 1. Macroscopic view of CS/PEG : 70/30 membranes in (a) dry and (b) wet conditions

❖ Surface morphologies of membranes

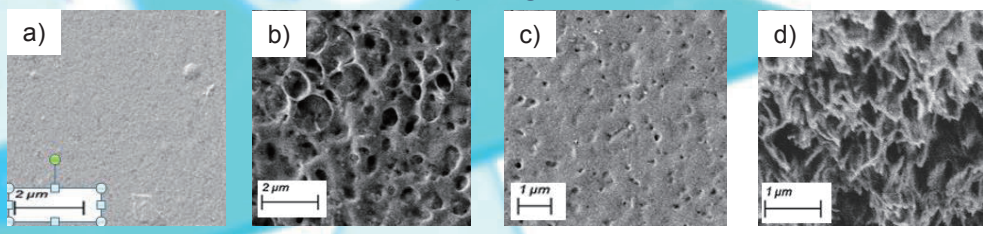
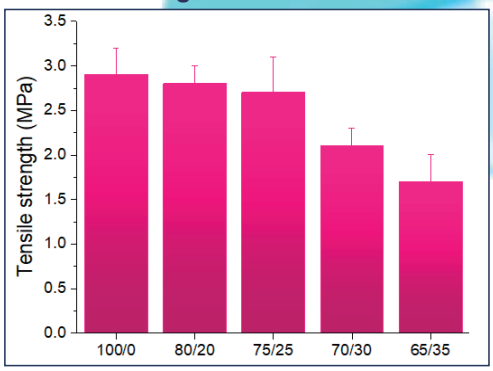
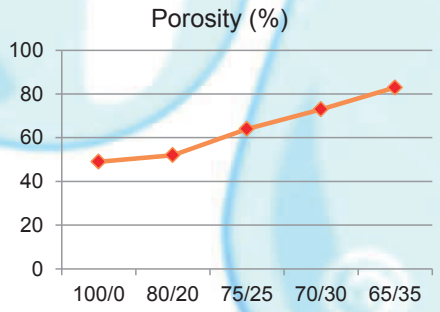


Figure 2. Surface morphologies of membranes (a) neat CS, (b), (c) and (d) CS/PEG : 70/30 at top, bottom and cross-section respectively

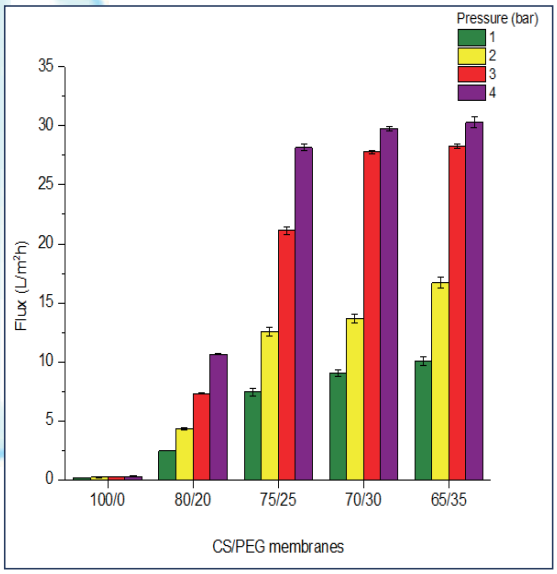
❖ Tensile Strength of CS/PEG membranes



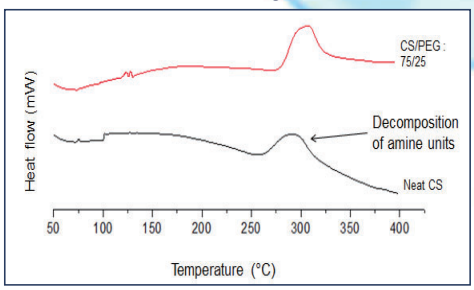
❖ Porosity of CS/PEG membranes



❖ Pure Water Flux



❖ DSC Analysis



Conclusion

In this preliminary study, results demonstrated that the incorporation of PEG enhanced the porosity, water permeability and thermal properties. Future study will include reinforcement of filler to improve mechanical properties of membranes. Overall, CS/PEG membranes can be used as microfiltration or ultrafiltration for wastewater remediation.

Acknowledgement: The authors thank to financial support from the Ministry of Education Malaysia: (FRGS)-FP053-2015A and GPF033A-2018

Introduction of a friendly environmental bio-soil method for improvement of landfill liner material

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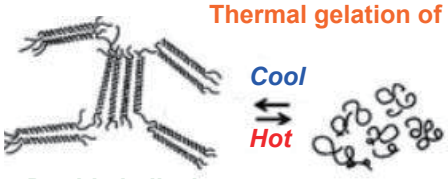
** Graduate School of Global Environmental Studies, Kyoto University

Introduction

Social and engineering demand:
A focus to design more secure landfills by improving the lining and covering systems is the most essential task for engineers.

Aim:
To introduce a friendly environmental material for the improvement of bentonite properties used in landfill liners

Thermal gelation of gellan gum

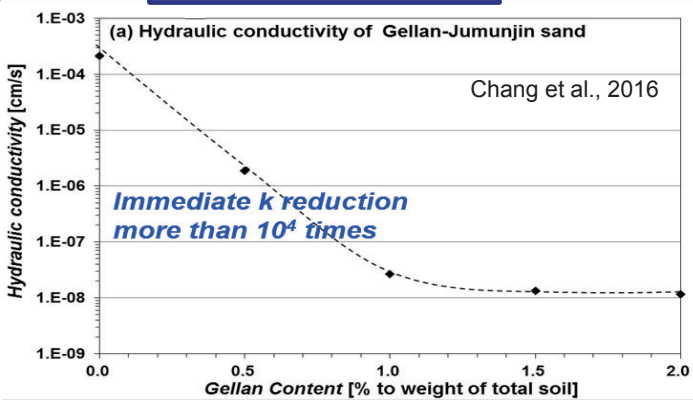


Its capable of forming hydrocolloid gels when mixed with heated water

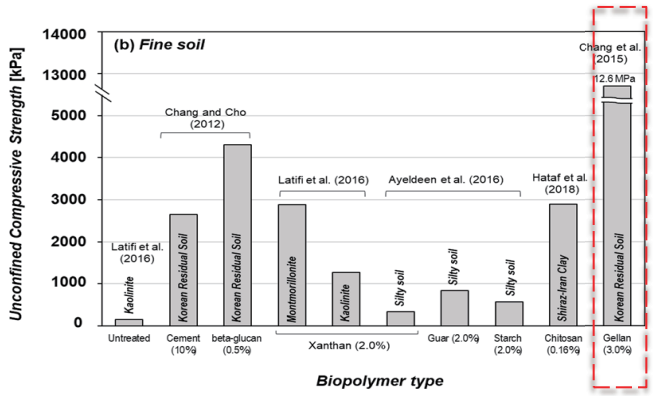
(Cameron et al., 2013)

Previous researches on gellan gum-treated soil: *Geotechnical Engineering Properties*

Water flow control via pore-clogging effect

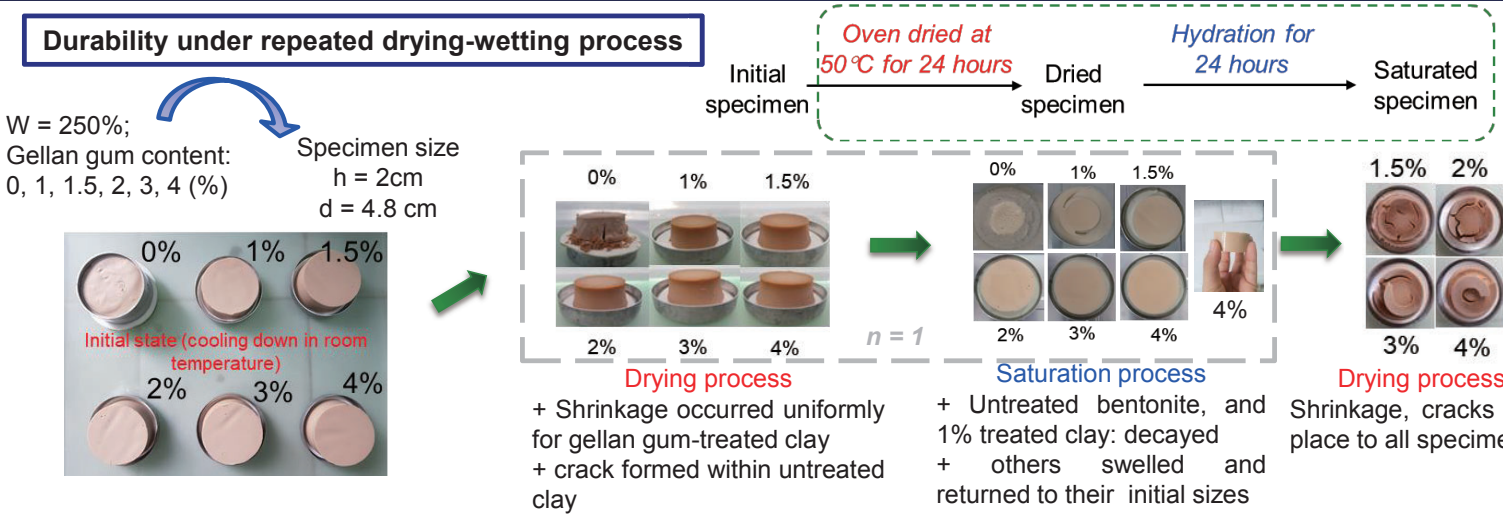


Soil strengthening via enhancing the inter-particle bonding of soil



Current research on gellan gum-treated bentonite in Vietnam

Durability under repeated drying-wetting process



Conclusion: ***Treated specimens show water durability better than that of untreated one, but n_{max} = 1)***

Future study: hydraulic conductivity of gellan gum-treated bentonite

Indoor PM2.5 Associated with Health Risk at Households in Hanoi, Vietnam.

Authors: Tran Thi Hong Hien[1], Vo Thi Le Ha[1], Nguyen Thi Thu Hien[1], Nghiem Trung Dung[1]
[1]School for environmental Science and Technology, Hanoi University of Science and Technology

1. Background

Indoor air pollution has been a major threat to global public health as people spend much more time in enclosed spaces than outside. This is particularly the case in urban areas. Roughly 80–90% of our time spent in indoor spaces and about 6% is spent in transport [1]. The WHO reported that indoor air pollution leads to premature deaths for 4 million people each year worldwide. Air quality in Vietnam has recently deteriorated with the high concentration of $PM_{2.5}$, that 60000 deaths from heart disease, stroke, lung cancer, chronic obstructive pulmonary diseases, and pneumonia in Vietnam in 2016 due to air pollution [2].

The objective of this study was to determine the level of indoor $PM_{2.5}$ in Hanoi and estimate the health effects

2. Methodology

Portable PATs+ and Purple Air-II had been co-located with Panasonic $PM_{2.5}$ sensor at S5. The correlation coefficient R^2 is range from 0.86 to 0.94, the adjustment coefficient equivalent is 0.5.

Fig1. K1, K2, K3 & K4 – four selected places and S5-compared monitoring station map in Hanoi
a) Purple Air II b) PATs+

Health risk adapted by the US EPA toolkit in 2009:

- The daily intake for a person is calculated by the formula:

$$DI = \frac{C_{air} \cdot IRA \cdot Dhour \cdot D\ day \cdot Dweeks \cdot Dyears}{24 \cdot BW \cdot 365 \cdot LE} \quad (\text{mg/kg.day})$$

- Incremental Lifetime Cancer Risk – ILCR calculated by following US Environmental Protection Agency toolkits:

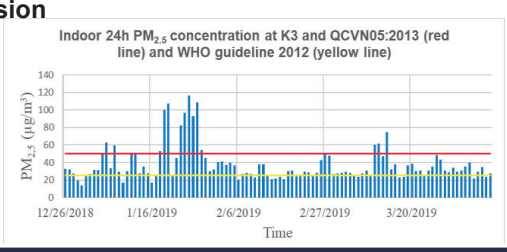
$$ILCR = DI_{Inhalation} \times SF_{Inhalation}$$

SF: cancer slope factor (kg.day/mg)

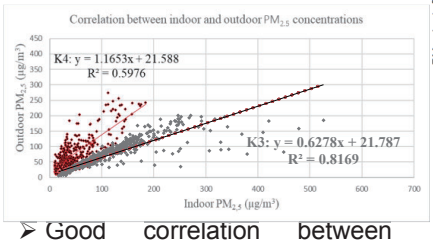
ILCR<10^{-6}: Low, ILCR=10^{-6} - 10^{-4}: moderate, ILCR>10^{-4}: high risk

3. Results and Discussion

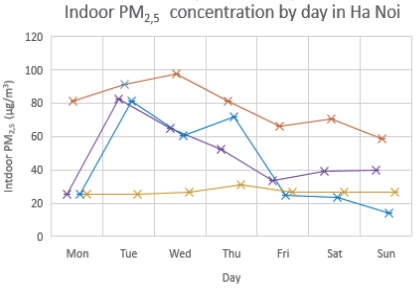
➢ $PM_{2.5}$ concentrations were highest at K3 and exceeded WHO guideline thresholds at all observed days.

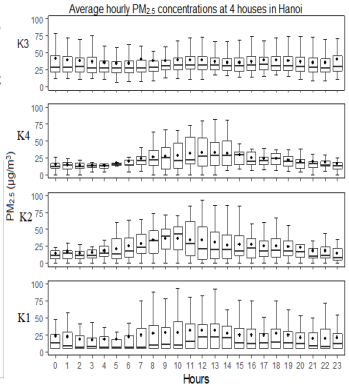


➢ The mean concentration of $PM_{2.5}$ at K2 (24.6 µg/m³) and K3 (37.47 µg/m³) (more population and traffic density) are higher than K1 (23.9 µg/m³) and K4 (22.3 µg/m³).



➢ Good correlation between indoor and outdoor $PM_{2.5}$ were found in K3 (R^2=0.82) and moderate in K4 (R^2=0.60).

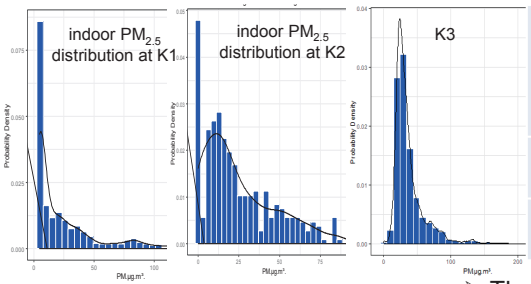




➢ The peak at noon was observed at 4 Sites (9AM to 2PM), possibly due to the influence of indoor activities, ventilation condition and outdoor sources.

➢ $PM_{2.5}$ concentration at K3, K2 and K4 at weekends was significantly lower than weekdays, except for K1

➢ $PM_{2.5}$ Distribution followed the Weibull function at K3.



Estimated Weibull Distribution Parameters	$PM_{2.5}$ K3
Scale	3,686
Shape	8,695

Object	DI	SF	ILCR
Children	0.05	0.00047	2.14×10^{-5}
Adults	0.03	0.00023	6.21×10^{-6}
Elder	0.04	0.00021	7.49×10^{-6}

➢ The ILCR value of the children was the highest in comparison with the others and levels of health risk were moderate.

4. Conclusion

➢ High $PM_{2.5}$ concentration was found in some residential house in Hanoi and some values exceeded WHO guideline.

➢ ILCR health risks are assessed for the elders, children and adults posed the moderate risk, and the children are the most affected.

5. References

[1] Nuno, R. M., Guilherme, C. G.: Impact of $PM_{2.5}$ in indoor urban environment, Sustainable Cities and Society., Vol.42, pp. 259–275, 2018.
2. World Health Organization - Household air pollution and health, World Health Organization (2018).

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on Education and Research in Global Environmental Studies in Asia

GHG emissions from septic tanks in Hanoi: a comparison between summer and winter

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**Graduate School of Asian and African Area Studies, Kyoto University
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****Hanoi University of Science and Technology

1. Introduction

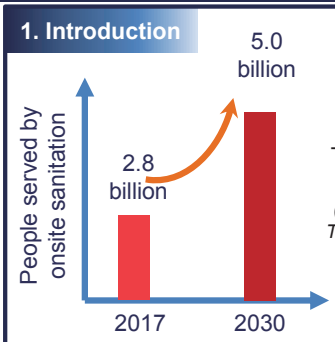


Fig 1 Onsite sanitation coverage
Source: WHO and UNICEF, 2017

The previous studies *(Diaz et al., 2011; Truhlar et al., 2016)*

- Septic tanks (ST) in **high-income** countries: **black and greywater;**
- **Low- and middle-income** countries: **only blackwater**;

CH_4 emission rate (11 g-CH_4/cap.day) **<** **2.4** times of IPCC emission factor (25.5 g-CH_4/cap/day)

Did not mention about correlation between septic tanks' conditions and GHG emissions

The range of temperature 12–27°C had no significant impact on CH_4 emissions from septic systems in the USA *(Diaz et al., 2011)*.

Still, **larger seasonal temperature** change might affect the emission from septic tanks.

Hanoi's temperature
Summer 26 -33 °C
Winter 14-19 °C

OBJECTIVE

To evaluate the GHG emissions from blackwater septic tanks with seasonal variation.

2. Materials and methods

25 STs in the urban of Hanoi were monitored in **summer** (Jun-Jul: ST1-ST10) & **winter** (Dec-Jan: ST1, ST2 and ST11-ST23);

Items	Summer (n = 10)	Winter (n = 15)	Average (n = 25)
Household size (people)	4.5 ± 1.1	4.3 ± 0.8	4.4 ± 0.9
Septage storage period (yr)	10.3 ± 5.7	12.6 ± 7.0	11.7 ± 6.5
Septic tank volume (m^3)	2.3 ± 0.7	2.0 ± 1.1	2.1 ± 0.9
1st compartment volume (m^3)	0.6 ± 0.5	1.1 ± 0.7	1.3 ± 0.7

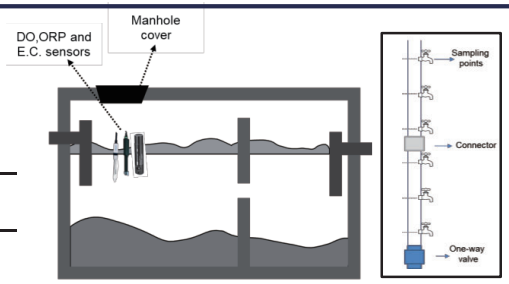
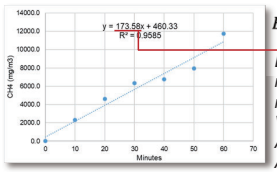


Fig 2 Onsite monitoring & the core sampling design for septage

Sample analysis for septage:
Onsite measurement: pH, E.C., DO, ORP, liquid temp.;
Laboratory analysis: SS, VSS, COD_{Cr}, BOD_5, T-N, sT-N, NH_4-N, NO_3-N, NO_2-N, T-P, PO_4-P.

Emission rate calculation



$$E = \frac{m \times 60 \times 10^{-3} \times 24 \times V_{FC} \times A_{comp}}{A_{FC} \times n}$$

E: the emissions rate (g/cap/day);
m: mass emission rate (mg/m³/min);
n: household size (capita);
V_{FC}: the chamber volume (m^3);
A_{comp}: area of compartment (m^2);
A_{FC}: area covered by floating chamber (m^2).

3. Results and discussion

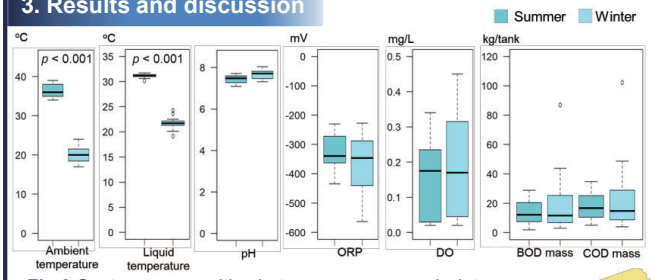


Fig 3 Septage composition between summer and winter

→ pH, ORP, DO, COD mass and BOD mass were **not significantly different** between summer and winter in Hanoi;

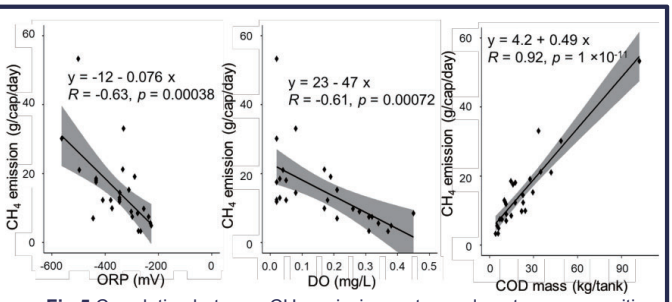


Fig 5 Correlation between CH_4 emissions rates and septage composition

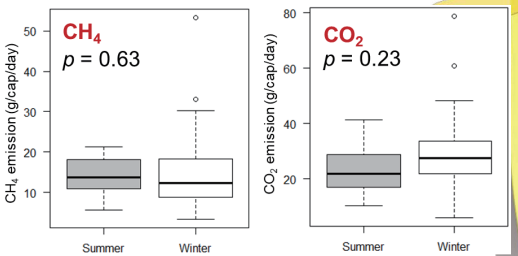
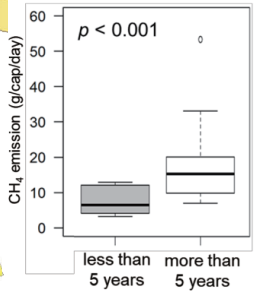


Fig 4 CH_4 & CO_2 emissions rates in winter & summer in Hanoi

No clear correlation between temp. and emissions

→liquid temp. (19.1-31.7°C) had **no significant impact** to emissions;

→Not **significantly different** in CH_4 & CO_2 emissions between summer and winter in Hanoi.



ORP, DO, organic mass & septage storage periods could play a more significant role in GHG emissions.

Stable temperature at the bottom of septic tanks (difference in soil temp (0.5m depth) between summer and winter was <6°C in the sub-tropical area, *Rodríguez et al., 2010*);

4. Conclusions

1) GHG emissions from septic tanks were **not significantly different** between summer and winter in Hanoi;

2) Emission rates from septic tanks (including summer and winter) were: **CH_4**: 14.96 ± 9.43 g/cap/day; **CO_2**: 27.75 ± 14.29 g/cap/day

The Monitoring of SARS-Cov-2 as Airborne Transmission Potential : Case Study Indonesia

Kamarisima*[1], Pingkan Aditiawati[1], Intan Taufik[1], Azzania Fibriani[1], Sparisoma Viridi[2], Anwar Fauzi Rahmat[1], Army Susandi[3], Aristyo Rahadian[3]
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Introduction

The COVID-19 pandemic caused by the SARS-Cov-2 virus has risen awareness worldwide. The data by November 2020 showed that Indonesia has been reported 470.648 cases since the first case in March 2020. As shown in Figure 1, the daily indices of active cases in Indonesia still increasing until today. The burden of COVID-19 was severe in Jakarta as the capital city of Indonesia and the centre for business and it drastically increased after the regional lockdown was terminated (NADCI,2020). There were many possible ways of SARS-Cov-2 virus transmission, such as direct contact, droplets transmission, and airborne transmission potential as the newest update (WHO,2020). However, the studies of airborne transmission of this virus in the urban environment were limited. the research was set up to monitor the presence of SARS-Cov-2 in the air particulate matter and its association with other microbes in the air particulate matter. This study mainly focused on the top three biggest transit-stations of Commuter train in Jakarta, namely (Manggarai, Tanah Abang, and Jakarta Kota). The commuter train was chosen because this was the only public transport that still operated during Jakarta-regional Lockdown. Thus, the impact of increasing human activities in the new normal activities may contribute to the accumulation of the SARS-Cov-2 virus in the air column.

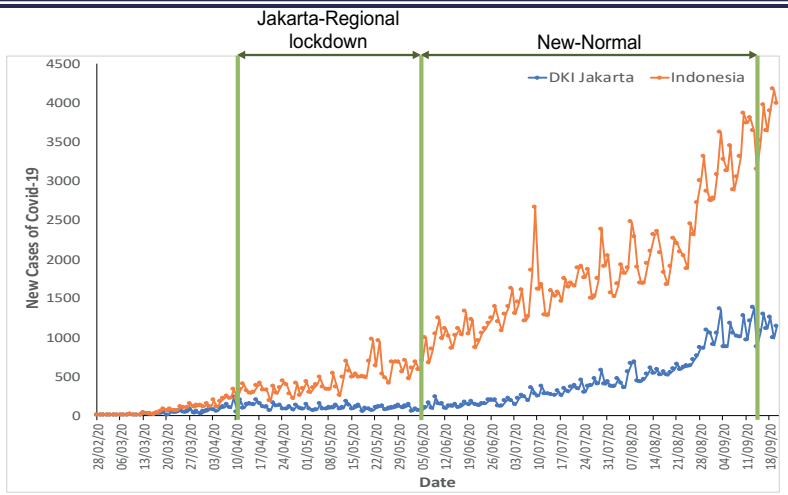


Figure 1. Number of active cases daily in Indonesia from February to September 2020 (The National Agency for Disaster Countermeasure of Indonesia, 2020)

Methodology

1 Air Sampling

The airborne microbes were collected using the PVDF membrane with pore size 0.45 µm for bacteria and 0.22 µm for the virus. Total air volume collected 5.08 m3. The sample collected at September, 11-12 2020

2 Bacterial Analysis

Bacterial quantification was done using culturable methods with agar media: Nutrient agar (for fastidious bacteria) and R2A agar (for non-fastidious bacteria)

3 The SARS-Cov-2 Detection

The viral RNA was extracted using Patho Gene-spin™ DNA/RNA Extraction Kit for viral nucleic acid. Then followed by RT-PCR analysis using DAAN kit . Gene targeted were: Internal control (RNAseP, SARS-Cov-2 gene (ORF1AB and N gene)

4 The Secondary Data

The secondary data obtained in this study were: air quality indices, passenger behaviors, and the number of passenger of the commuter train

Results and Discussion

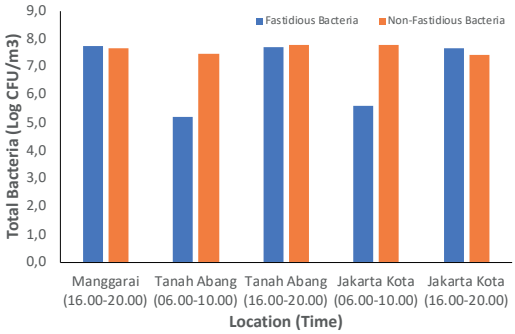


Figure 2. Total bacteria counts in the air particulate at three transit stations of commuter train in Jakarta

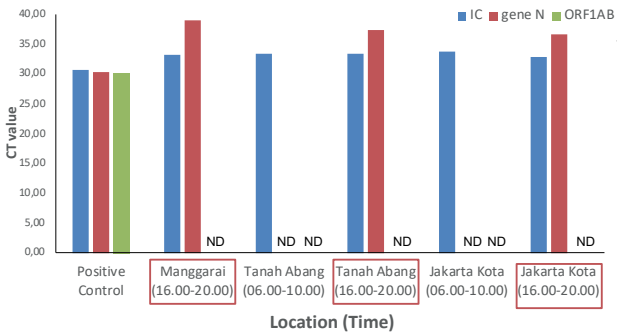


Figure 3.SARS-Cov-2 detection in the air particulate at three transit stations of commuter train in Jakarta

Table 1. Total Passenger Counts at three transit stations of commuter train in Jakarta on September, 11-12th, 2020

Passangger Counts	Manggarai	Tanah Abang	jakarta Kota
Gate in	32,433	139,46	30,913
Gate out	99,411	196,973	56,623
Total	131,844	336,440	87,753
(Gate in-Gate out)	(66,978)	(57,506)	(25,710)

In this study, the airborne microbial counts are not only limited to the SARS-Cov-2 virus but also the total bacteria to determine the air quality in general. As shown in Figure 2, the accumulation of fastidious bacteria was recorded at all stations during the night-time. The total fastidious bacteria was increased by two logs. While the number of fastidious bacteria remained stable. Moreover, the increasing number of total bacteria was also correlated with the presence of SARS-Cov-2 viruses (N gene) at all stations during nigh- time. A strong correlation (Pearson index > 0.9) also shown between microbial counts (bacteria and virus) and the number of passengers out. Thus, it served as evidence of SARS-Cov-2 virus accumulation in the air particulate which can be further used to determine the airborne transmission in Indonesia and worldwide.

ACKNOWLEDGEMENT:
This study was funded by Indonesian Ministry of Research and Technology

This poster is undisclosed

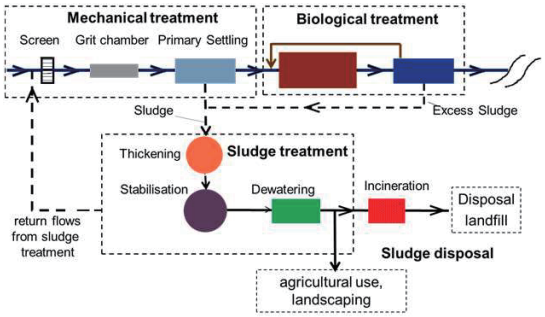
STUDY ON THE REDUCTION EFFICIENCY OF SLUDGE FROM WASTEWATER TREATMENT PLANT BY THE AEROBIC STABILIZATION PROCESS

Authors: VO Diep Ngoc Khoi*, LE Trong Binh*, TRAN Van Quang**

* The University of Science and Technology, The University of Danang
** Environment Protection Research Center, The University of Danang

INTRODUCTION

- **WWTP Sludge Treatment in general**

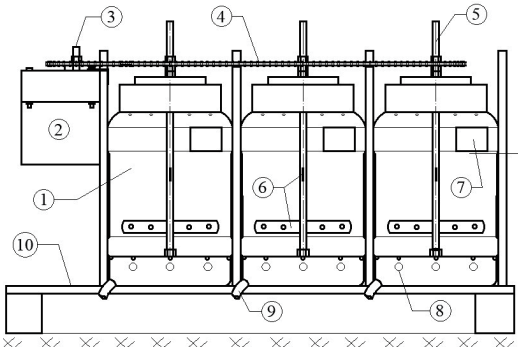


- **WWTP Sludge Treatment in new approach**

Sludge + Bulking agents + Heated air supply

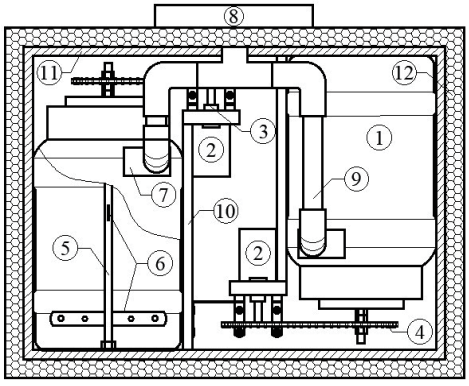
Sludge Reduction Rate & Stabilized Sludge Reuse

MATERIALS AND METHOD



Model structure (without the heated air supply – MH1)

Notes: *1-Reactor; 2-Motor; 3-Motor spindle; 4-Transmission sprockets; 5-Rotary; 6-Paddle; 7-Material input; 8-Exhaust hole; 9-Leachate pipe; 10-Model fixed floor*



Model structure (the heated air supply – MH2)

Notes: *1-Reactor; 2-Motor; 3-Motor spindle; 4-Transmission sprockets; 5-Rotary; 6-Paddle; 7-Material input; 8-Intake fan; 9-Heated air pipe; 10-Partitions; 11-Model fixed wood box; 12-Insulation foam barrel*

Cedar chips (CC), imported from Japan

WWTP Sludge (S) and Hyacinth (H) sampling

NT	NT0*	NT1	NT2	NT3**	NT4**
S (g)	100	100	50	100	50
H (g)	0	0	50	0	50
CC (g)	0	180	180	180	180

Notes: (*): NT - Without combined with bulking agent (Cedar chips); (**): NT - Combined with heated air supply

$$H = \frac{M(1)-M(4)}{M(1)} x100\ (\%) = \frac{M(1)-(M2-M3)}{M(1)} x100\ (\%)$$

Where: *H-Sludge reduction rate (wet weight, %); M(1)-The total amount of waste loaded (g/30 days); M(2)-Total weight after decomposition (g/30 days); M(3)-The amount of wood chips (g/period); M(4)-The total amount of residual waste (g/30 days).*

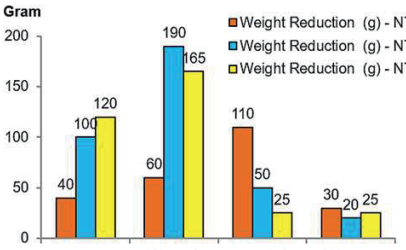
RESULTS & DISCUSSION

The properties and composition of pressed sludge and Hyacinth

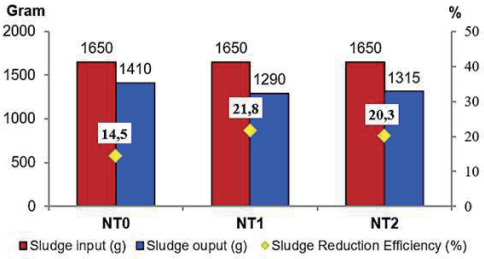
Samp.	Mois. (%)	Ash (%)	C (%)	N (%)	C/N
S-1	82.5	33.4	29.9	1.25	24
S-2	80.3	36.2	35.3	1.02	35

Samp.	Mois. (%)	Ash (%)	C (%)	N (%)	C/N
H-1	82.0	1.43	48.06	0.32	150
H-2	83.6	1.52	49.01	0.47	104

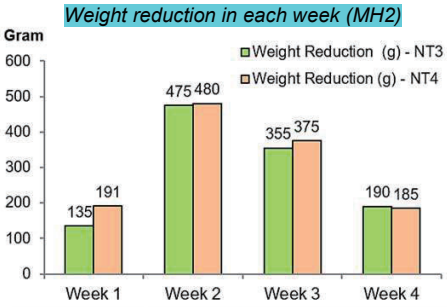
Weight reduction in each week (MH1)



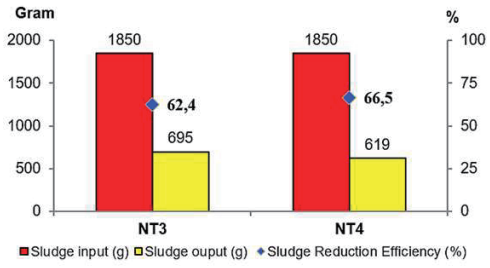
Material reduction rate after 4 weeks (MH1)



Weight reduction in each week (MH2)



Material reduction rate after 4 weeks (MH2)



Ratio	Week 1	Week 2	Week 3	Week 4
Material/Chips	0 - 1.16	1.16 - 1.27	1.27 - 2.24	2.24 - 3.44
Material/Chips	0 - 1.47	1.47 - 1.62	1.62 - 2.69	2.69 - 3.86

1,16-1,27 (NT3) & 1,47-1,62 (NT4)

H (> 20%): None heated air supply
H (> 62%): Heated air supply

CONCLUSIONS

The results show that the rate of decomposition according to the waste volume reduction after 4 weeks in an aerobic condition with cedar chips reached over 20%, about 7% more than without media in the same condition, it means there are differences when combining cedar chips in an experiment. This rate increased by about 40% in the condition of thermal stability and increased water evaporation. Product after decomposition process is assessed to have significant changes in color, odor and material size. It is an important basis for the establishment of the appropriate process parameters, the material/media mixing ratio and the duration of the experiment to determine the completely decomposition rate of materials in the subsequent studies.

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START-UP IN DRY ANAEROBIC DIGESTION: EFFECTS OF SHORT-TERM BIODEGRADABILITY OF THE WASTE AND INOCULUM'S METHANOGENIC ACTIVITY.

Nguyen Pham Hong Lien*, Shigeo Fujii**, Hidenori Harada***, Huynh Trung Hai*, Nguyen Thi Anh Tuyet*

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** Graduate School of Global Environmental Studies, Kyoto University; Graduate School of Asian and African Area Studies, Kyoto University

Background & Objective

Substrate to Inoculum ratio (S/I or W/I) is an important parameter in start-up of dry anaerobic digestion:

Traditional way to calculate W/I ratio (weight basis) | This study

S/I ratio: Substrate (Waste) / Inoculum (digested sludge)

VS basis	TS basis	WW basis
m_{VS} of waste (gVS)	m_{TS} of waste (gTS)	m_{WW} of waste (gTS)
or	or	
m_{VS} of inoculum (gVS)	m_{TS} of inoculum (gTS)	m_{WW} of inoculum (gTS)

Note: "m" is mass

New basis

Note: "m" is mass

OD_{20} of waste * m_{WW} (mgO_2/gWW) (gWW)

SMA of inoculum * m_{VS} (mgCOD/gVS.day) (gVS)

=R*

Disadvantages: These ratios are different from case to case because of the different waste and inoculum characteristics.

The modified ratio R* takes into account
+ the PUTRESCIBILITY OF THE WASTE (OD_{20})
+ and the STRENGTH OF INOCULUM (SMA)

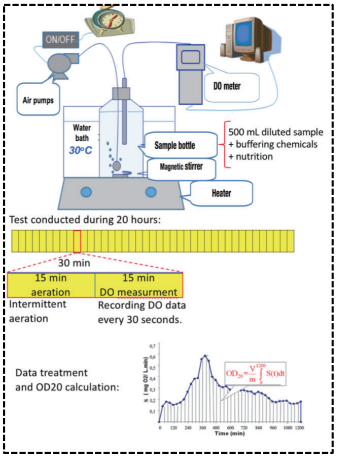
This study is to find out if a modified S/I ratio that is taken into account short-term biodegradability of the waste by OD_{20} parameter and Specific Methanogenic Activities of inoculum could be a better alternative parameter for success start up of solid waste dry anaerobic digestion

Methodology

Waste collection and preparation: Market waste + Yard Waste

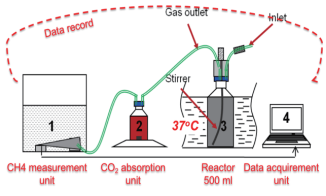
Inoculum (digested sludges) collection (5 samples)

OD_{20} determination:



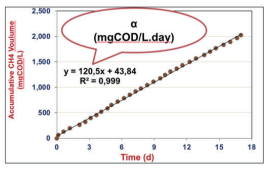
Combine to create 10 different mixtures

High solid anaerobic digestion (TS>15%) experiments (35 days retention time):



SMA determination:

SMA reactor content:
1. Inoculums
2. Substrate: acetic acid
3. Nutrients
4. Buffer



$SMA = \frac{\alpha \times V}{m_b}$, mgCOD/gVS.d

Where:
V – reaction volume, L
m_b – inoculum weight, gVS.

Results

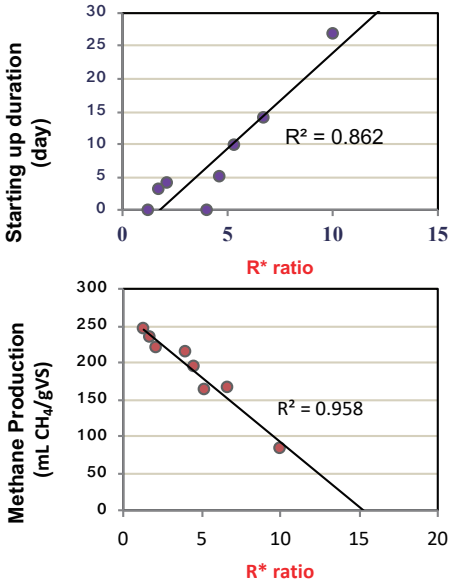


Figure: Correlation of R*ratio with starting up duration and methane production.

W/I ratio (weight basis) did not shown good correlation with neither methane production nor starting up duration ($R^2 < 0.5$) (Figure is not shown)

Conclusions

1. **A modified substrate to inoculum ratio R***, that is taken into account short-term biodegradability of the waste by OD_{20} parameter and Specific Methanogenic, **has a better correlation with starting up duration and methane production than that of weight-based S/I ratio.**
2. **A modified S/I ratio (R*) below around 5 (mgO_2/mgCOD.day)** is recommended for quick starting up of dry anaerobic digestion

Acknowledgment: The authors would like to acknowledge GSGES Seeds Research Funding Program and Hanoi University of Science and Technology for financially support this research.

Study in evaluating the possibility of increasing the organic matter loading treatment of Bio-Carrier in the Aeration reactor for seafood wastewater

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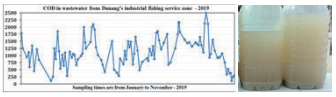
Faculty of Environment, Danang University of Science and Technology (DUT), Viet Nam

Introduction

Seafood Wastewater, Danang city, VietNam



→ *the fluctuation of the contaminant load in the influent.*
→ *The high concentration of organic matters and nutrient*

Treatment Process/Technology

(1) Influent → Anaerobic → anoxic → Oxic → Calrification → efluent
(2) Influent → Flotation/ (Flocculation-Calrification) → Oxic → Calrification → effluent
→ Method & Tech.: Suitable
→ Operation: Unstable & overload;

- Increase the capacity of Aeroten tank → Lack of land area;
- Increase the organic matter loading in aeroten tank;

Research→ the possibility of increasing the organic loading when adding bio-carriers for aerobic process

Methodology

Approach

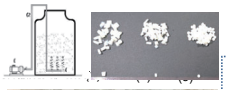
Collecting data → Designing model → Operating model → Evaluating results

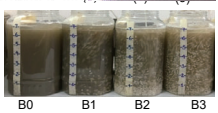
- Reactor;
- Aeration systems;
- Bio-carrier.

- Environmental conditions;
- HRT;
- Organic matter loading: F/M.

- Operational condition
- The treatment efficiency & The ability to increase OLR

Model





B0 B1 B2 B3

(1) BK-Biocarrier 4mm, (2) BK-Biocarrier 2mm, (3) PVAGel

B0: Reactor without io-carrier

B1: Reactor adding 10% BK-Bio-carrier 4mm

B2: Reactor adding 10% BK-Biocarrier 2mm

B3: Reactor adding 10% PVAGel

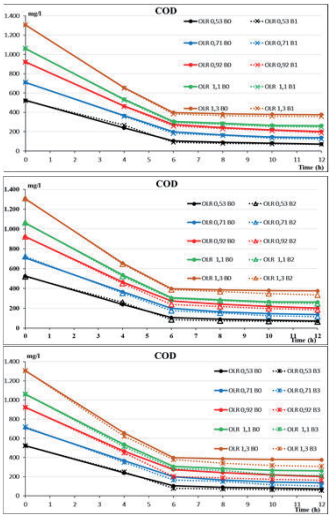
Experimental process

The wastewater taken from seafood processing plant, after pre-treatment and before entering the aeration tank.

(i) Adaptive operation & Determining Hydraulic Retention Time (HRT);
(ii) Determining the removal efficiency of organic matter by time;
→ Operating: Organic matter loading rate (OLR) was changed from 0.2 to 1.3gCOD/g (sludge).day;
→ Sampling: 1h, 2h, 4h, 6h, 8h, 10h & 12h after operating & Analytical parameters : pH, Alkalinity, BOD_5 , COD.

Results and Discussion

The removal efficiency of organic matter by time



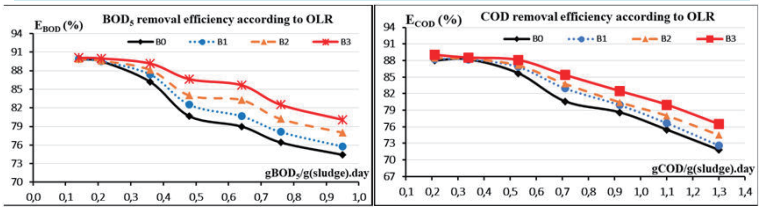
- After the first 6 hours, COD decreased rapidly, after 10 hours the value did not change significantly;
- When OLR changes from 0.53 - 0.71 - 0.92 - 1.1 - 1.3 gCOD/g(sludge).day., The removal efficiency of organic matter (E_{COD}) is respectively:

→ With BK-Biocarrier 4mm: ($E_{(COD)}$) 86.9% - 82.7% - 79.5% - 76.6% - 72.8%

→ With BK-Biocarrier 2mm: $E_{(COD)}$ 87.9% – 84.1% – 80.1% – 76.6% - 74.5%

→ With PVAGel → $E_{(COD)}$ 88.9% – 85.8% – 82.3% – 80.2% - 76.5%.

Improve the efficiency of aeration tank (Increase ORL)



→ Treatment efficiency decreases when increasing OLR rate;
→ With the same OLR rate (L_o), the treatment efficiency increases by adding the bio-carriers
→ L_o < 0.3gBOD_5/g(sludge).day. → The addition of bio-carrier had no impact;
→ L_o > 0.5gBOD_5/ g(sludge).day.→ The addition of bio-carriers to increase the removal efficiency of organic matter was significant;
→ To achieve the E_{COD}~80% → Adding 10% of bio-carriers (BK-Biocarrier 4mm, BK-Biocarrier 2mm and PVA Gel) & model could get the OLR: 0.67; 0.78 and 0.95 gBOD_5/g (sludge).day respectively, while the OLR without any carrier achieve 0.5 gBOD_5/g (sludge).day.

Conclusion & Recommendation

Conclusion:

(1). With bio-carriers, the aeration tank can improve the the organic loading removal efficiency.

(2). PVAGel was the most efficiency carrier, then BK-Biocarrier 2mm and BK-Biocarrier 4mm carriers run after, respectively.

(3). When operating the aeration tank with BOD_5 removal efficiency of 80%, the organic loading rate increased 1.84 times with adding 10% PVAGel carrier (correspond with 0.95 gBOD_5/g(slude).day) and 1.5 times when adding 10% BK-Biocarrier 2mm (correspond with 0.78 gBOD_5/g(sludge).day).

Recommendation:

Continue to research on the optimal usage for each bio-carrier types, on the ability to remove nutrients & Compare the cost, the economic aspect in practice.

A novel method for extraction of lipids from liquid microalgae without dewatering

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* Department of Environmental Engineering, Graduate School of Engineering, Kyoto University, Kyoto, Japan

Background

The development of renewable energy technologies has advanced in response to an ever-increasing demand for fossil fuels and global warming caused by CO_2 emissions from their combustion. Biodiesel produced from microalgae is considered a promising substitute for fossil fuels. Biodiesel production from microalgae consists primarily of microalgae cultivation, harvesting, lipid extraction, and transesterification. However, harvesting and lipid extraction are substantial bottlenecks in the development of an energy-efficient and cost-effective process for conversion of microalgae to biodiesel. Here, liquefied DME was used to extract lipids from microalgae without dewatering. A suitable entrainer for dimethyl ether (DME) was identified among ethanol, dimethyl sulfoxide (DMSO), acetone, and tetrahydrofuran (THF) for improving DME performance.

Materials and methods

Marine microalgae strain *N. oculate* was cultivated in 20-L bucket photo-bioreactors at 20 ± 2° C with light/dark cycles of 12 h/12 h. After 2 weeks of cultivation, the microalgae entered the stationary phase and were thickened by induced flocculation using 60 mg/L AlCl3. The DME extraction system was shown in Fig.1: a liquefied DME storage vessel (vessel 1), a vessel to measure DME (vessel 2), a vessel for lipid extraction (vessel 3) and a vessel for separating liquid from solvents (vessel 4). The performance of our DME-based method was compared to the performances of Bligh & Dyer and Soxhlet methods in terms of raw lipid yield, fatty acid yield, and C/H/N composition. For each method, extracted lipids were characterized by thermal gravimetry (TG)/differential thermal analysis (DTA), Fourier-transform infrared spectroscopy (FTIR), and trace elemental analyses.

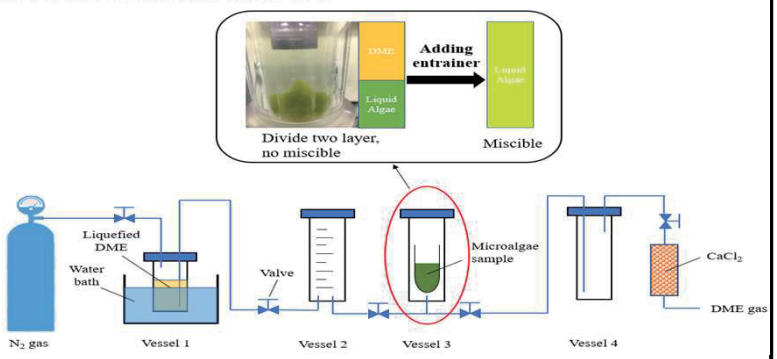

Fig.1 Lipid extraction system.

Results and Discussion

These results (Fig.2) showed that both ethanol and acetone were effective entrainers, enhancing raw lipid yields by factors of 4.0 and 6.4 relative to the blank, respectively. Lipid extraction using our DME-based method was compared with Soxhlet and Bligh & Dyer extractions. When B&D (dry) extraction is regarded as the benchmark for total lipid recovery, DME method of 1st extraction process extracted 26.4% of the total raw lipids and 54.4% of the total FAMEs in the microalgae. Although the process did not achieve complete lipid extraction, simultaneous dewatering would allow the remaining lipids to be easily recovered in the second DME extraction process, by which 53.2 % of total raw lipids with 44.7% of the total FAMEs was further extracted by the 2nd process.

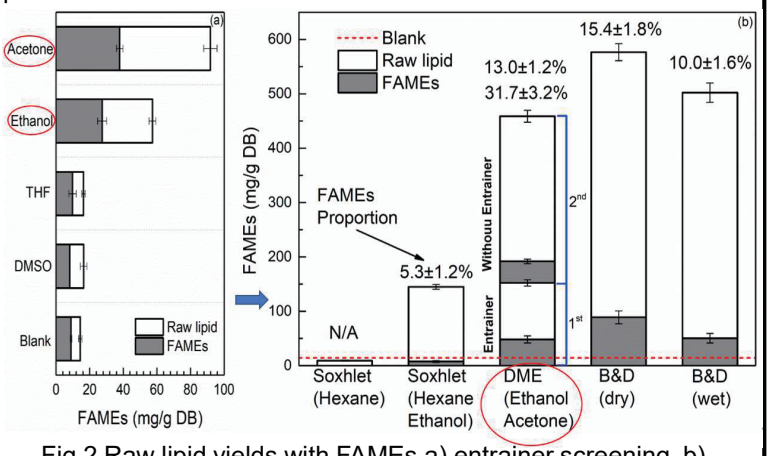

Fig.2 Raw lipid yields with FAMEs a) entrainer screening, b) comparison with conventional methods.

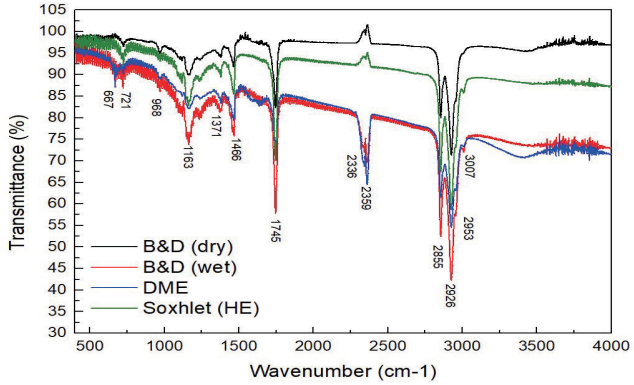

Fig.3 FTIR of lipids obtained using the four extraction methods.

Conclusions

(a) Mixture of ethanol and acetone can significantly improve the yield of lipids extracted from microalgae without dewatering; (b) The DME method of 1st process extracted 26.4% of the total raw lipids with 54.4% of the total FAMEs in microalgae, and remnants could be easily recovered by a 2nd extraction process; (c) There was no obvious difference among lipids by the various methods, except for nitrogen in lipids extracted by B&D (wet) and DME method were higher; (d) DME-based extraction resulted in particularly high levels of Mg in the produced lipids, indicating that further purification would be required prior to the use of these extracted lipids as biofuel.

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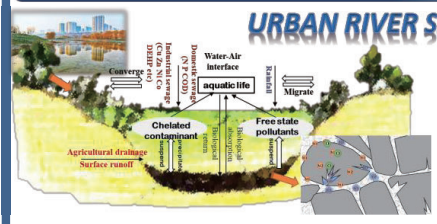
Heavy Metal Contaminated Sediment Remediation by Chitosan Oligosaccharide Synergistic Leaching with Bio-surfactant

Authors: Ying Zhang*, Ruohan Li*, Yuntao Guan*

* Institute of Environment and Ecology, Tsinghua Shenzhen International Graduate School

Motivation



In the process of remediation of composite polluted sediment, following is of interest to the current study:

(i) Desorption and complexation behaviour of sediment contaminants(HMs, DEHP) during synergistic leaching.

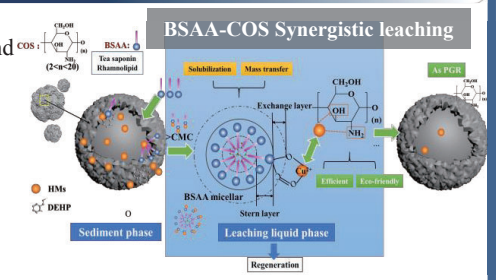
(ii) Targeted capture and degradation of DEHP in multivariant load eluents.

With the continuous development of urban modernization during the last decades, industrial, domestic sewage and urban non-point source runoff pollution flood into the urban river channel. Taking Shenzhen, China as a example , heavy metals (HMs) such as copper, chromium, nickel, cobalt with organic pollutants as DEHP accumulate in river sediment through river, bringing huge risks to the river water safety and the dredged sediment is difficult to dispose of.

Methodology

(i) The sediment is leached and aged by heavy metal-organic material solution before leaching.

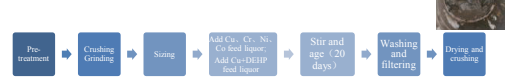
(ii) Chitooligosaccharides, rhamnose and tea saponin are chosen to be the leaching reagents.



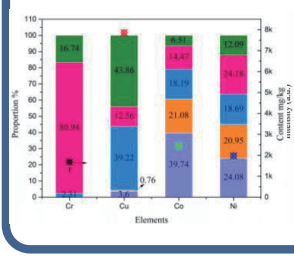
(iii) The leaching equilibrium isothermal test was carried out in a constant temperature oscillator. The content of HMs was measured by ICP, the content of DEHP was measured by HPLC, and the nanometer size of the leaching solution was measured by Zeta potentiometer.

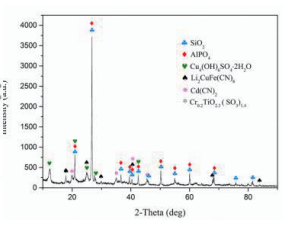
Results

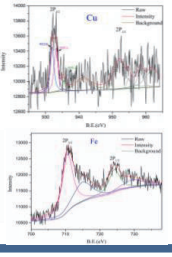
1. The characterization of microstructures and distribution pattern of the composite contaminated sediment



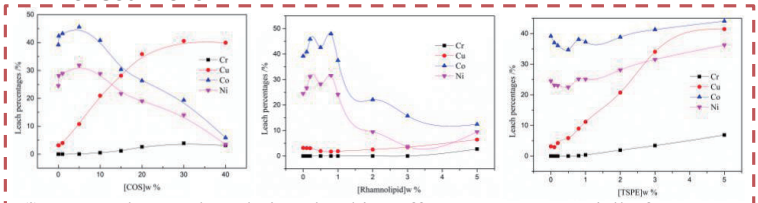
Element	Mg	Ca	Mn	Cu	Zn	Ni	Cr	Cd	Co	TP	TKN	DEHP
Content mg/kg	6505	2283	421.7	7857.3	249.6	1973.7	1681.4	5.404	2456.9	1190	1057	7.45



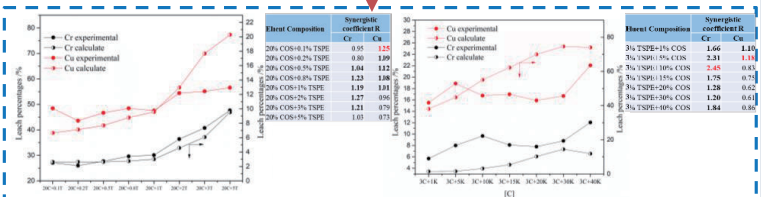




2. Leaching behaviour and effect of each system on HMs and DEHP in river sediment



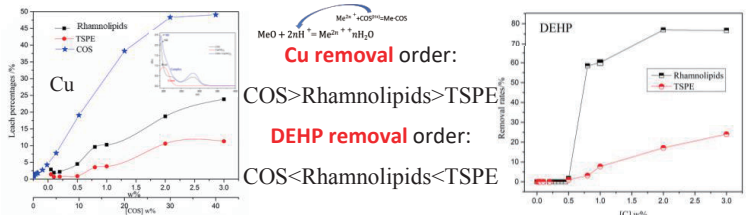
(i) COS and TSPE has obvious leaching effect on HMs, expecially for Cu.



Eluent Composition	Synergistic coefficient R	
	Cr	Cu
20% COS+0.1% TSPE	0.95	125
20% COS+0.2% TSPE	0.80	1.09
20% COS+0.5% TSPE	1.04	1.12
20% COS+0.8% TSPE	1.23	1.08
20% COS+1% TSPE	1.19	1.01
20% COS+2% TSPE	1.27	0.96
20% COS+3% TSPE	1.21	0.70
20% COS+5% TSPE	1.03	0.73

Eluent Composition	Synergistic coefficient R	
	Cr	Cu
3% TSPE+1% COS	1.66	1.10
3% TSPE+1.5% COS	2.31	1.18
3% TSPE+10% COS	2.45	0.83
3% TSPE+15% COS	1.75	0.71
3% TSPE+20% COS	1.28	0.62
3% TSPE+30% COS	1.20	0.61
3% TSPE+40% COS	1.84	0.80

(ii) Synergetic behavior can be observed with COS and TPSE, TPSE promotes desorption of the HMs in the sediment, COS chelates the HMs in the free state.



Cu removal order:

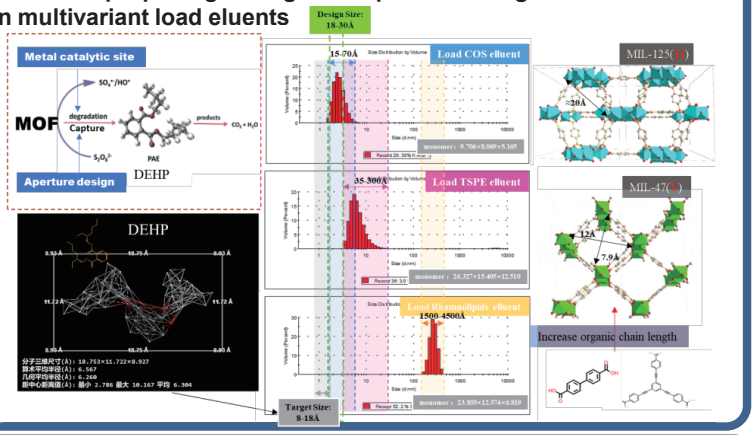
COS>Rhamnolipids>TSPE

DEHP removal order:

COS<Rhamnolipids<TSPE

(iii) Single leaching system cannot simultaneously remove copper and DEHP contamination in contaminated sediment.

3. Method proposing of targeted capture and degradation of DEHP in multivariant load eluents



Sumarry

(i) COS and TSPE have optimal leaching effects on HMs removal. In COS & TPSE synergetic leaching system, synergetic coefficients of Cu and Cr can obtain 2.4 and 1.2 respectively. In which, TPSE promotes desorption of the HMs , COS can chelates the HMs in free state efficiently.

(ii) A composite leaching system is necessary for simultaneous removal of heavy metals and HMs, targeted capture and degradation of DEHP in multivariant load eluents by MOF is proposed.

Indium-modified Ga_2O_3 hierarchical nanosheets as efficient photocatalysts for the degradation of perfluorooctanoic acid

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BACKGROUND

The contamination of per- and polyfluorinated alkyl substances (PFASs) in environment has emerged as an environmental and health concerns. With their widespread use in industrial surfactants, consumer products and firefighting foams, PFASs have been frequently detected in drinking, wastewater, food, and even living organisms. Recent studies have revealed that exposure to PFAS can lead to metabolic disruption, immunotoxicity, and upping the risks of cancer. Regarding the environmental persistence and potential health risks, it is imperative to develop effective approaches for the remediation of PFAS.

Perfluorooctanoic acid (PFOA), as a particularly troublesome member of PFASs family, has attracted ever-increasing concern in the past decades. Due to the high thermal and chemical stability of C-F bonds (536 kJ mol^{-1}), PFOA is environmentally persistent and hard to be biologically decomposed.

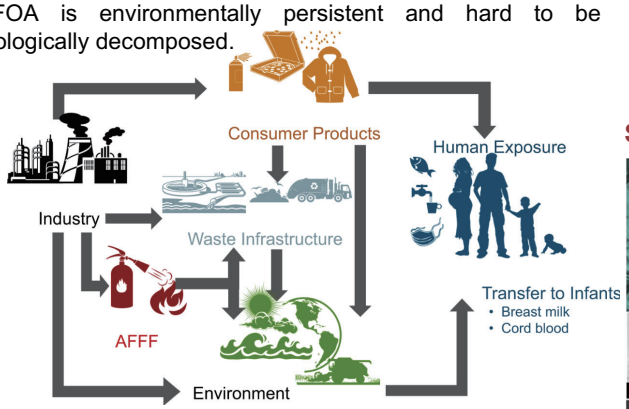
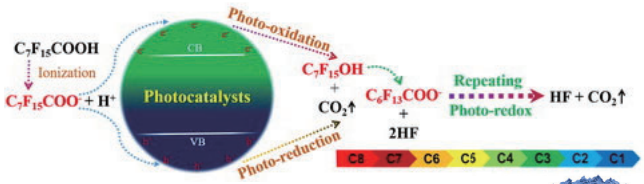


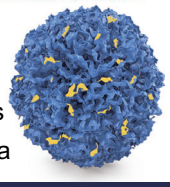
Fig. 1 Environmental transport, fate, and risk of PFAS

The recent advances in heterogeneous photocatalysis have demonstrated high efficiencies in degrading persistent contaminants, which provides an alternative approach for PFOA removal. Notably, Ga_2O_3-based photocatalysts exhibited great potential for PFOA remediation due to its high oxidizing capability and energy sustainability. Thus, Ga_2O_3 hierarchical nanosheets modified by a series of transition metals were rationally developed, and applied as heterogeneous photocatalysts for fast and efficient PFOA degradation.

METHODOLOGY



- ✓ Ga_2O_3 hierarchical nanosheets
- ✓ Doping with foreign metal ions
- ✓ Fabricating semiconductor heterojunctions
- ✓ Construct structures with high surface area



RESULTS & DISCUSSION

Transition metal modified Ga_2O_3 nanosheets for photodegradation of PFOA

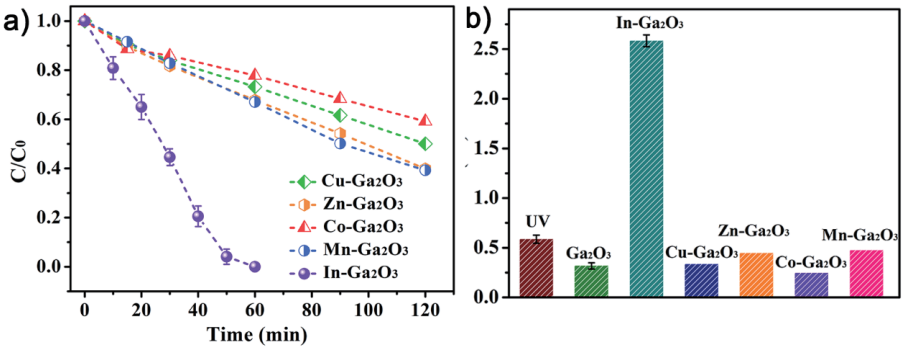


Fig. 2 (a) Photocatalytic degradation of PFOA with UV light by different transition metal modified Ga_2O_3 nanosheets, and the In-Ga_2O_3 under darkness was used as control. (b) Rate constants of PFOA degradation by different transition metal modified Ga_2O_3 nanosheets. The reactions were carried out at initial PFOA concentrations of 20 mg/L with 0.5 g/L catalysts, 298 K and without pH adjustment (pH = 4.5).

Structural analysis of In-Ga_2O_3 hierarchical nanosheets

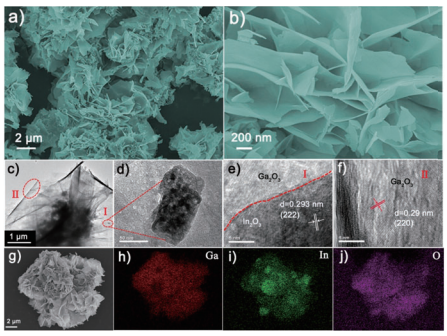
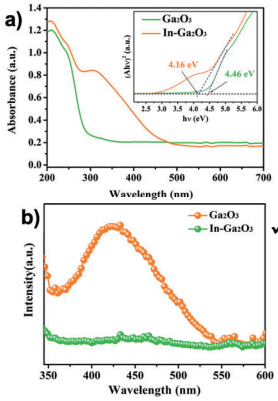


Figure 3. (a, b) SEM images and (c-f) TEM and HRTEM images of In-Ga_2O_3 hierarchical nanosheets, (g-j) SEM image and the corresponding EDS mappings of the In-Ga_2O_3 hierarchical nanosheets.



- ✓ Light harvesting across UV to visible region
- ✓ Better photogenerated carrier separation ability

Figure 4. (a) UV-visible diffuse reflectance and (b) Photoluminescence spectra of In-Ga_2O_3 hierarchical nanosheets.

PFOA Degradation pathways and mechanism insights

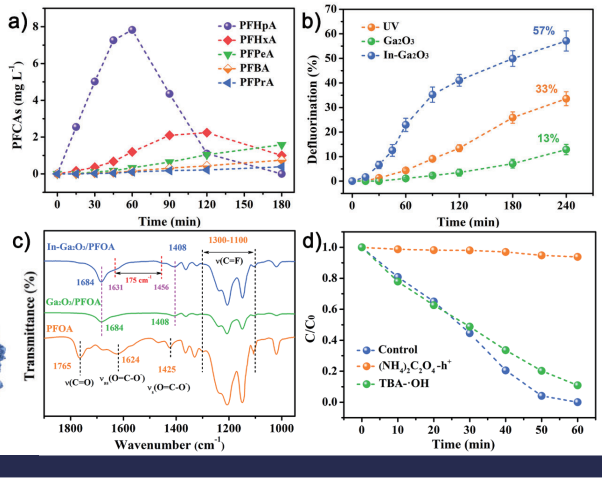


Fig. 5 (a) Time-dependent concentration changes of intermediates and (b) defluorination during PFOA photodegradation by In-Ga_2O_3 hierarchical nanosheets. (c) DRIFT spectra of PFOA, Ga_2O_3/PFOA and In-Ga_2O_3/PFOA hierarchical nanosheets. (d) Photodegradation of PFOA in presence of different quenching agents.

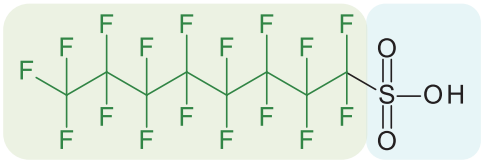
Screening approach of per- and polyfluoroalkyl substances (PFASs) in firefighting foam impacted waters in Okinawa

Satoru Yukioka*, Shuhei Tanaka*, Yuji Suzuki*, Shinya Echigo**, Anna Kärrman***, and Shigeo Fujii*

* Graduate School of Global Environmental Studies, Kyoto University, Kyoto, Japan ** Graduate School of Engineering, Kyoto University, Kyoto, Japan
*** MTM Research Centre, School of Science and Technology, Örebro University, Örebro, Sweden

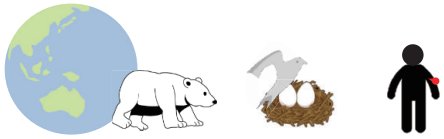
Research background

Perfluorooctane sulfonic acid (PFOS)

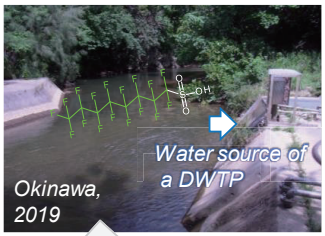


C-F bond is stable
- Water and oil repellency
- Heat-resistant

Widely detected water environment, biota, and human blood



(Smitwick et al., 2005; Young et al., 2007)



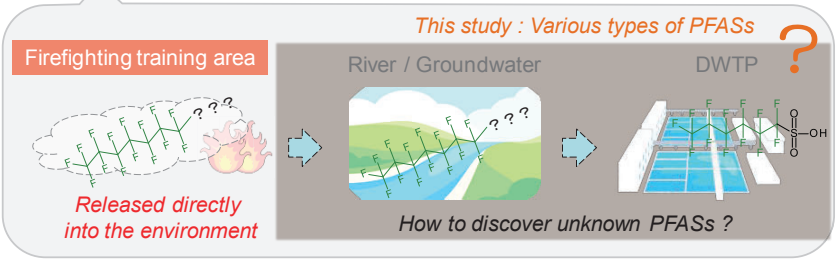
PFOS & PFOA in water source of a DWTP have exceeded U.S.EPA health advisory

(PFOS & PFOA: 70 ng/L)

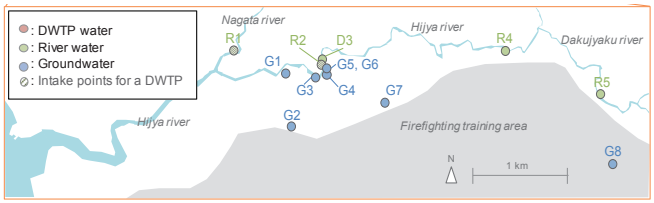
(OECD, 2019)

Previous studies : PFAAs & certain precursors

This study : Various types of PFASs

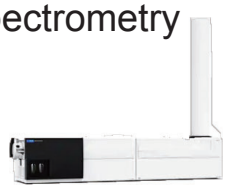


Methods

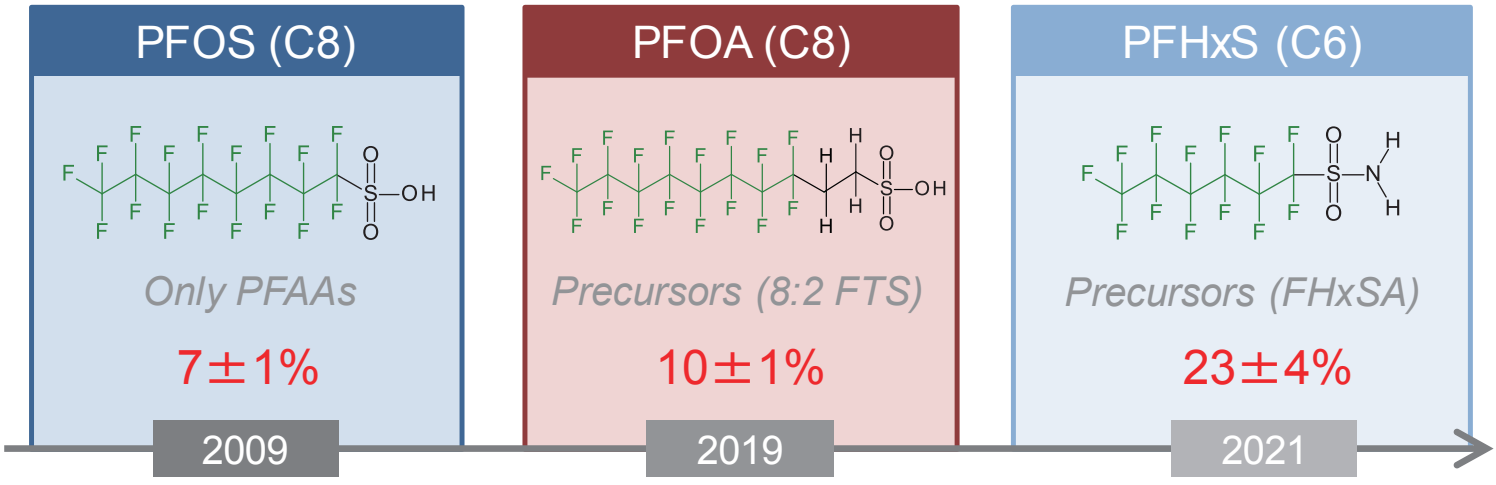


High resolution mass spectrometry

Suspect screening



Results and discussion



The 40% of total 116 PFASs will be regulated in next year.

Poster Presentations- Agriculture and Biology

Kyoto University International ONLINE Symposium 2020
on Education and Research in Global Environmental Studies in Asia

Evaluation on Flood Mitigation function of Urban Agriculture, a case study in Kamo river watershed, Kyoto, Japan

Boyiwen ZHANG*, Ryo NUKINA*, Shozo SHIBATA*
* Graduate School of Global Environmental Studies, Kyoto University

Background

Why urban agriculture(UA)? Why Kyoto city?

As a consequence of global climate changing, both the frequency and intensity of **extreme weather events** has dramatically increased over the last decades. The necessity of **strengthening urban resilience** to climate-related stress is well-established. **Green Infrastructure** has drawn researchers and policy makers attention since the turn of the century, and **Low Impact Development** (green roof, bio-retention, raingarden, ...) has been widely applied mainly in the western world. Urban agriculture ,as one of the green spaces inside urban area, its **environmental function** is less discussed compared to social and economical ones.

Japanese Urban Agriculture

- official land use within urban –promotion area as "productive green land".
- not rooftop farmland or edible garden but operated by full-time farmer.

Paddy dam (Yoshigawa, 2002)

- intentionally storage rainwater by installing "run-off control devices" to paddy field
- however, it has been only applied in rural area

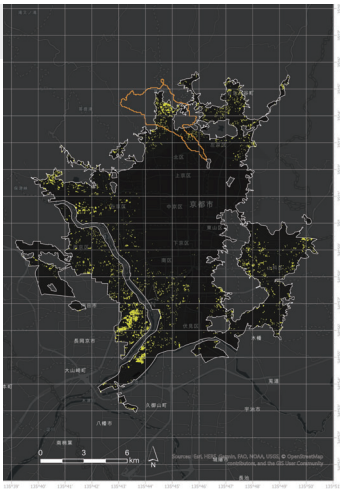


Fig.1 Kyoto city urban-promotion area (yellow: urban agriculture area; orange: research site, Kamo river watershed)

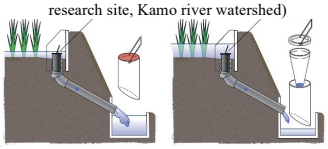


Fig.2 "Run-off control device" for paddy dam

Object

This study aims at quantifying the **water storage capabil**ity of urban farmlands in Kamo river watershed when the "run-off control devices" are applied. By doing so, it will help to stop the disappearing of this type of land use, and hopefully become a mirror of other regions, domestically and internationally.

Research site& Method

Kamo River watershed located in the north of Kyoto city. of house collapse. The total area is 870ha, within urban-promotion area 435ha (50.3%). This area is famous for its brand vegetables among Japan. The research will be conducted by three parts as in Fig. 3 below:

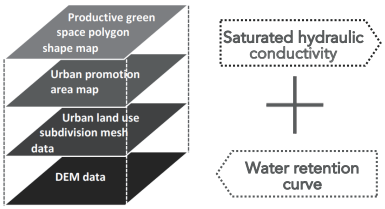


Fig.3 Research flow chart

- The land use analysis has been conducted by processing DEM data (5m) from National Land Research Institute, Land use subdivision mesh data(50m) and urban promotion area map from Japanese Ministry of Land, Infrastructure, Transport and Tourism; and Productive green land shape data from City planning division from Kyoto city by using ArcGIS 10.4.
- For soil samples, three sampling plots were selected on high, middle, and low elevation inside the densest region where urban farmlands locate. As a contrast for other green spaces' soil condition, 2 parks are also considered.

Results & Discussion

- 50.3% of the research site (438.33ha) belongs to urban promotion area (UPA), within it the dense existence of urban farmland stands out more. 76.1% of the surface is impervious, here, 68.4% is covered by building, the remained 1.0 % covered by roads. Over one third of the pervious surface is urban farmland (7.6% paddy field and 3.0% dry field, 46.9ha). Inside the urban promotion area urban parks area is less 1%.

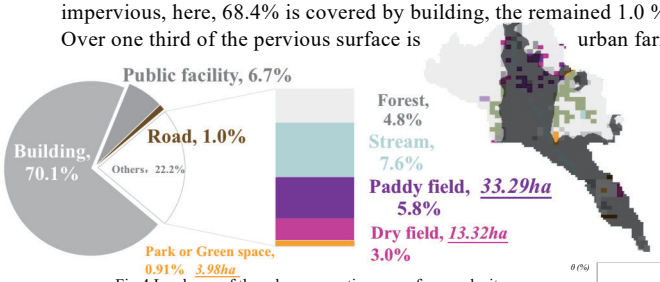


Fig.4 Land use of the urban-promotion area of research site

- Dry field's soil has the largest Ks, which means water is easier to transmit. Paddy field's and Park's soil are low in Ks, water could hardly be charged to the under ground water layer. From the water retention curve the capability of water continence is well established.

The water content at soil water potential pF -10cm is higher than truth, due to early operation before fully drainage.

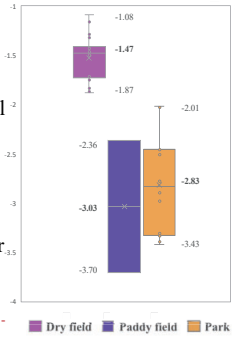


Fig.5 Saturated hydraulic conductivity

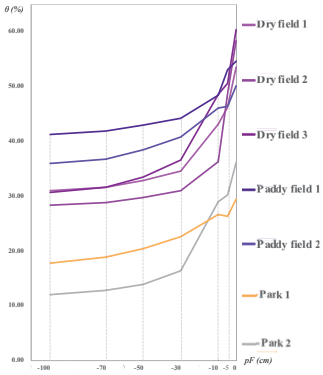


Fig.6 Water retention curve

Conclusion

The rain fall event used for trial calculations of water storage capability of urban farmland within research site was set as "Heavy rain of July, Heisei 30". The total precipitation was 171mm, and the maximal hourly precipitation was 20mm.

The water balance of rain water fell onto the urban-promotion area of research site has been calculated. The total amount of rainwater falls on the urban promotion area of research site is 486.5ton. Within paddy fields and dry fields together can hold 100.67ton water(**20.2%**). Its is **necessary** and **urgent** to not only protect from urban farmlands from disappearing, but also to regenerate them in Kyoto, in Japan.

This study clarified that the large potential of water storage capability of PGS in research site during heavy rainfalls, however, it will be only valid under the condition that all the paddy field is under appropriated construction. The actual surface runoff during rainfall to get a more precise water balance. To get a more accurate result, simulation in the practice of low impact development controls in SWMM is needed, and it will be conducted in the future research.

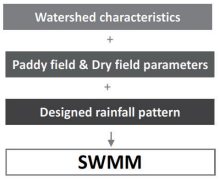


Fig.7 Future water simulation flow chart

Study of Zoo Animals and Exhibit Elements Based on Visitor Preference at Kyoto City Zoo

Authors: Sholihin Nafar [1][2], Masayuki Tanaka [3][4], and Shozo Shibata [1]

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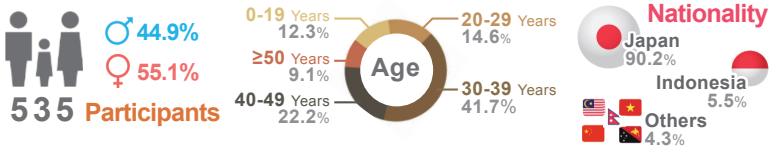
[3] Center for Research and Education of Wildlife, Kyoto City Zoo; [4] Wildlife Research Center, Kyoto University

BACKGROUND

The shifting of zoos to become more conservation-oriented has brought positive impacts to the environment and conservation practice in general. However, there is still a conflict between improving animal welfare and visitor satisfaction. Therefore, we try to figure out the equilibrium point of the conflict based on zoo exhibit design approach. This study is an initial research that collected visitor preferences on zoo animals and the landscape elements of zoo exhibits. By understanding visitor preferences, zoo exhibits can be designed by the consideration of visitor preferences as the representation of visitor satisfaction.

METHODOLOGY

Data was collected by a self-administrated questionnaire at Kyoto City zoo and online method. It was consisted of questions about (1) demographic information, (2) preference on animals, and (3) preference on zoo exhibits design. Seven scores of Likert Scale were used in the questions that required rating answers.



RESULTS AND DISCUSSION

The result of favourite and least favourite animals species were cohoerence with the preference of animal classes where Mammals tend to be the most favourite class compared other class. The results were similar to the previous researches conducted in UK (Moss & Esson, 2010; Carr, 2016) and US (Mooney *et al.*, 2020).

Most Favourite animals

1. Asian Elephant 13.5% (198 responses)
2. Giraffe 11.2% (164 responses)
3. Tiger 10.1% (148 responses)

Mammals — Very Like (38.9% responses)
Birds — Neutral (25.9% responses)
Amphibians — Neutral (24.9% responses)
Reptiles — Somewhat dislike (20.9% responses)
Fishes — Neutral (22.1% responses)
Insects — Neutral (20.6% responses)

Most Least Favourite animals

1. Snake 17.4% (165 responses)
2. Iguana 7.9% (75 responses)
3. Frog 14.3% (136 responses)

Preference of Exhibit Elements

- Wood/ Log — Very Important (24.2% responses)
- Grass — Very Important (28.3% responses)
- Stone — Neutral (24.6% responses)
- Pond/ Water Feature — Very Important (31.3% responses)
- Shrub — Very Important (26.2% responses)
- Flower — Very Important (27.1% responses)
- Toys (Environmental Enrichment) — Neutral (24.3% responses)
- Tree — Very Important (35.1% responses)
- Fence — Very Important (25.2% responses)

CONCLUSION

Mammal was suggested as the most favourite animal class compared the other class with the majority answers was 'very like'. In other side, reptile got the lowest score with the majority of visitor answer 'somewhat dislike'. The result of favourite and least favourite species also similar to the class preferences where Asian Elephant, Giraffe, and Tiger became the most favourite animals. In opposite, Snake, Iguana, and Frog became the most least favourite animals which were belong to reptile and amphibian. We also found that the presence of tree, flower, shrub, grass, wood/log, pond/water feature, & fence of zoo exhibits were 'very important' from visitor perspecitve. However, stone and toys/environmental Enrichment got a lower score where the majority answers were 'neutral'.

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Carr, N. (2016, July). An analysis of zoo visitors' favourite and least favourite animals. *Tourism Management Perspectives*, *20*, 70–76. https://doi.org/10.1016/j.tmp.2016.07.006
Mooney, A., Conde, D. A., Healy, K., & Buckley, Y. M. (2020, February). A system wide approach to managing zoo collections for visitor attendance and in situ conservation. *Nature Communications*, *11*(584), 1–8. https://doi.org/10.1038/s41467-020-14303-2

IMAGE REFERENCES

Kyoto City Zoo Website (https://www5.city.kyoto.jp/)
Book by Jojo Ticon from the Noun Project
Group questioning by Cathy Moser from the Noun Project
Light by Numero Uno from the Noun Project
Magnifier by Vectors Point from the Noun Project
Picture by Alice Design from the Noun Project
Task by Markus from the Noun Project

New soybean elite line for drought prone area of the Northeast Thailand

Authors: Jirapong Yangklang*, Patcharin Patthawaro*, Tidarat Monkham* , Sompong Chankeaw* and Jirawat Sanitchon*

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Abstract

The unpredictable climate and irregular rain distribution in Thailand affected sharply decrease the soybean production area. The problem solving via the breeding program, the criteria section has been changed from intermediate and late maturity to early maturity. KKU soybean research identified the elite line, KKU 35 * SJ-32 form multilocation yield trial with acceptance from farmers though participatory varietal selection (PVS) before release. Since KKU 35 * SJ-32 in early maturity (95 days), it is suitable for crop rotation with rice in dry season in low land irrigated area and with some crops in wet season in rainfed upland area.

Introduction

Soybean production area in Thailand has sharply decreased since two decades because of the global warming that affect rain fall and rain distribution. In the production year 2018/2019 , soybean planted area was decrease to 24,031 ha. (DOAE, 2019). Selection criteria has been changed from late maturity to early maturity. Soybean breeding program at KKU identified elite since from multilocation yield trials. However, soybean line should be accepted by farmer through participatory varietal selection (PVS) before release.

Methodology

Five soybean elite lines together with 2 check varieties, (Chiang Mai 60, SJ 5) were planted at Nong Wua Sor District, Udon Thani Province, Thailand on upland area during June – October 2020. Fifty soybean farmers were invited for the participatory varietal selection (PVS). The discussion was done after score making.

KKU 35 * SJ-32

Result

The first in rank soybean line derive form popular vote through participatory varietal selection (PVS) was KKU 35*SJ-32 , followed by the variety KKU 35 Since it was early in maturity of 95 days, that make it is suitable for crop rotation with rice in dry season and with some field crop in wet season.

Acknowledge

This research was support by cooperative program between Kyoto University and Khon Kaen University and also granted by Agricultural Research Development Agency (ARDA).

Photoperiod sensitivity index classification in Thai indigenous upland rice germplasm

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Rice (*Oryza sativa* L.) is an economics and food supply for more than half world's populations. However, Climate change is a main problem which affected to rice productivity. Crop duration determine the ability of production under stresses.

Flowering time is a key factor to determined the crop duration. So, flowering time is an interesting trait as a selection criterion for rice breeding to approve climate change and the adaptation to specific cultivation areas and seasons.

The information in this study can utilization as a genetic database for further breeding program and planning selection for the environmental stress in each area. So, The objective in this study were classify Thai indigenous upland rice genotypes based on photoperiod sensitivity index (PSI).

Figure 1 Photoperiod sensitivity index(PSI) experiment in upland rice field.

- 256 upland rice genotype were collected from all parts of Thailand and grown in the field in two planting date during 2019 wet-season at Khon Kaen University field.
- Days to 50% flowering (DTF) were estimated to determine photoperiod sensitivity index (PSI). Grain yield was determined at harvesting time in each plot.

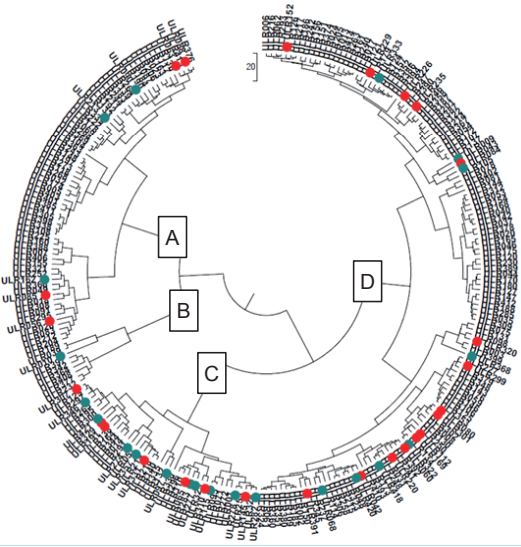

Figure 2 Cluster analysis on the basis of Euclidian distance for 256 upland rice genotypes. Green encircled symbols represent insensitive to photoperiod, red encircled symbols represent strongly sensitive to photoperiod and non-symbols represent mild sensitive to photoperiod.

The result showed that a dendrogram can be classified into four group (Fig. 2). Moreover, The result found that Group B comprised 1 genotypes which insensitive to photoperiod and 8 mild sensitive to photoperiod with highest grain yield (3,137.5 – 4,375 kg/ha). All of grouped was consisted of both sensitive and non-sensitive genotypes. Moreover, most of upland genotypes are mild sensitivity.

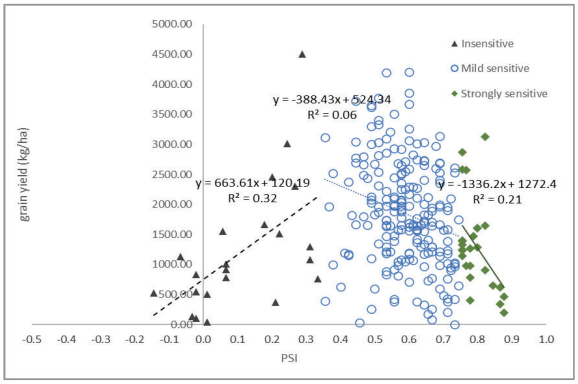

Figure 3 Relationship between grain yield and photoperiod sensitivity index (PSI) in 256 upland rice genotypes. ** The correlation is significant at *P<0.01*

The result showed that photoperiod sensitivity index (PSI) varied from -0.1 to 0.9 in 256 rice genotypes and can be divided into three group (Fig. 3). PSI parameter was significant related with grain yield and had high variation in each group.

In mild photoperiod sensitivity group had a high variation in grain yield than non-sensitivity and strong sensitivity groups. Most of upland genotypes was collected from north and northeastern part of Thailand that growing in rainy season.

The results suggested that the use of photoperiod insensitivity genotypes was the interesting choice not only high grain yield but also suitable under unpredictable rainfall area. Photoperiod sensitivity genotypes had high risk under late season drought especially in Thailand. Moreover, early flowering with photoperiod insensitivity genotypes were one selected choice for high yield potential.

Acknowledgement: Plant Breeding Research Center for Sustainable Agriculture, Khon Kaen University

Sources of *Rhizoctonia solani* from Northeast of Thailand reveal variation in sheath blight disease severity in rice cultivars

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Thailand is one of the important rice producer and exporter country of the world. Climate change affects the virulence of many rice plant pathogens cause of blast, bacterial blight, and sheath blight diseases. The fungus *Rhizoctonia solani* causing sheath blight disease reduces quality and yield of rice worldwide. The pathogen has a wide host range that contributes to the variationof morphology, biology and severity. Sheath blight disease is one of the rice production problems in Thailand. Several methods such as chemical control, agricultural practice, and resistance cultivars,can be used for controlling the sheath blight disease.

The knowledge on virulence variability of sheath blight pathogen in Northeast, a major region of rice production in Thailand, is an important aspect for sheath blight disease managements. This knowledge can beneficially for breeding of rice resistant cultivars. Therefore, the research aimed to study the severity variation of *R. solani* causing sheath blight disease in rice from Northeast Thailand on commercial rice cultivars, KDML105and Pathum Thani1. The results of this study can be supported to the isolate selection for use in rice resistance screening and breeding selection against sheath blight disease in the future work.

Methodology

Thirty isolates of *R. solani* were collected from rice production area across Northeast Thailand on four directions (Figure 1). After pure isolate on PDA medium (Figure 2), the fifteen pathogen isolates were test for disease severity on KDML105 and Pathum Thani 1 rice cultivars by placing a mycelial plug directly on the plant and wrapped with parafilm in the greenhouse condition (Figure 3). The symptoms of sheath blight disease were observed and collected at 21 days after inoculation.

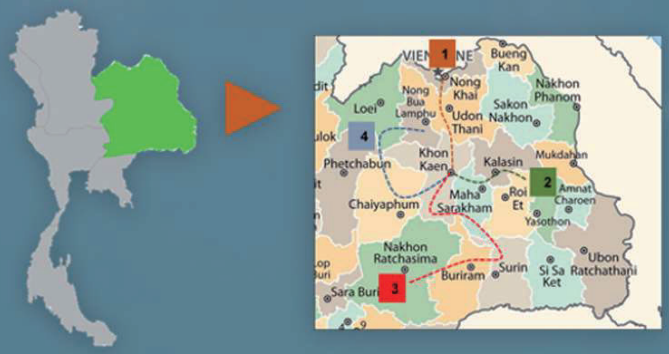

Figure1 The survey and collection direction of sheath blight disease in paddy field of Northeast Thailand.

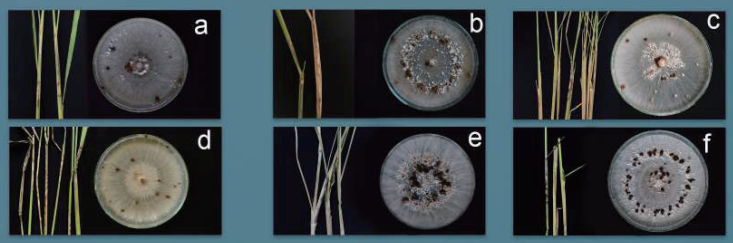

Figure2 Isolate samples of *Rhizoctonia solani*: (a) H-06 from Udon Thani, (b) H-11 from Khon Kaen, (c) K-01 from Khon Kaen, (d) K-12 from Buri Ram, (e) K-18 from Khon Kaen and (f) L-08 from Chaiyaphum.

Figure 3 Schematic representation of sheath blight inoculation under greenhouse condition.

Results and discussion

The results found that each isolate reveal severity variation in both rice cultivars (Table1). Lesion length and severity score were ranged from 0.00 to 20.85 cm and 1.41 to 7.48, respectively. Maximum mean lesion length on KDML105 and Pathum Thani1 rice cultivars were observed as 20.83 cm with H-06 and 14.17 cm with K-12 respectively. Maximum severity score on both test cultivars were observed from isolate H-06 (7.48 on KDML105 and 6.33 on Pathum Thani 1) followed by isolate K-01 (7.00) and K-12 (5.55) on KDML105 and Pathum Thani 1 rice cultivars respectively. The results indicated that H-06 from Udon Thani, K-01 from Khon Kean and K-12 from Buri Ram can be used in resistance screening and breeding program for against sheath blight of rice in future. However, the molecular based of pathogen genetic diversity are also needed to confirm the variability of pathogens in this study.

Conclusion

The pathogens of sheath blight disease in rice of Northeast Thailand are divest in both of morphology and disease severity. The three isolates (H-06, K-01 and K-12) were shown high value in sheath blight disease severity on commercial rice cultivars are beneficial for future rice breeding program against sheath blight disease.

Table 1. Mean lesion length (cm) and severity score of fifteen *Rhizoctonia solani* from Northeast Thailand on KDML105 and Pathum Thani 1 rice cultivars.

Isolates	Mean lesion length (cm)		Severity score	
	KDML105	Pathum Thani 1	KDML105	Pathum Thani 1
H-06	20.85 a	10.10 a-c	7.48 a	6.33 a
H-07	8.24 b-g	12.00 ab	4.67 c-f	5.11 a-c
H-11	12.69 b-d	5.13 b-f	5.44 b-e	4.63 a-c
H-12	12.89 b-d	10.57 a-c	5.81 a-d	3.96 b-e
K-01	14.79 a-c	10.67 a-c	7.00 ab	5.19 a-c
K-06	8.06 b-h	5.33 b-f	5.44 b-e	5.15 a-c
K-11	3.76 e-i	4.37 c-f	4.22 d-h	3.96 b-e
K-12	15.04 ab	14.17 a	6.37 a-c	5.55 ab
K-13	10.88 b-e	7.13 b-e	6.37 a-c	5.07 a-c
K-15	7.28 c-i	3.87 c-f	5.07 c-e	4.33 a-d
K-18	4.52 e-i	7.50 a-d	3.93 d-i	4.70 a-c
L-07	4.03 e-i	0.00 f	2.85 f-k	1.44 g
L-08	9.06 b-f	4.27 c-f	4.56 c-g	3.74 b-f
L-09	1.38 g-i	0.47 ef	1.63 jk	1.41 g
L-10	6.50 d-i	2.10 d-f	3.08 f-j	3.04 c-g
Mean	5.50	3.62	3.45	2.89
F-test	**	**	**	**
CV%	84.7	116.25	34.09	45.66

Means followed by the same letter in a column did not differ significantly at the 5% level by LSD, Severity score 1=Lesions limited to lower than 1% of plant height, 3=1-25%, 5=25-50%, 7=51-75% and 9=More than 75%.

Acknowledgements:

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A comparative study on fuel properties and pyrolysis behavior of torrefied biomass pellets via pelletization before and after torrefaction process

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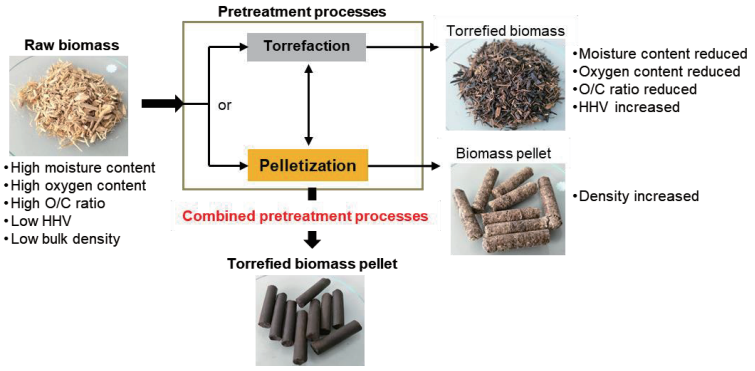
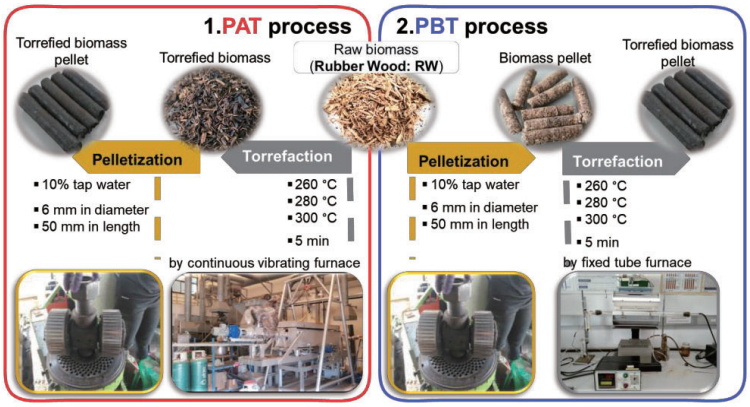
Background



Objective

- To produce high-quality solid fuels and compare its fuel properties from biomass wastes via the two combined pretreatment processes from physical and thermal with a different sequence between the **pelletization after torrefaction** (**PAT**) and the **pelletization before torrefaction** (**PBT**) under various torrefaction temperatures
- To comparatively investigate reaction behaviors of a subsequent pyrolysis and combustion process of the **PAT** and **PBT** torrefied biomass pellets.

Methodology

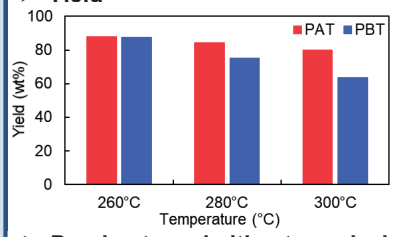


Characterization of raw and torrefied biomass pellets

- Proximate analysis by using themogravimetric analysis (TGA)
  - %Volatile, Fixed carbon (FC) and Ash
- Ultimate analysis by using CHN analyzer
  - %C, H, N, and O to HHV calculation
- Pyrolysis behavior using TGA
- Combustion behavior using TGA
- Equilibrium moisture content (EMC) analysis

Results and discussion

Yield



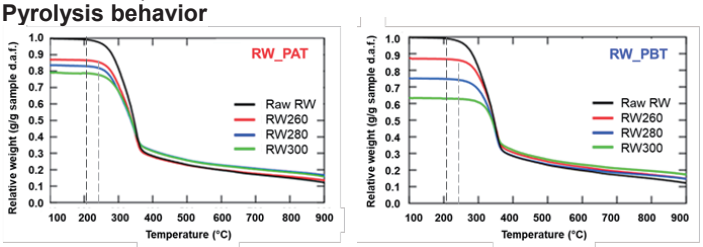
- Yields of torrefied pellets decreased when increasing torrefaction temperature
- Yields of **PAT** torrefied pellet were higher than those of **PBT** torrefied pellet

Proximate and ultimate analysis

Biomass	Fixed carbon (%FC)			%C			HHV(MJ/kg)		
	Raw	PAT	PBT	Raw	PAT	PBT	Raw	PAT	PBT
Raw	11.6	-	-	48.0	-	-	15.3	-	-
RW260	-	14.6	16.7	-	49.1	50.7	-	16.4	16.5
RW280	-	18.6	19.0	-	49.2	54.0	-	16.4	18.1
RW300	-	19.9	26.8	-	51.1	57.8	-	17.2	19.7

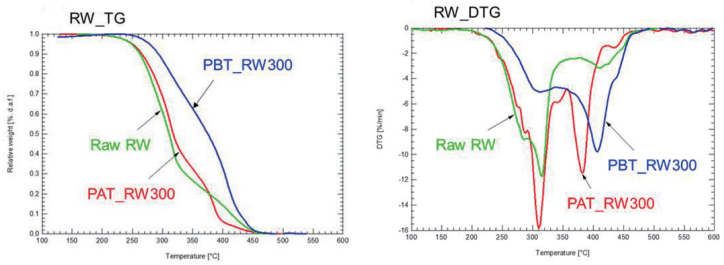
- %FC, %C, and HHV of torrefied biomass pellets increased with increasing temperature
- %FC, %C, and HHV of **PBT** torrefied pellets were higher than those of **PAT** torrefied pellets

Pyrolysis behavior



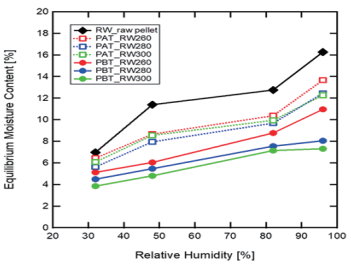
- **PBT** torrefied pellet had higher thermal decomposition temperature than **raw** and **PAT** torrefied pellets

Combustion behavior



- **PBT** torrefied pellet had higher thermal decomposition temperature than raw and **PAT** torrefied pellets as shown in the DTG curves.

Equilibrium moisture content (EMC) analysis



- Decreasing EMC when increase temperature of torrefied biomass pellets compare with raw pellet
- **PBT** torrefied pellet lower EMC than **PAT** torrefied pellet

Conclusions

- The sequences of pelletization and torrefaction pretreatment processes (**PAT** and **PBT**) of biomass were compared in order to improve fuel properties of torrefied biomass pellets.
- **PBT** process can produce higher %FC, %C, and HHV than **PAT** process under various torrefaction temperatures at the period of time.

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Mineralogy and Elemental Compositions of Soils from Different Climatic Regions of the Indo-Gangetic Plain, India

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[3] ICAR-Central Soil Salinity Research Institute, Karnal, Haryana, India [4] International Maize and Wheat Improvement Center (CIMMYT), New Delhi, India

Background

- The Indo-Gangetic Plain (IGP) is a major food-producing area of India, which is extended over different climatic regions of the country. It covers 13% of the area of India and produces nearly 50% of the country's food grains and feed 40% of total population of the country (Pal et al. 2009).
- Elemental composition and clay minerals contain useful information about parent materials, depositional environment, and weathering condition of the soil.
- The objective of this study was to clarify the factors determining elemental distribution, physicochemical and mineralogical properties of the soil from different part of IGP.

Materials and methods

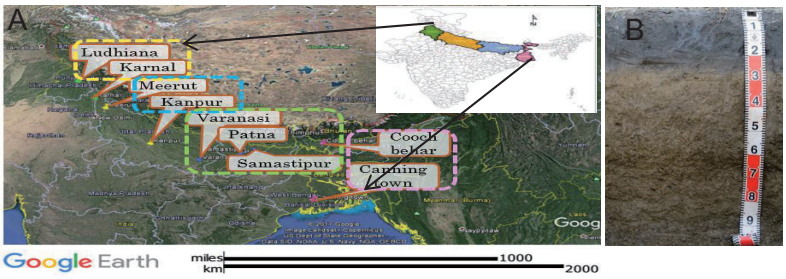

Fig 1. (A) Study area with sampling sites **(B)** Soil profile from a sampling site.

- Total 140 soil samples were collected from different horizons of ~1m in-depth soil profiles across the study area.
- Samples were analysed for physicochemical properties, total elemental compositions and mineralogy by following standard protocols.

Results and Discussion

- Soil texture analysis suggests that most of the samples from all the locations of IGP were silt loam.
- The mean concentrations of major elements in soil followed order of Si>Al>Fe>K>Mg>Ca>Na for all the samples.
- Principal Component analysis for total element suggests that PC1 (Fe-Al-Na-Si) and PC 2 (Mg-K) capture information about source of parent material and represent the weathering degree. PC3 suggest the influence of $CaCO_3$. (Fig. 2, Table 1).
- Kaolinite, smectite, chlorite, mica, quartz, and feldspar minerals were identified in clay fraction of soil samples.
- Chlorite presence was clear in soils from Coochbehar and Samastipur. Highest content of kaolinite mineral in Coochbehar and Canning town indicates that humid and hot climate favoured the formation of kaolinite in soils of that region (Fig. 3, Table 2).

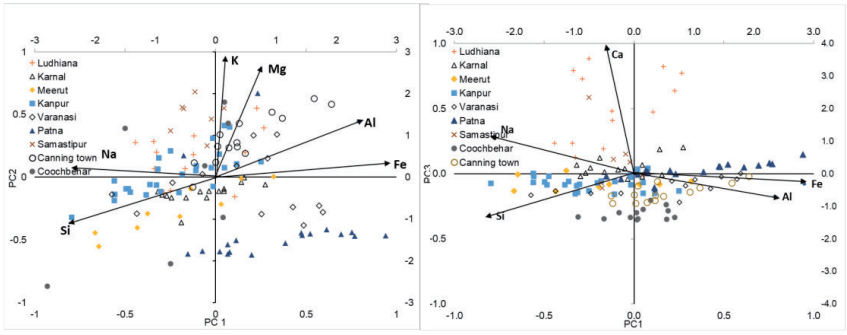

Fig. 2. PCA biplots for PC1 and PC2, and PC1 and PC3 with scores grouped by locations.

	Rotated Component[a]		
	PC1	PC2	PC3
Si	**-.807**	-.363	-.322
Fe	**.948**	.108	-.076
Al	**.784**	.441	-.174
Ca	-.145	-.030	**.958**
Mg	.252	**.871**	.206
Na	**-.777**	.071	.274
K	.050	**.936**	-.192
Variance	40.7%	28.3%	17.3%

a. Varimax rotation converged in 5 iterations

Table1. Rotated component matrix of the PCA.

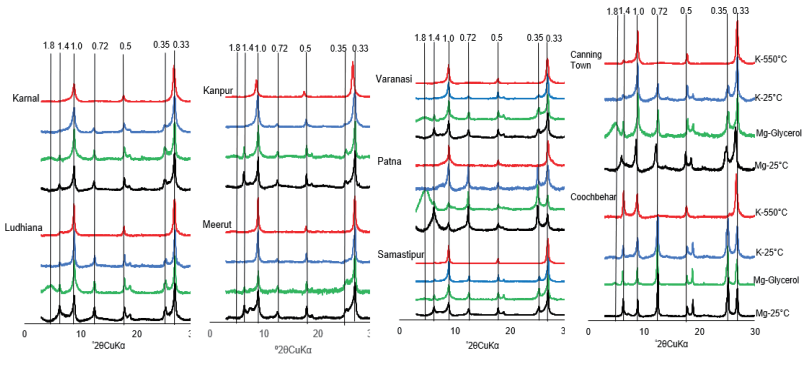

Fig. 3. X-ray diffractograms of the clay fraction of representative samples for all locations.

Location	Dominant	Clear
Ludhiana, Karnal	Mica, quartz	Kaolinite
Kanpur, Meerut	Mica, quartz	Kaolinite
Varanasi	Mica, quartz	Chlorite, kaolinite
Patna	Smectite, kaolinite	Mica, quartz
Samastipur	Mica, quartz	Chlorite, kaolinite
Coochbehar	Kaolinite	Quartz, mica, chlorite
Canning town	Mica, quartz, kaolinite	Smectite, chlorite

Table 2 Clay minerals abundance in all locations.

Conclusion

- Parent material and climate are the main controlling factors for elemental composition, soil physicochemical properties and distribution of clay minerals in soils from different climatic regions of India.
- Coochbehar and Samastipur soils showed influence of sediments from Himalayan regions along with ganga river sediments.

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Assessment of ammonium removal in wastewater using bio-adsorbents derived from agricultural wastes-Case study in Vietnam

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(1) School of Environmental Science and Technology, Ha Noi University of Science and Technology, Ha Noi, Viet Nam

(2) Environmentally –friendly Industries for Sustainable Development Laboratory, GSGES, Kyoto University, Japan

BACKGROUND

Vietnam is an agricultural country which produce huge and diverse source of by-products, estimated millions of tons per year and mostly discharged into the environment or burning in the field which polluted the environment. Once utilized, this could be cheap source for making low-cost bio-adsorbents. Therefore, this study focused on preliminary assessment of using some agricultural by-products such as longan skin, peanut shell, coffee husk to remove ammonium in wastewater. Currently in Vietnam, ammonium residue in wastewater, especially urban domestic wastewater, is one of the main and serious sources of environmental pollution in big cities.

INTRODUCTION

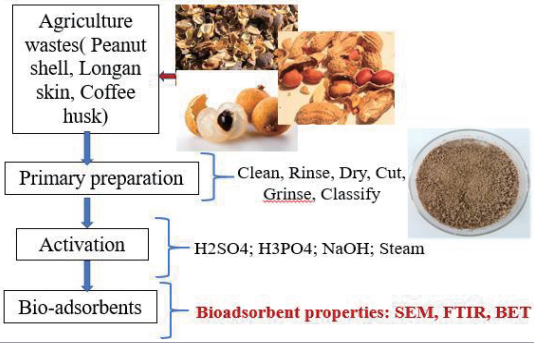
Source(*) : baovemoitruong.org.vn

Every year, huge amount of biomass generated from agricultural production was burned in fields causing serious air pollution or piled up in fields polluting the soil and water environments during decomposition process. Therefore, utilizing this waste source to manufacture bio-adsorbent material brings many benefits.

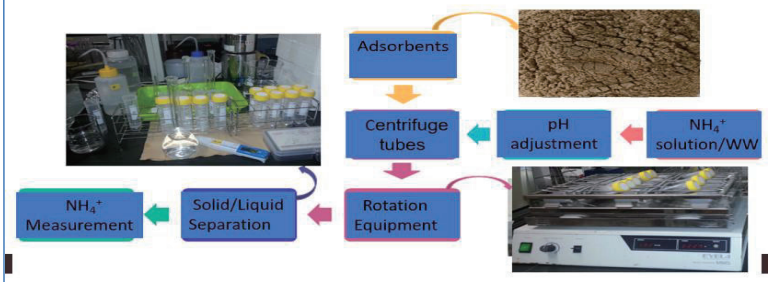
OBJECTIVES

Assess some activated conditions that affect the characteristics of bio-adsorbents and Ammonium removal efficiency.

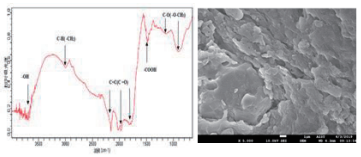
BIOADSORBENTS PRODUCTION



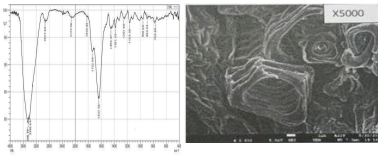
Batch experiment procedure for Adsorption method



RESULTS AND DISCUSSION

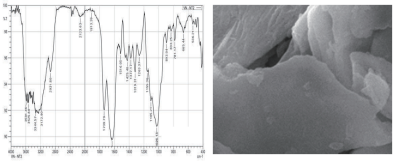


FTIR and SEM of coffee husk

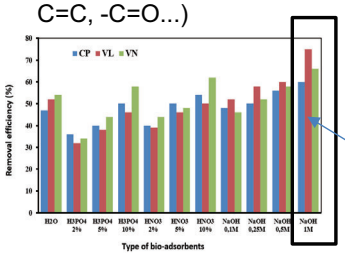


FTIR and SEM of longan skin

❖ Surface of bio-adsorbents was uneven and existed many folds and remain some function groups (-OH, $-CH_3$, $-CH_2$, -COOH, -C=C, -C=O...)



FTIR and SEM of peanut shell



❖ Cashew nut shells(marked as VL) material showed best performance for ammonium removal especially when it was activated with alkaline, following Longan skin(marked as VN) and Coffee husk(CP).

CONCLUSIONS AND RECOMMENDATION

- Activation using alkali gave highest ammonium adsorption efficiency compared to other activation methods by H_3PO_4 acid or HNO_3 acid or by superheated steam.
- Activated by alkaline solution, some raw agricultural products could become protentional bio-adsorbents for application in real wastewater treatment with high ammonium concentration.

Risk Assessment of Heavy Metals of Vegetables from Abandoned Open Dumping Site in Banyumas Regency Indonesia

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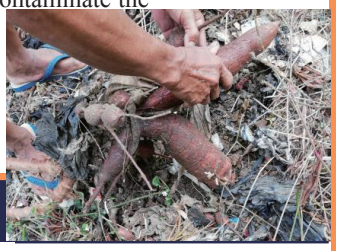
** Department of of Environmental Engineering, Universitas Islam Indonesia

Background

- The Gunung Tugel landfill has not been operating since 2016 and it is planted with edible fruits and vegetables around there
- The Gunung Tugel landfill uses an open dumping method with suboptimal leachate treatment, so that leachate water from the landfill can seep through the soil and contaminate the plantations around the landfill area.



Methodology

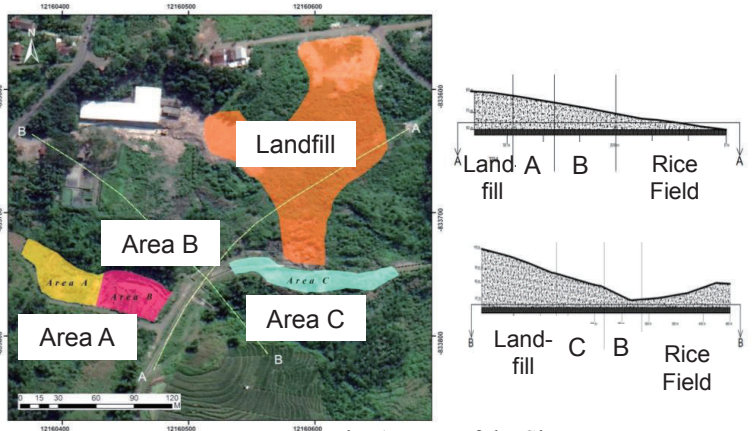


Fig. 1 Maps of the Site

- The method of determining and sampling is done by the stratified sampling method.
- Samples were washed thoroughly and dried in an oven at 105° C for 24 hours, then the samples were analyzed using the Atomic Absorption Spectrophotomic (AAS) instrument.
- The results of the analysis were compared with the quality standard.
- Risk Quotient (RQ) and Excess Cancer Risk (ECR) were obtained to make estimation level of non-carcinogenic and carcinogenic.

Results and Discussion

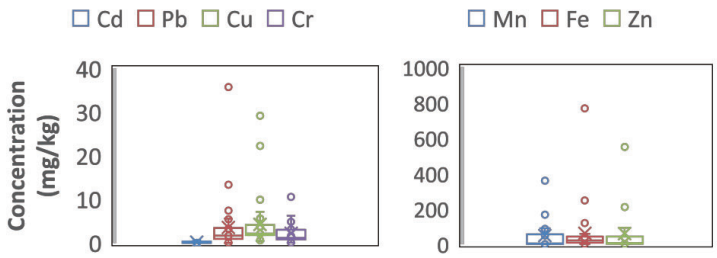


Fig. 2 The Distribution of Heavy Metals

Tabel 1 The Average Concentration of Heavy Metals Each Object

Type	Name	Cd[1]	Pb[1]	Cu[2]	Cr[3]	Mn[4]	Fe[4]	Zn[2]
		mg/kg						
Vege-tables	Ipomea aquatica	0.30	4.03	9.86	5.19	78.53	26.46	261.29
	Amaranthus spp	0.83	7.43	2.23	4.43	166.98	51.49	210.08
	Limnocharis flava	0.20	19.58	5.60	1.87	51.94	135.41	37.19
Tubers and Nuts	Ipomea batatas Poir	0.14	0.99	1.01	1.03	4.44	6.69	10.18
	Ipomea batatas L.	0.08	1.18	2.00	0.61	2.80	11.28	12.80
	Solanum tuberosum	0.46	2.07	3.72	1.01	0.84	26.20	2.91
	Curcuma longa	0.23	1.46	2.45	0.73	182.83	122.14	22.58
	Manihot esculenta	0.13	2.04	1.81	1.08	1.05	15.69	2.02
	Arachis hypogaea	0.02	0.05	0.73	0.09	0.60	1.90	4.72
Fruits	Cucurbita moschata	0.20	1.56	2.09	1.21	1.12	12.65	5.22
	Musa paradisiaca	0.39	2.06	2.20	1.23	20.70	10.55	27.22
Standard (mg/kg)		0.05	0.20	10.00	0.50	11.00	8.00	50.00

[1] BPOM Indonesia, 2017
[2] China's National Food Safety Standard of Maximum Level of Contaminants in Foods, 2010
[3] China's National Food Safety Standard of Maximum Level of Contaminants in Foods, 2014
[4] USDA, 2017

- 12 types of vegetables and fruits are grouped into 3 groups
- All metals except Cu are exceeding the standards in some types

Fig. 3 The RQ and ECR Range of Value

Type	RQ	ECR
Vegetables	0.05 - 6.52	1.7.E-05 - 9.6.E-04
Tubes and Nuts	3.5.E-05 - 0.41	9.2.E-08 - 9.7.E-05
Fruits	0.01 - 0.87	2.3.E-06 - 1.7.E-04

- Vegetables in some Heavy Metals have RQ>1
- Vegetables and fruits in Cr have ECR ≤ E-4

Conclusion

- Zn>Mn>Fe>Pb>Cu>Cr>Cd
- Ipomea aquatica and Amaranthus spp. are the plants that absorb the most pollution while Arachis hypogaea is the least
- Estimated level of non-carcinogenic and carcinogenic health risks for respondents due to consuming vegetables in the landfill area is unacceptable or might cause health problems from Pb, Cr, Cd, and Mn

Analysis of phytoplankton and water quality changes in the southern basin of Lake Biwa in the last 70 years

Authors: ○Takahiro Yokoi[1), 2)], Shigeo Fujii[2)]

1) Kyoto Municipal Waterworks Bureau
2) Graduate School of Global Environmental Studies, Kyoto University

INTRODUCTION

The southern basin of Lake Biwa had been polluted and eutrophicated since 1950s. The eutrophication increased some harmful algae causing troubles such as musty odor. Environmental conversation activities have been implemented since 1970s, but water treatment problems have not been solved yet. This study described phytoplankton and water quality changes in Lake Biwa, measured by Kyoto Municipal Waterworks Bureau since 1950s.

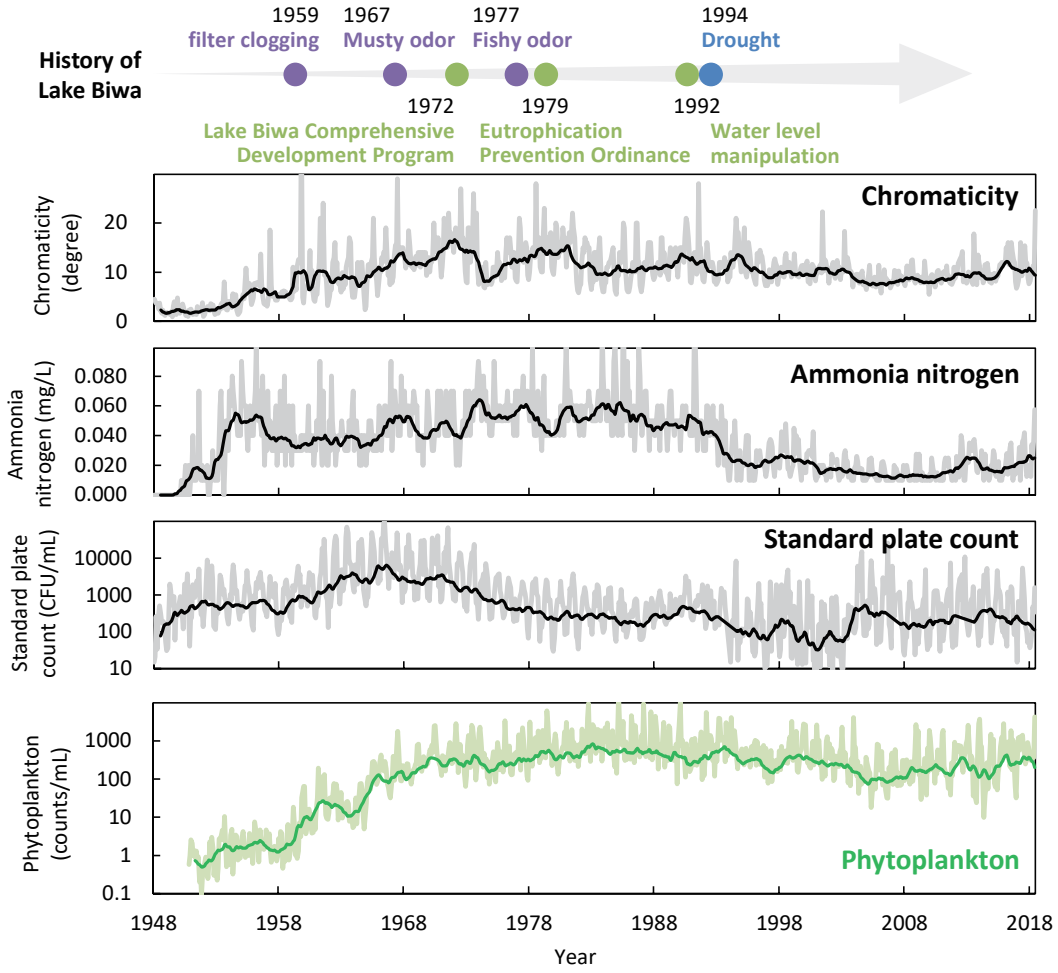


Fig. 2 trends of water quality and phytoplankton (black and green lines: 12-months moving average)

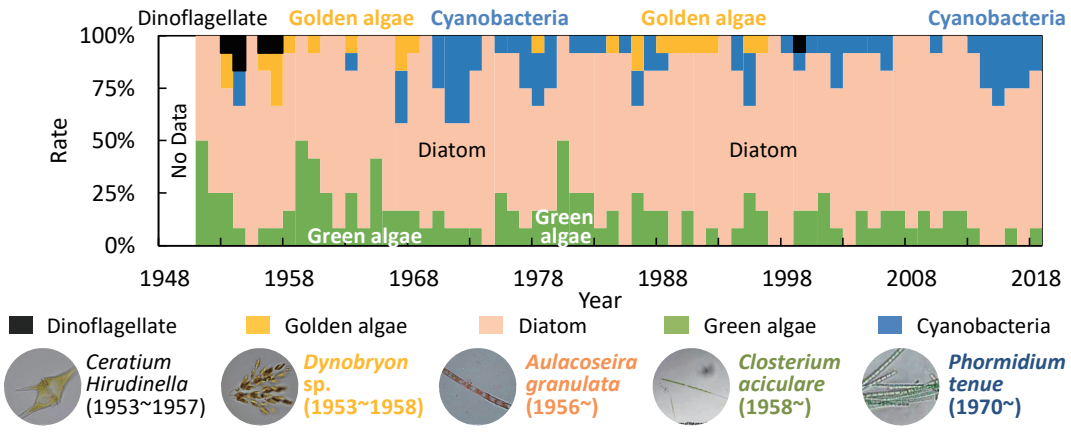


Fig. 3 trend of rate of monthly dominant species (Pictures: National Museum of Nature and Science

DATA

Period: Monthly measurement, or average of weekly measurement in 1949-2018

Sampling points: Intake basin of Keage Water Purification Plant

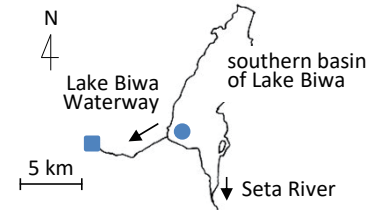


Fig. 1 Sampling points

Chromaticity: colorimetric method with Nessler cylinders

Ammonia nitrogen: Nesslar method → 1-naphtol method since 1993

Standard plate count: nutrient medium → standard medium since 1978 (sampling point: mixing basin of KWPP in 1993-2003)

Phytoplankton: collect with plankton net since 1953 -> direct count since 1970 (sampling point: OWI in 1993-2003)

RESULTS & DISCUSSION – WATER QUALITY

- From 1950s, the water quality was getting worse due to the rapid economic growth.
- In 1960s and 1970s, the lake water was polluted most seriously.
- In 2010s, some water quality items got improved, and some did not.

RESULTS & DISCUSSION – PHYTOPLANKTON

- In 1950s, the phytoplankton concentration (PC) was so low.
- In 1950s, golden algae *Dinobryon* sp. (low-nutrient habitant phytoplankton) was sometimes dominated.
- In 1970s and 1980s, cyanobacteria were increased as PC was increased.
- In 2010s, cyanobacteria were increased again, although PC was decreased.

CONCLUSION

The phytoplankton and water quality changed with similar patterns, reflecting a pollution level in each decade.

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Effect of supplement cassava root silage on growth performance of native pig

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** Graduate School of Global Environmental Studies, Kyoto University

ABSTRACT

Nine female pigs (local pig) (9 – 12 kg LW). The experimental design was arranged in randomize completely block design (RCBD), three treatments of this experiment were different levels of supplemented diets (cassava root silage (CS), each treatment was comprised 3 replications and experimental period was 34 days with an extra 14 days for adaptation to the pens and diets. When cassava root silage (CS) was supplied at the different level which it was not affected in growth rate and feed conversion rate (FCR). However, when employed 30 % of cassava root silage female pigs were significantly displayed highest consumption of diets(p<0.05).

INTRODUCTION

The Cassava is composed almost entirely of starch and contains very little protein (less than 3% in the dry matter; http://www.feedipe dia.org/), it is necessary to supply with protein-rich feeds such as fish and soybean meals in order to make a balanced diet for pigs. These protein meals are expensive in Lao PDR as they are mostly imported from neighbor countries. In previous research was indicated that true protein content of cassava pulp could be increased from 2 to 12% in DM by fermentation with yeast, urea and DAP (Sengxayalth and Preston, 2017).

OBJECTIVES: To evaluate the different levels of supplement cassava root silage on growth performance of native pig.

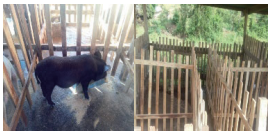
MATERIALS AND METHODS

Location and duration

Conducted in the Integrated Demonstration Station, Faculty of Agriculture and Forestry, Champasak University, Lao PDR, it far from city center about 13 Km.

Animals and housing

Local pigs (Moo Lat breed; females) were selected at 9-12 kg of initial weight and allocated to individual pens with 1.2 m wide, 1.6 m length and 1 m height. Each pen had one drinking nipple and one feed trough.



Treatments and experimental design

The experiment arranged in randomize completely block design (RCBD) with three replications of each treatment.

CS-10 = 10 % of cassava root silage
CS-20 = 20 % of cassava root silage
CS-30 = 30 % of cassava root silage

Feeding and management

The protein supplements were mixed with rice bran and mixed feeds and offered at 4% of live weight (DM basis) in 8:00 am and 16:00 pm. The amounts of feed offered and feed residues were adjusted daily to minimize refusals.

Data collection and measurements

Pigs were weighed before feeding and at 14 day intervals. Feed offered and residues were recorded daily. At the end, the samples of individual animal was analyzed.

Chemical analysis

Feed samples were analyzed dry matter (DM), ash and nitrogen.

MATERIALS AND METHODS

Statistical analysis

The data for growth rate was compared by using the general linear model (GLM) option in the Minitab ANOVA software release 13.31 (Minitab 2016).

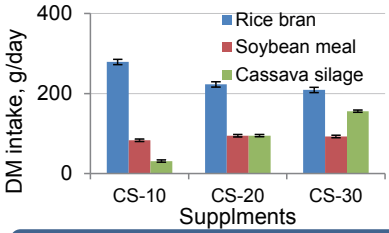
RESULTS AND DISCUSSIONS

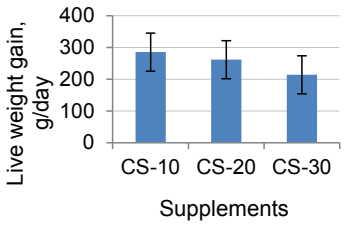
Chemical composition of feeds

The chemical composition of feed ingredients

Feed ingredients	DM	N*6.25
Soy bean meal	80	45
Rice ban	80	9
Cassava root	22	2.9
Cassava root silage	28	16.5

Growth and feed conversion





Discussions

The response in feed intake and live weight gain on supplied 10% of cassava root silage may due to cassava root was fermented by yeast. Whitney et al., (1998) was manifested yeast property as it is in B-vitamins and minerals (Magnesium and Zinc).

Conclusions

CS was supplied at the different level which it was not affected in growth rate and feed conversion rate. However, when employed 30 % of cassava root silage female pigs were significantly displayed highest consumption of diets($p<0.05$).

Acknowledgements

Sincere gratitude GSGES seeds research funding program to support fund for This study and appreciate ChU to provide the places and equipment.

Drought Indices (SPEI): A Tool for Monitoring and Prediction of Agricultural Risk and Sustainability

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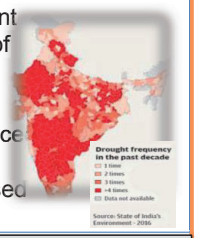
1. RESEARCH BACKGROUND

- Drought is one of the world's costliest natural disasters, causing an average US$6–8 billion in global damages annually [1], [2]; affect environment and activities related to agriculture, vegetation & livelihood and local economies [3].
- Agriculture is the first most affected sector when drought hit, more than 80% of direct impacts caused through reduced crop production that leads to economic loss [4]
- Drought indices are the indicators, commonly used to detect the potential risk of occurrence and severity of drought.
- In India, various studies were conducted using either SPI and PDSI, which does not satisfy the multi-scaler characteristics of drought.
- Hence this study considered SPEI drought indices; a newly developed which includes rainfall, a temperature component and evapotranspiration in its computation; and especially suited for studies of the effect of global warming on drought severity [5].

Motivation for Solving Research Problem

- Drought has been a constant visitor to India, large parts of the country perennially reel under recurring drought.
- 1/3rd India's total districts face >4 drought per decade. Drought prone area increased by 57% since 1997.



Objectives

To study spatial-temporal analysis of drought identification and assessment of agricultural risk using SPEI drought Indices over Godavari River Basin, India.

Study Area & Data Used

- 40 Years (1980-2019), observed gridded data, precipitation (0.25×0.25) over 6995 rain gauge stations and temperature records from 2140 station (1×1) degree resolution collected from Indian meteorology Department (IMD)
- Both datasets regridded with same resolution (0.25 × 0.250), using CDO

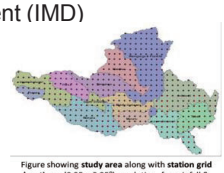


Figure showing **study area** along with **station grid locations**, (0.25 × 0.25°) resolution, for rainfall & temperature data processing

2. METHODOLOGY

- SPEI calculation for any location required long-term precipitation and temperature record for at least 30 years.
- SPEI uses the monthly (or weekly) difference (D) between precipitation (P) and the reference crop evapotranspiration (ETo), and calculate water surplus or deficit for the analyzed month (i) using:

$$D_i = P_i - ETo_i \qquad \text{Equation (1)}$$

- ETo, is calculated generally using a simple climatic water balance (Thornthwaite1948), and it is expressed as:

$$ETo = 16K\left(\left(\frac{10T}{I}\right)^m\right) \qquad \text{Equation (2)}$$

Where, **T** is monthly temperature, **I** is heat index, **K** is the constant, and **m** is a coefficient depending on I.

- Values of **Di** can be aggregated for any certain periods of time, considering the accumulation of the water balance in that period.

$$D_i^k = \sum_{j=0}^{k-1} D_{i-j} \qquad \text{Equation (3)}$$

where **k** is the period of aggregation (accumulation period), and **i** is the observed month.

- Therefore, SPEI can be compared with other SPEI values over time and space, and categorized using following table

SPEI	Drought category
≥2.0	Extreme wet
1.50 – 1.99	Severe wet
1.49 - 1.00	Moderate wet
0.99 - -0.99	Normal
-1.00 – -1.49	Moderate drought
-1.50 - -1.99	Severe drought
≤-2.00	Extreme drought

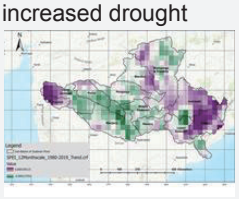
- The flood and drought occurrences are determined according to the dryness & wetness of SPEI index value.

3. RESULTS & DISCUSSIONS

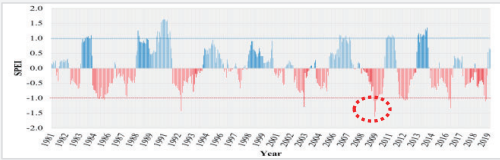
- ✓ Temporal SPEI annual trend showed significantly decreasing trend, indicating sign of continuous increase in magnitude of intensity of drought over study area

Spatial Variability and Trend of SPEI

- ✓ Nine sub-basins out of 12 showed negative (–ve) trend, indicating increased drought risk.
- ✓ Whereas only 3 sub-basins showed +ve trend, indicating reduced drought risk.



Impacts of drought



- ✓ Drought of 2009, the severest one, reduced agricultural production by 20 to 40%, rice output reduced by 15 million tones than previous season, with food grain scarcity triggered inflation by 17 to 20%.

4. FUTURE SCOPE & RECOMMENDATION

- ✓ Great scope for development of Decision Support System (DSS) for prediction and monitoring of operational drought to overcome the agriculture risk and food insecurity among increasing populations.

5. CONCLUSIONS

- ✓ Rate of fluctuation & recurring droughts shown increased during current decade, with increased intensity and magnitude. Denotes possibility of more droughts in coming future.
- ✓ Moreover, the decreased rate of total annual rainfall observed during 2nd half of recent decade (2015-2019).
- ✓ This indicates prediction of more drought risk; especially in non-monsoonal period in upcoming future; adding high risk for agriculture and water resources,
- ✓ Hence, this study serves to inform and enrich the information on drought risk, help to appropriate management of water resource over Godavari river basin, to achieve agriculture sustainability

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Blue, green and grey water footprint of paddy in Malaysia's granary

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BACKGROUND

Agriculture is an immensely water consuming activity, greatly influenced by climate change, and possibility of decreasing harvest may cause massive water requirements (Bocchiola, 2015). Rice production needs substantial amounts of water, for instance, in Asia, more than 50% from 90% total diverted freshwater used in agriculture is used to irrigated rice (Bouman, 2012). Rice is the staple food in many countries, accounting for more than 40% of global food production (Herman, Murchie, & Warsi, 2015). As the most consumed cereal in various countries, rice research is essential as to face global food security issue. In Malaysia, the production of rice increased from 2,252,168 in 2018 to 2,517,406 metric tons in 2019 (Department of Agriculture, 2019). It is apprehensive that the impact to the environment will increase accordingly. Water footprint (WF) constitute of three water components involved in production. Green water indicates rainwater, blue water represents irrigation water withdrawn from ground or surface water whilst grey defines as polluted water which related to use of nitrogen fertilisers (Chapagain & Hoekstra, 2011).

METHODOLOGY

WF accounting of paddy was conducted using CROPWAT 8.0 software for initial stage of accounting and following The Water Footprint Assessment Manual (Hoekstra, Chapagain, Aldaya, & Mekonnen, 2012) by considering data of average paddy production, yield and climate between 2014, 2015 and 2016 for Kedah and Kelantan, Malaysia. Total WF is the sum of three WF components, assessed using equation :

$$WF_{total} = WF_{green} + WF_{blue} + WF_{grey}$$

Green and blue WF was evaluated using equation :

$$WF_{green} = \frac{CWU_{green}}{Y} \text{ and } WF_{blue} = \frac{CWU_{blue}}{Y} \text{ accordingly.}$$

Grey component was estimated using :

$$WF_{grey} = \frac{(\alpha \times AR) / (C_{max} - C_{nat})}{Y}$$

RESULT & DISCUSSION

From the research, total WF were 1547.03 m^3/t (49.11% green, 27.82% blue, 23.06% grey) for Kedah and 1932.19 m^3/t (42.68% green, 35.74% blue, 21.58% grey) for Kelantan as shown in Table 1. Green water footprint is the highest component for both states followed by blue and grey component. A research conducted by Mekonnen & Hoekstra (2011) regarding global water footprint related to crop production in the period 1996–2005 also found out that green is the highest contributor (78% green, 12% blue, 10% grey). Similar to Chapagain & Hoekstra (2011), conducted study also shows green component is the highest, 632 m^3/ton from total WF of 1325 m^3/ton which represent 48% of total WF, followed by blue and grey component as 44% and 8% respectively. Total WF for both states slightly high, 1.2 to 1.5 times larger as compare to 2000-2014 annual WF for rice for 13 major global rice producer conducted by Chapagain & Hoekstra (2011), which was 1325 m^3/t.

Table 1 : Green, blue, grey and total water footprint

WF component (m^3/t)	Kelantan	Kedah
WF_{green}	824.68	759.81
WF_{blue}	690.56	430.43
WF_{grey}	416.95	356.78
WF_{total}	1932.19	1547.03

CONCLUSION

Green water footprint is the highest component for both states. Globally, 86.5 % of the water consumed in crop production is green water, which often has a very significant contribution to total water consumption, even in irrigated agriculture (Mekonnen & Hoekstra, 2011). Even though Malaysia not listed as thirteen major global rice producers, quantifying WF of rice production utterly pivotal as Malaysia is in the phase of enhancing rice production and quality for food security purpose.

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Mapping Three Decades of Agricultural Abandonment in the Ifugao Rice Terraces using Google Earth Engine

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Introduction

For the past several decades, the Philippines' **Ifugao Rice Terraces,** a UNESCO World Heritage site, has been experiencing continuous agricultural abandonment. Although several research has already shown some quantification of the abandonment in the rice terraces [1,2], there hasn't been any land cover map produced that shows the gradual abandonment of the rice terraces through time.

This study aims to generate maps of a watershed in Ifugao from 1990 to 2020 to determine the spatial abandonment of the rice terraces through time.

Fig 1. View of the Ifugao Rice Terraces [3]

Methodology

Landsat Satellite images were used to generate the Land Cover maps. The land cover generation process was implemented mainly in Google Earth Engine and complemented with ArcGIS

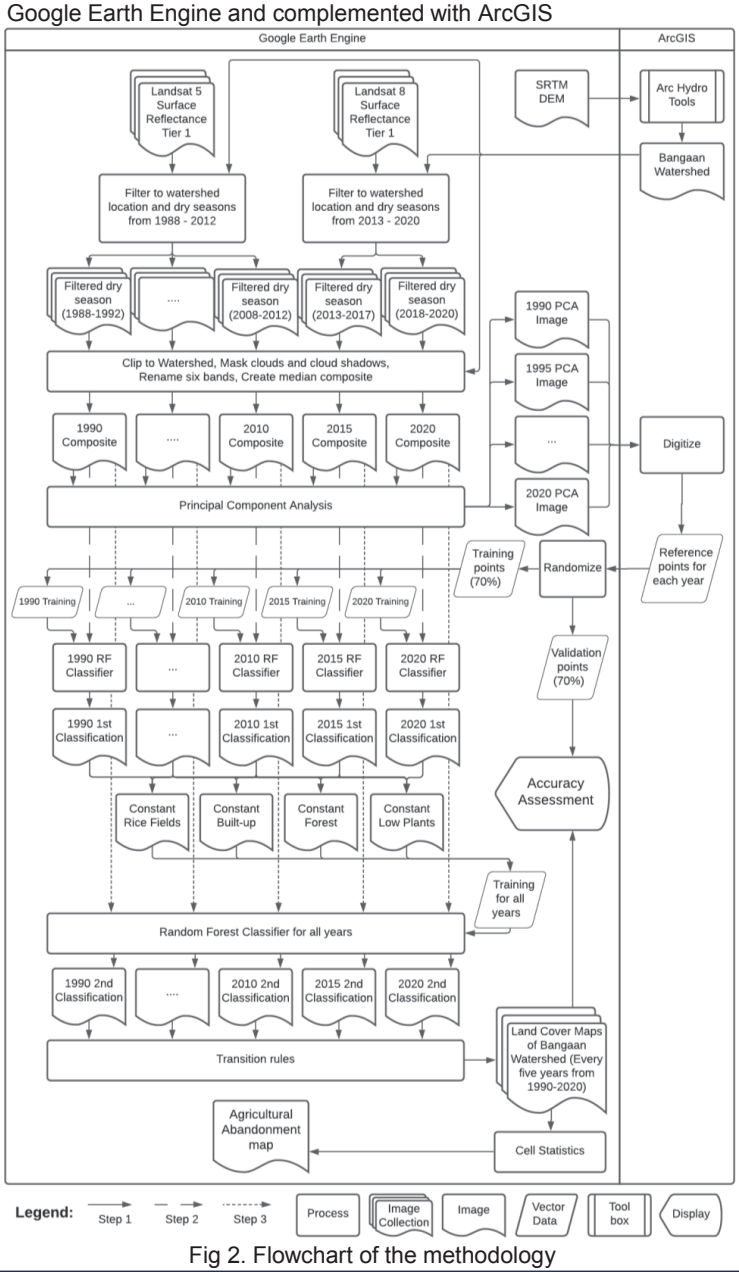

Fig 2. Flowchart of the methodology

Results and Discussion

Seven land cover maps of Ifugao from 1990 to 2020, in five-year intervals, have been produced. Four classes were produced: Rice Fields, Built-up, Forest, and Low Plants. All maps showed high Overall and Kappa Accuracies, with the least accurate map (year 2015) having a Kappa Accuracy of 89.62%

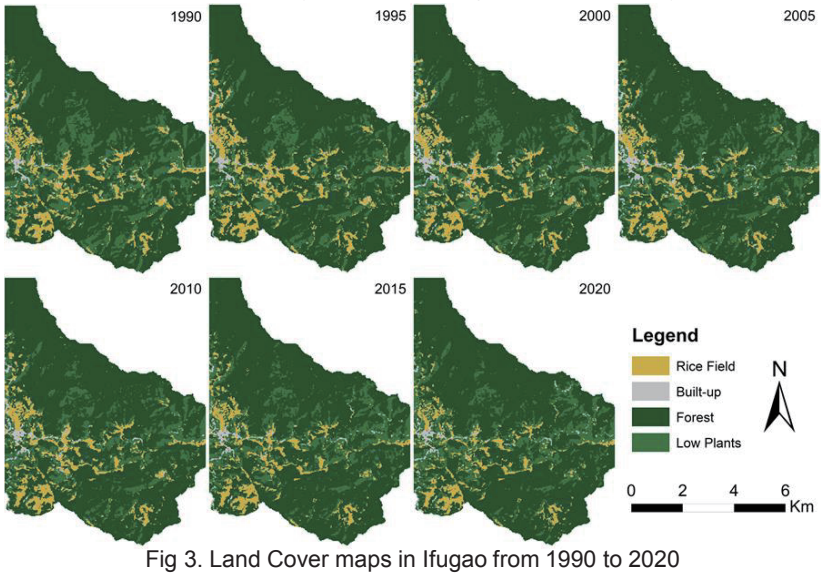

Fig 3. Land Cover maps in Ifugao from 1990 to 2020

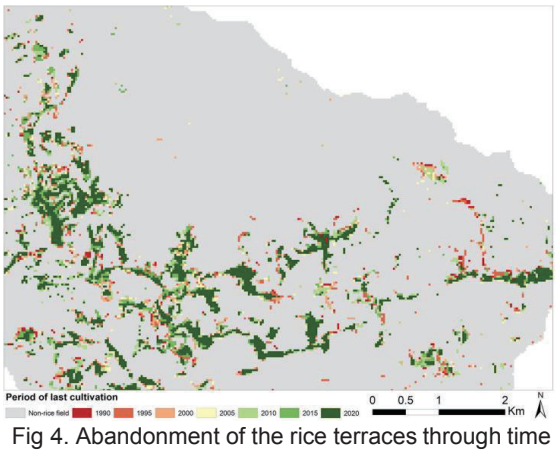

Fig 4. Abandonment of the rice terraces through time

A map of the last period of rice cultivation was generated through GIS Analysis. The map shows that since 1990, rice fields have been continuously abandoned.

These results call immediate proposal of policies to mitigate the abandonment of the terraces. It is important that policies should be sustainable to address the problem until the distant future

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Impacts of Urbanization and Land Transitions on Seagrass Ecosystems: a study from tropical lagoon in Central Vietnam

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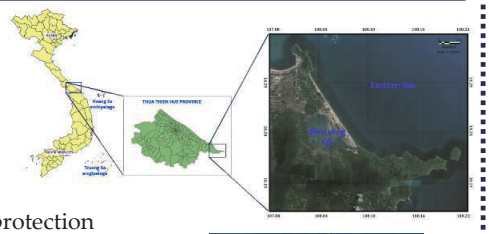
ABSTRACT
Remote sensing and GIS were used to evaluate the variation of seagrass beds from the period of 1998 to 2020. The change in the area of seagrass beds and other land use types around Lang Co lagoon was studied in the period of 22 years. In the period of 1998–2004, seagrass was not clearly affected by socio-economic development activities, while the period of 2006–2012 witnessed significant impacts of socio-economic activities on seagrass beds. The period of 2014–2020 revealed the most apparent impacts of economic development on seagrass beds. The results of analysing land use transitions indicated that while waters, sand and artificial layers were stable over time; bare soil, forest and agricultural soil layers combined with plantations areas tended to change continuously over the years.

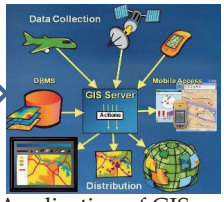
INTRODUTION



Feeding grounds, shoreline protection

Socio-economic development activities

Methods

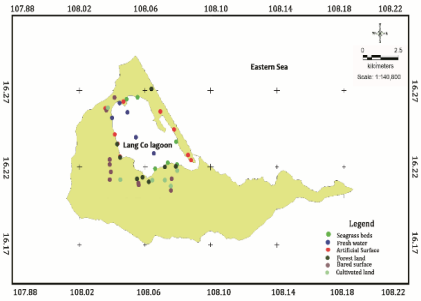


Application of GIS and Remote sensing data

MATERIALS AND METHODS

Field survey method

To collect the above information, the study conducted field survey trips on February and May 2020. The survey location data or key point data obtained during the field surveys



Satellite image processing

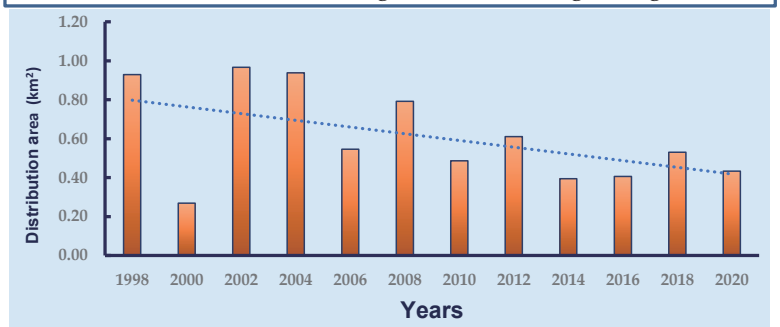
Radiation correction → Atmospheric correction → Water column correction → Imagery interpretation process → Accuracy assessment of classification (K, OA)

Statistical analysis

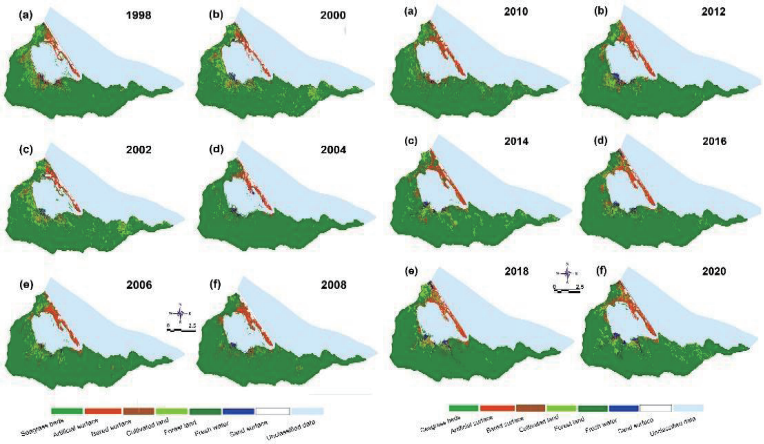
Results obtained during field surveys and laboratory analysis were processed by MS. Excel software that was integrated statistics tool (XLSTAT).

RESULTS AND DISCUSSION

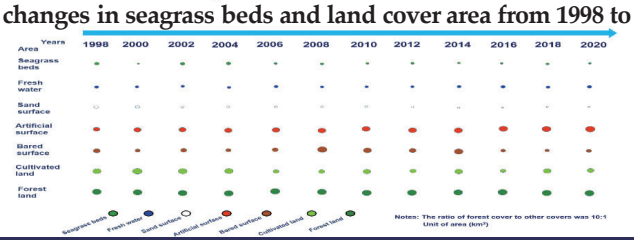
Current situation of seagrass beds in Lang Co lagoon



The maps of land cover and seagrass beds in Lang Co town from 1998 to 2020



The changes in seagrass beds and land cover area from 1998 to 2020



CONCLUSION

Socio-economic development activities at Lang Co town have significant impacts on the distribution and development of seagrass beds at Lang Co lagoon, T.T. Hue province, Central Vietnam. The results of analysis of seagrass area in Lang Co lagoon over 12 years time–series ranged from 0.27 to 0.97 km² and tended to decrease during the study period.

Study on diurnal cycle of rainfall by using weather radar in peatlands along the eastern coast of Sumatra, Indonesia

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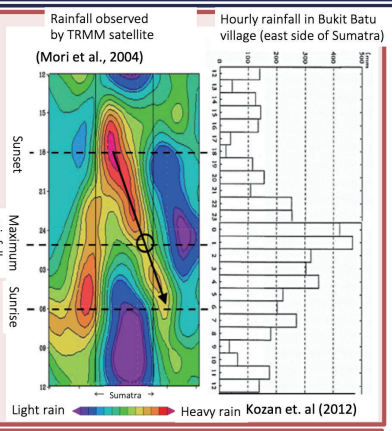
<Background>

・In tropical peatlands of Indonesia, since the 1970s, plantations has developed, and peatlands are drying out. In the year of El Nino, large-scale fires broke out due to burning for farmland development and littering of cigarettes, etc. Smoke (Haze) spreads across national borders, and health hazards have become a serious problem.
・Understanding the daily fluctuations of rainfall characteristic of the Indonesian maritime continent leads to grasp when and where it will rain. In other words, information on when and where it does not rain is important for understanding the danger of fire.
・Daily rainfall fluctuations have been investigated in peatlands of Sumatra using rain gauge (Kozan et al., 2012), but there is still uncertainties of the characteristics of the spatial distribution of precipitation.
On the other hand, satellite data was used to investigate daily rainfall fluctuations around Sumatra (Mori et al., 2008), but rain data with more detailed spatiotemporal resolution is needed for peatland management.
・We investigate the daily fluctuations of rain in peatlands along the eastern coast of Sumatra using a weather radar with high spatiotemporal resolution.



Data & Methodology

・Furuno X-band radar (Model: FURUNO WR-2100) was installed at Malay campus, Bengkalis state college of Islamic religion(STAIN Bengkalis) in February, 2020.
・Radar data was downloaded only during the time when daily rainfall of 25 mm or more was observed(*).
・Rainfall estimated by radar is compared with rain gauge in Perapat Tunggal station, west side of Bengkalis Island.
(*)Currently, it is difficult to observe continuously rain and download a large amount of data because there are problems of network and electrical systems(laptop battery life and power outage).
We need to replace equipment and utilize generator.

<Pre-analysis of radar>
・Ground clutter automatically removed using observational system.
・Rainfall estimated from radar parameters using Marshall and palmer(1948)
・Attenuation collected using Bringi and Chandrasekar(2001).


Fig.1 Furuno X-band radar

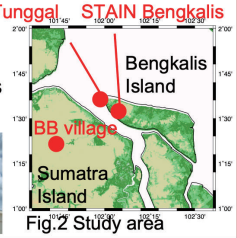


Fig.2 Study area

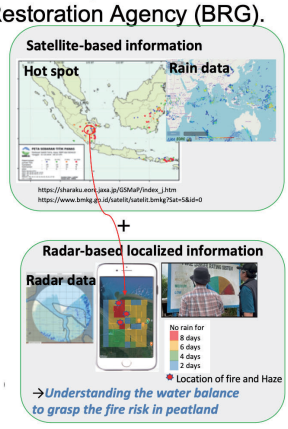
Methodology –Multiple observations in peatland-

・In the peatlands of Sumatra, the villagers judge the consecutive non-precipitation days and share the information on boards. Also, groundwater levels are provided on website of Republic of Indonesia Peat Restoration Agency (BRG).

・BPPT and Indonesia Meteorological Agency(BMKG) provide index of the dryness in the soil using satellite and rain gauges, etc. However, satellite data has limitation for rainfall accuracy.

	Time	Space	Observational area
Satellite	Half of day/ 10 minutes	1km	Global
Ground-based weather radar	2 minutes	50-100m	Within 50km radius

Fig.3 Multiple observations In peatland



Results and discussion

・To compare rainfall derived from radar and rain gauge(SESAME, x-axis of Fig.4), only 18 samples in a total of 3 hours every 10 minutes were used. The coefficient of determination was about 0.5(Fig. 4).
・Area with high rainfall intensity of about 40 mm/hr or more, move from west to east around Bengkalis Island before midnight(Fig. 6). The time when relatively heavy rainfall was observed in eastern Sumatra was almost the same as the time when maximum rainfall was observed in Bukit Batu(BB) village of eastern Sumatra(Kozan et al., 2012).

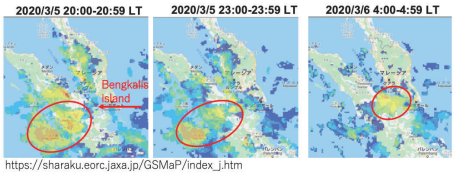


Fig.5 1-hour rain rate derived from satellite(GSMaP)
Rain area with relatively high rainfall pass from west to east of Sumatra.

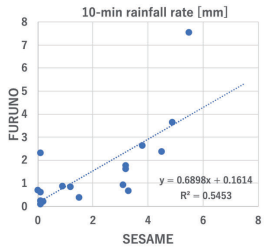


Fig.4 Relationship between rain gauge and radar

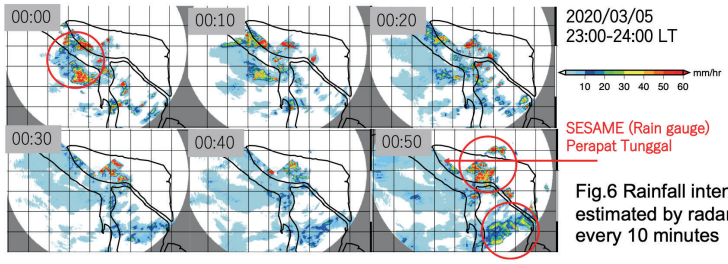


Fig.6 Rainfall intensity estimated by radar every 10 minutes

Summary & Future work

・To understand daily fluctuations of rainfall in the eastern coast of Sumatra, rainfall was estimated using X-band radar. After comparing the rainfall derived from radar and rain gauge, the movement of the rain area was qualitatively investigated.
・The time when relatively heavy rain area pass through the eastern Sumatra was almost the same as the previous study using a rain gauge(Kozan et al., 2012).
・In the near future, we compare rain gauges and radar by using more rainfall events and different cumulative times. Through the analysis, we need to find the spatiotemporal resolutions that match the rain characteristics around peatland area.

ANALYSIS OF DIAGNOSTIC OUTCOME OF COVID-19 SAMPLES FROM WEST JAVA INDONESIA

Azzania Fibriani [(1)], Ema Rahmawati [(2)], Ryan Bayusantika Ristandi [(2)], Rifky Waluyajati Rachman [(2)], Cut Nur Cinthia Alamanda [(2)], Gusti Ayu Prani Pradani [(1)], Miftahul Faridl [(1)], Karimatu Khoirunnisa [(1)], William Steflandel Purba [(1)]

* [(1)] School of Life Sciences and Technology, Institut Teknologi Bandung, Indonesia, [(2)] Laboratorium Kesehatan Provinsi Jawa Barat

BACKGROUND

Since the beginning of this year, the same as other countries, the newly pandemic SARS-CoV2 also became a major problem in Indonesia. Although many SARS-Cov2 detection has been performed in this country, however, limited information was provided in according to different tests diagnostics performances. Therefore in this study we would like to evaluate the performance of different diagnostics tests to detect SARS-Cov2 in West Java province, Indonesia.

METHODOLOGY

We evaluated SARS-Cov2 tests performance that was conducted in West Java, Indonesia. We included samples from March to October 2020. The comparison among different diagnostic assays were analyzed using statistical analysis method.

RESULTS

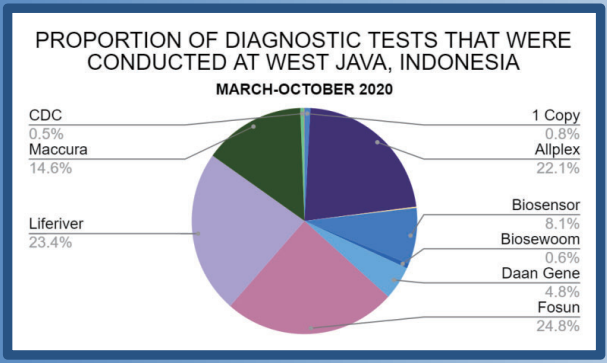


Figure 1. The figure described the proportion of each diagnostic assays that were used in this study. We collected 108,397 samples since March to October 2020. The samples were examined using 10 different PCR kits all through the time.

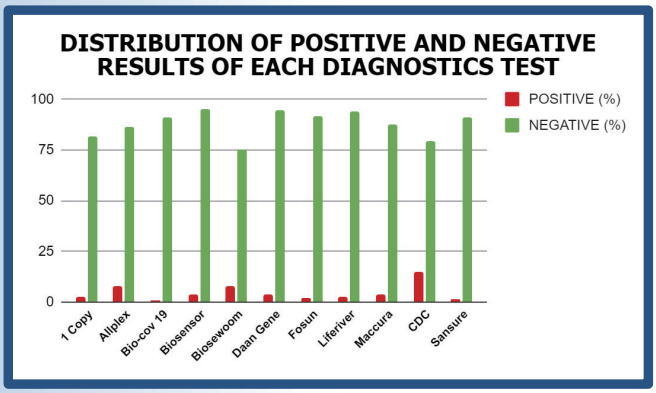


Figure 2. The figure described the proportion of positive and negative results of each diagnostic test that was performed at West Java, Indonesia. Among those samples, the positivity rate was 3.96%. The highest positivity rate was obtained by the CDC kit (15%).

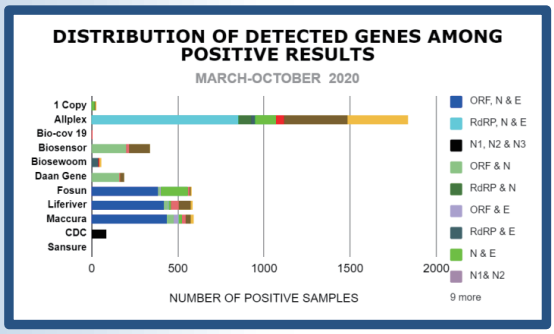


Figure 3. The figure described the distribution of detected genes among Real-time PCR positive results. Among those target genes, the most detected target among positive samples was N gene (85%).

CONCLUSION

In conclusion, there was differences at the positivity rate of each PCR kit, hence, each target gene has different sensitivity to define COVID-19 patients.

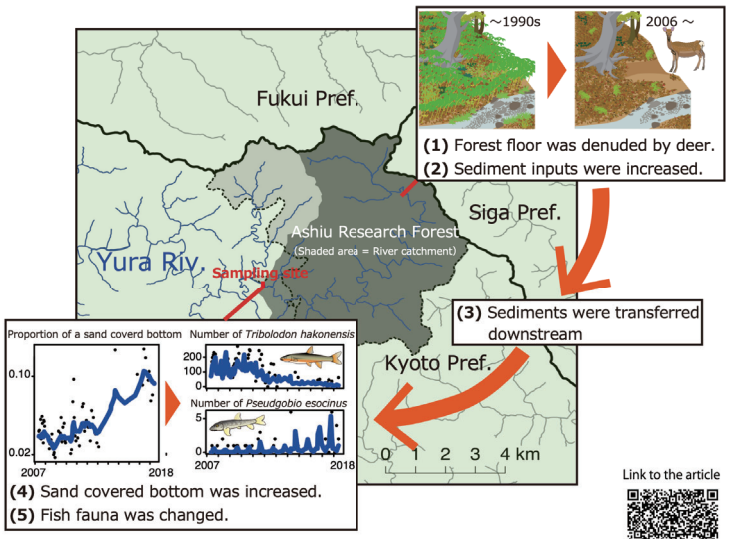
AKNOWLEDGMENT

We would like to thank to West Java Government and West Java Laboratory that provided resources, data and samples for this study

Effect of forest floor degradation by deer overconsumption on population dynamics of stream fishes in a temperate stream

Hlkaru Nakagawa: Center for Southeast Asian Studies (CSEAS)

Schematic summary of this study



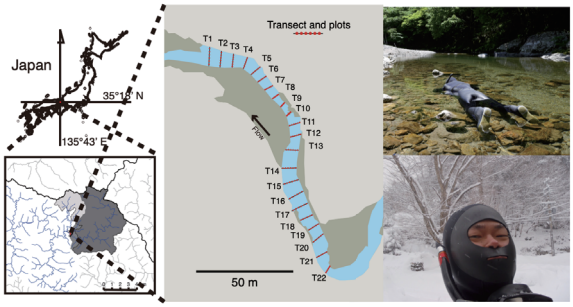
Link to the article

* This study have been published in *Conservation Sicience and Practice* 1(8), e71 (Nakagawa 2019, doi.org/10.1111/csp2.71, open access)

Abstract

- Forest degradation caused by deer overabundance has become a worldwide problem in recent decades.
- Overgrazing by deer may not only affect terrestrial ecosystems but spreads to aquatic ecosystems.
- However, emplical examination based on long-term monitoring has been seldom investigated.
- I examined the relationships between changes in habitat charactristics and population dynamics of 13 fish species at a downstream site over the course of 11 years after forest floor degradation by deer overconsumption.
- This study is a pionior case study that indicates the importance of catchment-scale management if we try to recover stream ecosystem to the state before forest degradation.

Long-term monitoring and statistical analysis

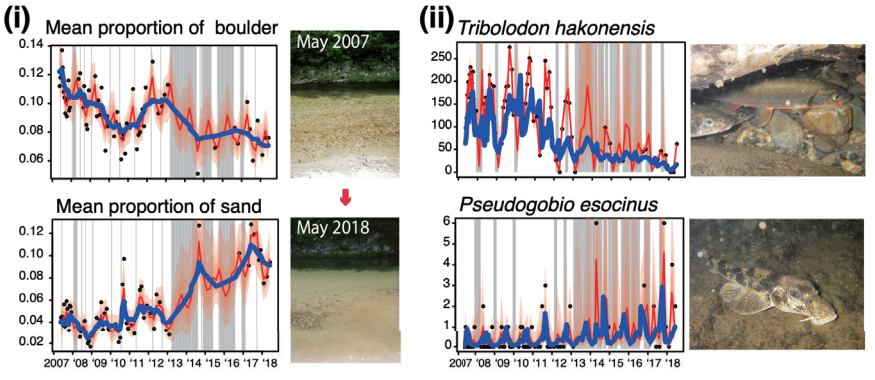


- Snorkeling fish observation and environemtal monitoring by line-transect method were conducted from 2007–2018 at the lowest site of the river catchment in the Ashiu Research Forest, Kyoto University.
- Population density of 13 fish species, water depth, current speed and proportion of substrates (sand, granule, pebble, cobble, boulder, bedrock) were recorded through year.
- Temporal changes in habitat environments and its effects on population dynamics of fishes were examined by the state-space model.

Model: $\log P_t = r + (1 - d)\log P_{t-1} + \varepsilon$; $\log N_t \sim \log P_t + coef * E_t + S + \varepsilon$

- $\log P_t$: State of fish population at time t
- Gompertz population growth
- $\log N_t$: Number of fish observed at time t
- $coef$: Coefficient of the effect of environment
- E_t: State of environmnet (sand bottom proportion) at time t
- S: Seasonal adjustment

Results and discussion



- During 11 years of observation, characteristics of stream habitats changed from a predominantly coarse substrate to a fine substrate [**Panel (i)**].
- A remarkable decrease in one species (*Tribolodon hakonensis*) and increase in another species (*Pseudogobio esocinus*) were observed, and the results of statistical analysis supported the effect of sand increase [**Panel (ii)**].
- Previous studies have reported the increase of sediment imput by deer overabundance at upstream area of the forest, while large anthropogenic changes in the forest have not been recorded at least recent 30 years.
- I concluded that the increase of sediment transportation upstream caused by deer is the most reasonable explanation for the changes in river ecosystem downstream.

Non-destructive Estimation of Shell Thickness and Refractive Index of Intact Quail Egg Using Terahertz Spectroscopy

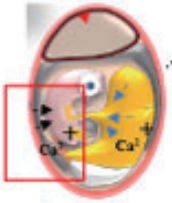
Alin Khaliduzzaman*,†, Keiichiro Shiraga*, Naoshi Kondo* and Yuichi Ogawa*
* Graduate School of Agriculture, Kyoto University
†JSPS Postdoctoral Research Fellow, Laboratory of Biosensing Engineering, Kyoto University

Background

A ***Shell Thickness*** is a Quality Criteria of an Egg

- Higher protection of content
- More resources for calcium for embryo

Eggs Transportation

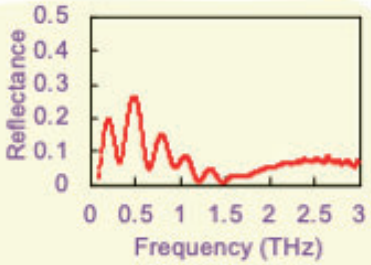


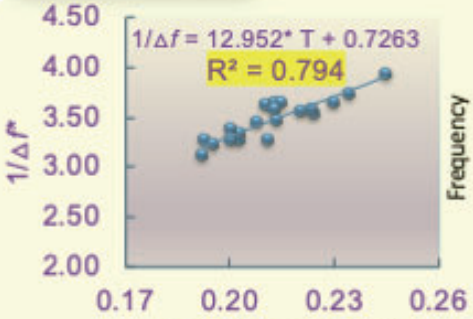
B ***Refractive Index*** is a measure of shell strength and density

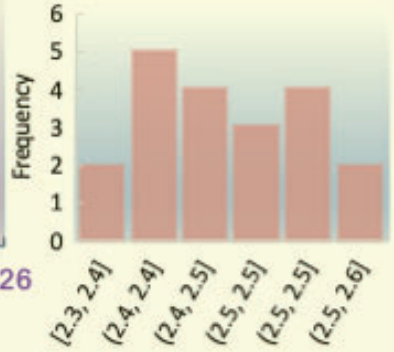
- Less mechanical damage
- Biological indicator of birds

Therefore, non-destructive protocol has great scientific and industrial values

Results



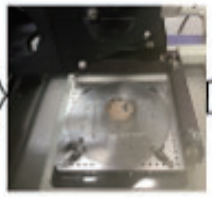


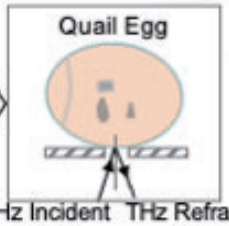


1/Δf = 12.952* T + 0.7263 ...Eq.1

Methodology


Quail Eggs
(Market eggs)


Egg on THz-TDS
(Teraview)



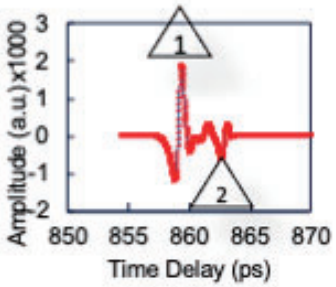
$$P = \frac{2nT}{\cos\theta_2} = \frac{2n_2T}{\sqrt{1-\left(\frac{n_1}{n_2}\sin\theta_1\right)^2}} \quad \text{...Eq.2}$$

P= optical path in eggshell (mm)
c= speed of light in vacuum (mm/s)
n_2= refractive index of shell
n_1= refractive index of air
T=actual thickness of shell (mm)
θ_1=incident angle of THz pulse (deg)

MATLAB

Quail Eggs → THz Signal Acquision → Signal Tranformation → Signal Processing → Shell Thickness / Refractive Index

Discussion



- The first peak and second peak appeared at air-shell and shell-membrane interface respectively
- The interference in THz frequency signal appeared due to cristaline structure[1] of eggshell
- Speed of THz pulse is 2.4 times slower in quail eggshell

Reference

1 Khaliduzzaman et al., 2020. A Nondestructive Eggshell Thickness Measurement Technique Using Terahertz Waves. *Sci Rep* **10**, 1052 (2020). https://doi.org/10.1038/s41598-020-57774-5

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PRODUCTION OF PROPOLIS BY STINGLESS BEES CULTIVATED IN MODULAR *TETRAGONULA* HIVES

Muhammad Yusuf Abduh**, Annisa Shabrina*, Andreas Shabrina, Andreas Raden Caman, Arsy Elia Pertiwi* and Muhammad Insanu*

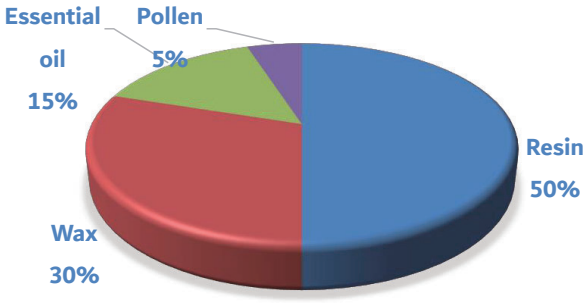
* School of Life Sciences and Technology, Institut Teknologi Bandung
** University Center of Excellence for Nutraceuticals, Biosciense and Biotechnology Research Center, Institut Teknologi Bandung

BACKGROUND

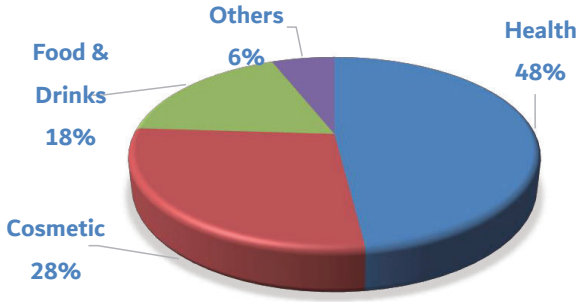
T. Laeviceps

T. Biroi

H. Itama

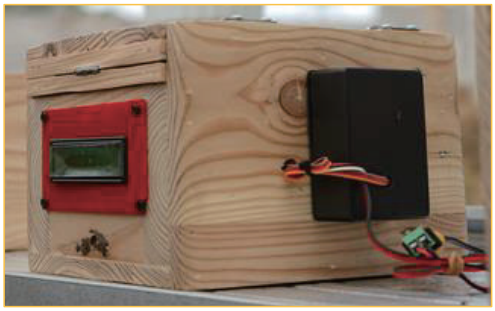


Composition of Propolis

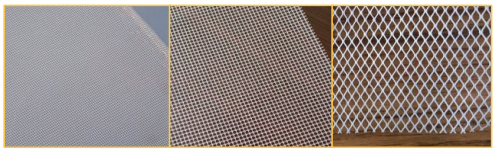


Field of Application of Propolis

METHODOLOGY



1) Cultivation-Modular *Tetragonula* Hives:
- Size (small, medium, large)
- Mesh material



Nylon Polyethylene Aluminum

2) Extraction of propolis

3) Characterization of propolis

Brown Yellow Red

RESULTS & DISCUSSION

MOTIVE sizes	Mesh materials	Propolis productivity (g/colony/week)	Honey productivity (g/colony/week)
Small	Nylon	1.24 ± 0.21	0.09
	Polyethylene	1.12 ± 0.58	0.08
	Aluminium	1.12 ± 0.54	0.02
Medium	Nylon	1.51 ± 0.63	0.09 ± 0.07
	Polyethylene	1.60 ± 0.27	0.12 ± 0.17
	Aluminium	1.81 ± 0.80	0.78 ± 0.18
Large	Nylon	2.52 ± 0.37	0.12 ± 0.02
	Polyethylene	2.32 ± 0.39	0.35 ± 0.35
	Aluminium	1.31 ± 0.50	0.03 ± 0.01

Kyoto University International ONLINE Symposium 2020
on Education and Research in Global Environmental Studies in Asia

Effect of Peanut Shell – Bokashi on growth performance of Vanilla planifolia: A case Study in Thua Thien Hue Province, Central Vietnam

Authors: Vu Tuan Minh* and Histoshi Shinjo**

* Department of Horticulture- Hue University of Agriculture and Forestry, Vietnam
** Graduate School of Global Environmental Studies, Kyoto University

ABSTRACT

The experiment was carried out in Thua Thien Hue province, Central Vietnam in 2020. It was laid out in Randomize Complete Block design with 3 replication and 4 treatments. The results indicate that treatment of application with 0.4 – 0,5 kg/m² charcoal Bokashi gave highest growth of vanilla plant and vine branching; The index leaf area index increase was recorded highest reaches 0.06 leaf m²/ land m². Beside that, this rate of Peanut shell- Bokashi also improved soil fertility as compare with other rate.

Key words: *Vine branching, leaf thickness, leaf area index, Vanilla planifolia.*

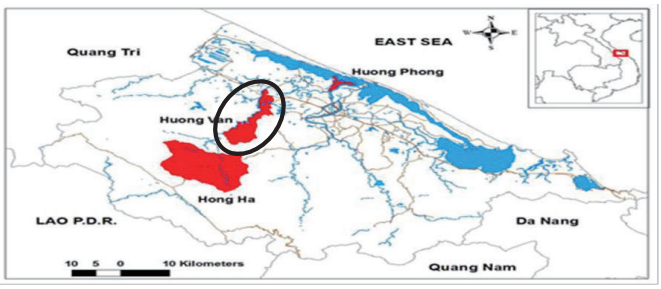


Fig. 1. Location of the study area

Research objectives and methods

Key question: How Bokashi material and peanut shell can be incorporated into Hummus matter **to improve the growth** of Vanillas?

Research contains	Methodology	Indicators
Study 1: Field site Observation on growth performance	The experiment was laid out in Randomize Complete Block design (RCBD) with 3 replication and 4 treatments In every 30 days measurement such as vine length, number of node, internode length, diameter of node, the speed of the vine length increase, Leaf index etc	Growth performance of vanilla under different managing treatment conditions

Treatments	Dosage Application of Organic matter	Treatment sign
Treatment I	Peanut shell + 0,1 kg/m² Charcoal Bokashi	BC 01 (Control)
Treatment II	Peanut shell + 0,3 kg/m² Charcoal Bokashi	BC 03
Treatment III	Peanut shell + 0,4 kg/m² Charcoal Bokashi	BC 04
Treatment IV	Peanut shell + 0,5 kg/m² Charcoal Bokashi	BC 05

Fig. 2. Namely of the experimental treatments

Study 2: Laboratory Analysis of organic materials examined	✓ 3 samples will be taken from each material use types before and after research period. ✓ 1 kg of the organic samples will be collected from each land use. ✓ Specific analysis of each indicator	With good treatment by pH, organic carbon, total nitrogen, total phosphorus, total potassium, CEC

Result

Table 1. Effect of Peanut shell-Bokashi dose on vine tillering ability of Vanilla

Treatment	Peanut shell-Bokashi applied to …..		
	Bud 1 (days)	Bud 2 (days)	Bud 3 (days)
B01(control)	20,4[a]	50,8[a]	0
B03	17,9[c]	46,7[c]	86,3[b]
B04	18,5[c]	50,4[b]	84,4[c]
B05	19,2[b]	51,0[a]	93,3[a]
$LSD_{0.05}$	0,69	0,41	0,87

a, b, c are the letters representing the different groups. The same formulas are represented by the same letter; Different letters indicate significant differences at α = 0.05.

Table 2. Effect of Peanut shell-Bokashi dose on the rate of Vanilla vine tillering

Treatment	Bud 1 (%)	Bud 2 (%)	Bud 3 (%)
B01(control)	100	100	0
B03	100	100	26,7
B04	100	100	33,3
B05	100	100	26,7

Table 3. Effect of Peanut shell-Bokashi dose on number of leaf and leaf area index

Treat.	Fist monitoring			Last monitoring			LAI increased (leaf m²/ land m²)
	Aver. No. leaf/plant (leaves)	Aver. leaf area (cm²)	LAI (leaf m²/ land m²)	Aver.No. leaf/plant (leaves)	Aver. leaf area (cm²)	LAI(leaf m²/ land m²)	
B01	26,50[a]	27,647[a]	0,07	39,25[c]	28,697[a]	0,11	0,04
B03	26,75[a]	32,713[a]	0,09	40,95[b]	34,323[a]	0,14	0,05
B04	26,12[a]	28,577[a]	0,07	43,33[a]	30,513[a]	0,13	0,06
B05	26,25[a]	31,457[a]	0,08	42,20[ab]	33,080[a]	0,14	0,06
$LSD_{0.05}$	0,734	11,481	//	2,023	11,61	//	//

a, b, c are the letters representing the different groups. The same formulas are represented by the same letter; Different letters indicate significant differences at α = 0.05.

Table 4. Effect of Peanut shell-Bokashi dose on number of soil properties element

Citerias	pHKCL	OC %	N %	P_2O_5 %	P_2O_5dt mg/100g	CEC cmolc/kg	H^+ cmolc/kg	AL_3^+ cmolc/kg
Before	6,09	0,87	0,017	0,017	3,31	0,42	0,36	0,04
After								
B01	5,83	0,70	0,028	0,009	3,50	0,28	0,17	0,03
B03	6,07	0,96	0,017	0,021	5,95	0,58	0,07	0,05
B04	6,14	0,95	0,028	0,015	4,25	0,44	0,10	0,04
B05	6,21	0,87	0,020	0,020	5,82	0,50	0,08	0,04

CONCLUSION

The treatments using high-dose charcoal Bokashi all showed good effect on vine tillering ability compared to the control treatment. The average leaf area of the experimental treatments did not differ significantly, but the number of leaves in the experimental treatments showed significant differences leading to an increase in the leaf area index. Peanut shell-Bokashi dosage of 0.4 - 0.5 kg /m² gives the best results. Its can be indicated for long term taking care of Vanilla in Central Vietnam.

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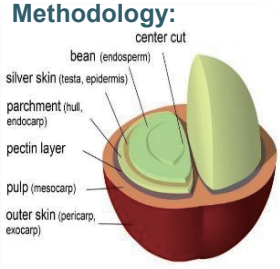
"Effect of Coffee Pulp compost on growth of Tram Gio (*Melaleuca cajuputi*) at the nursery stage"

Authors: Le Thai Thuy NHI*, Le Thai HUNG**, Hitoshi SHINJO ***
* CARD Office - ** Department of Forestry, at Hue University of Agriculture and Forestry, Vietnam
** Kyoto University, Japan

Background: As the 2nd largest coffee exporter globally, Vietnam has considerable amount of coffee by-products that are released into the environment. This has caused environmental pollution in the coffee bean production and processing areas. Besides, for sustainable agriculture, the use of organic fertilizers is essential. Therefore, the goal of this study is to treat and recycle the raw materials from coffee pulp to make organic fertilizer, contributing to reducing environmental pollution and developing sustainable agriculture in Vietnam

Methodology:



Anatomy of Coffee cherry (Credit: Y.tambe)

- **Materials:** Coffee pulp and agriculture waste

Control: CT	Treatment 1: T1	Treatment 2: T2	Treatment 3: T3	Treatment 4: T4
Soil Only	Local method	Coffee compost 70% Peanut Shells 30%	Coffee compost 70% Cow dung 30%	Coffee compost 70% + Cow dung +10% Peanut Shells 10% + Chemical 10%

Local method: 1000 kg of coffee by-products mixed with 1kg of Trichoderma probiotic, 1kg of molasses, and 15kg of P_2O_5, 5kg N, and 3kg of K_2O

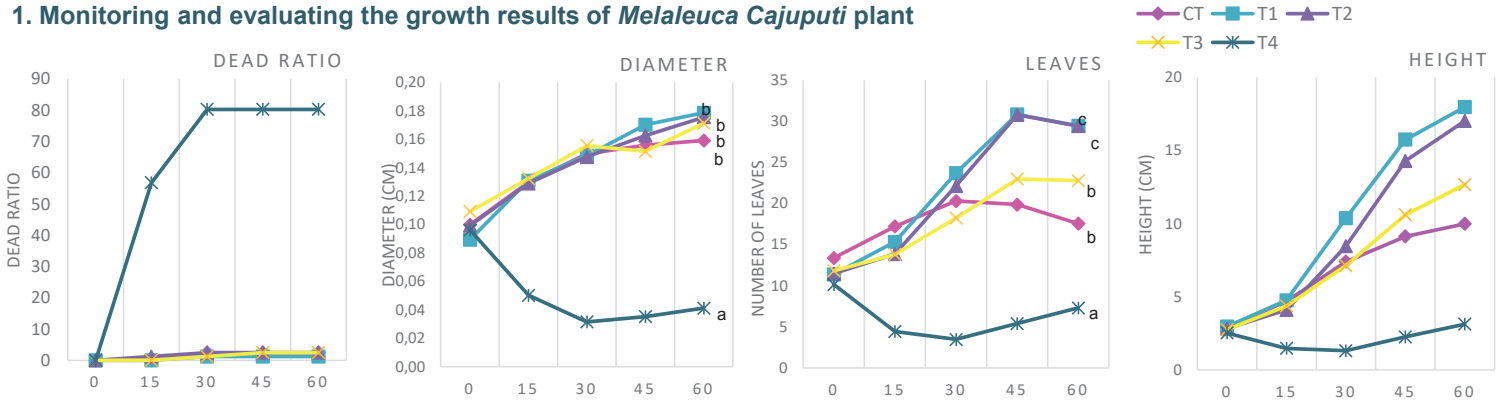
Jun	July	Aug	Sep	Oct	Nov

Material obtained — Composting — Cultivation

- **Indicator plant:** Tram Gio (*Melaleuca cajuputi* Powell, 1809)

Cajuputi essential oil product of LMX Hue

1. Monitoring and evaluating the growth results of *Melaleuca Cajuputi* plant



2. Effect of fertilizer Treatments on the growth of *Melaleuca Cajuputi* plant

Growth of *Cajuputi*

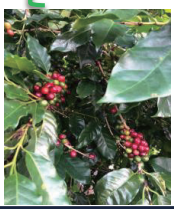
Negative effect ← Cf + Chemical 10% (T4)

Positive effect ← Cf + Chemical + Probiotic (T1)
Cf + Peanut shells (T2)

- High concentration of chemical fertilizer
- Timing for composting

- Nitrogen nutrient in Peanut shell
- Consistent concentration of chemical fertilizer

✓ T1 & T2 showed significantly better growth than the CT
✓ High concentration of chemical fertilizer gave negative effect on the growth stage of seedlings
✓ T2 could partly replace the amount of chemical fertilizer in T1
✓ Coffee pulp & peanut shells are the ideal material for organic fertilizer



Valuing water supply and soil erosion control functions of watersheds in the Forestland Management Project (FMP) sites in the Philippines

Analyn L. Codilan* ,Priscila C. Dolom** ,Leonida A. Bugayong** ,Noel L. Tolentino**, Hanna Leen L. Capinpin**, Ma. Magdalena B. Villanueva**, Ma. Cynthia S. Casin**, Judith F. Castillo**, Jean C. Nicmic**, Jan Joseph V. Dida* and Diorella Mari T. Garcia**

*Institute of Renewable Natural Resources/**Forestry Development Center, College of Forestry and Natural Resources, University of the Philippines Los Baños*

Background of the Study

Watersheds, if properly managed, provide various goods and services (ecosystem services) for human welfare. These watershed ecosystem services like provision of water and soil erosion control are vital to humanity. The critical sub-watersheds (Upper Magat and Cagayan River Basin, Upper Pampanga River Basin, and Jalaur River Basin) serving as Forestland Management Project sites are not exempt from these services. Despite of their importance and the dependence of humans on their provision, ecosystem services continue to be undervalued, especially in the critical sub-watersheds under FMP. The study used the Integrated Valuation of Ecosystem Services and Trade-offs (InVEST) tool to quantify annual water yield and annual soil loss from the FMP sub-watersheds as a first step in valuing these services and relate to policy development for the conservation and management of the sub-watersheds.

Methodology

There are 25 sub-watersheds located inside FMP sites across four regions (CAR, R1, R2, R3 & R6). To quantify the annual water yield and annual soil loss, two base periods (current:2018-2022 & projected:2023-2027) and two scenarios (business-as-usual and development) were used. Basically, BAU scenario reflects the land uses in the study sites without the FMP interventions while Development scenario showcases FMP interventions (i.e. reforestation, agroforestry, plantation) in addition to existing land uses. Information from DENR 2010 & 2015 Land Cover Map, LGU Land Use Map, identified activities in the River Basin Project and priority land uses of stakeholders were used in the generation of the land use maps.

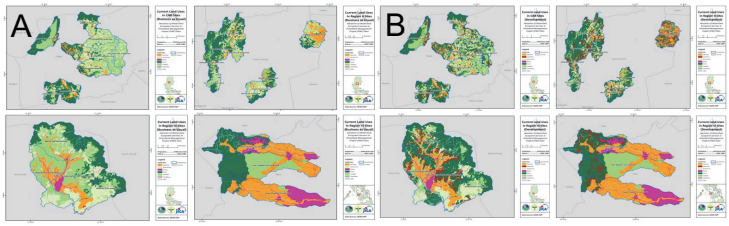


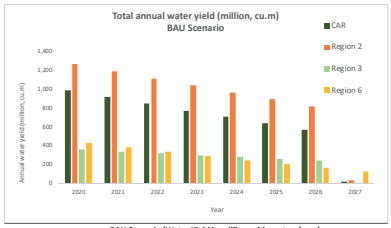
Fig 1. Current (A) and projected (B) land uses across FMP regions and subwatersheds under BAU and Development scenarios

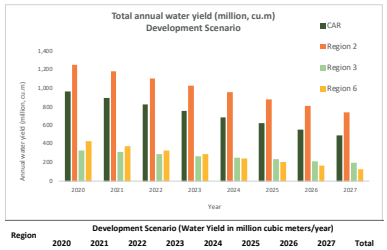
In order to estimate annual water yield and annual soil loss under the two base periods and scenarios, the water yield model and soil erosion model using RUSLE in InVEST was used. In addition, the mean annual rainfall data recorded from 2012 to 2018 by PAG-ASA and other weather monitoring stations nearest to the location of the sub-watersheds was used. The study followed the stepwise analysis and specific data requirements (primary and secondary data) indicated in InVEST. The resulting values from BAU and Development scenarios were compared and analyzed.

Results and Discussion

Total Annual Water Yield

A generally decreasing trend in the estimated annual water yield is observed for both scenarios. For all regions, the rainfall amount from 2020 to 2027 is projected to decrease, resulting in a similar decrease in water yield. Total annual water yield from 2020-2027 is about 17.0 billion m^3 (BAU) and 18.0 billion m^3 (Dev't), with the highest value observed in Region 2.





BAU Scenario (Water Yield in million cubic meters/year)

Region	2020	2021	2022	2023	2024	2025	2026	2027	Total
CAR	982.96	913.11	843.61	771.97	703.75	636.52	570.66	17.62	**5,788.68**
Region 2	1261.47	1186.41	1111.65	1036.46	962.54	889.22	816.4	35.92	**7,930.10**
Region 3	358.21	338.4	318.75	298.19	279.04	260.23	240.89	6.05	**2,110.24**
Region 6	426.94	379.51	333.7	288.24	247.32	205.72	168.39	131.7	**2,173.98**

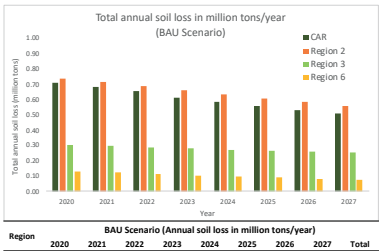
Development Scenario (Water Yield in million cubic meters/year)

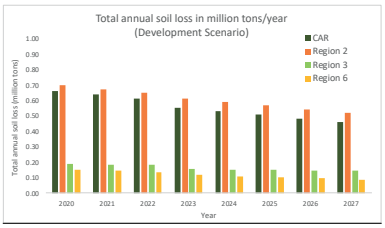
Region	2020	2021	2022	2023	2024	2025	2026	2027	Total
CAR	964.68	895.11	825.96	753.52	685.75	619.03	553.8	490.83	**5,788.68**
Region 2	1250.81	1175.94	1101.37	1026.42	952.76	879.69	807.18	735.92	**7,930.10**
Region 3	331.43	312.19	293.19	270.56	252.31	234.52	216.33	199.7	**2,110.24**
Region 6	425.64	378.2	332.43	287.9	245.73	205.41	167.2	131.46	**2,173.98**

Fig 2. Total annual water yield under BAU and Development scenarios

Total Annual Soil Loss

Similarly, a decreasing trend in annual soil loss is observed across regions and in both scenarios. This is due to the decreasing rainfall amount resulting to a decrease in the value of the erosivity factor (R) and consequently, a decline in the annual soil loss value. Estimated annual soil loss is 13.1 M tons (BAU) and 11.6 M tons (Dev't), with the highest value observed in CAR.





BAU Scenario (Annual soil loss in million tons/year)

Region	2020	2021	2022	2023	2024	2025	2026	2027	Total
CAR	0.72	0.67	0.66	0.6	0.59	0.58	0.54	0.5	**4.84**
Region 2	0.73	0.72	0.69	0.64	0.64	0.61	0.57	0.56	**5.19**
Region 3	0.3	0.29	0.29	0.28	0.27	0.26	0.26	0.26	**2.22**
Region 6	0.13	0.13	0.11	0.1	0.1	0.09	0.08	0.07	**0.81**

Development Scenario (Annual soil loss in million tons/year)

Region	2020	2021	2022	2023	2024	2025	2026	2027	Total
CAR	0.66	0.65	0.6	0.56	0.53	0.5	0.48	0.46	4.84
Region 2	0.69	0.67	0.66	0.63	0.59	0.58	0.54	0.51	5.19
Region 3	0.19	0.19	0.18	0.15	0.15	0.15	0.15	0.14	2.22
Region 6	0.16	0.15	0.13	0.12	0.1	0.1	0.1	0.09	0.81

Fig 3. Total annual soil loss under BAU and Development scenarios

BAU vs Development Scenario

Results show that in general annual water yield is higher in the Dev't scenario than the BAU scenario. On the other hand, annual soil loss is generally lower in the Dev't than in the BAU scenario.

These results indicate that indeed the interventions introduced by FMP have significant and positive impacts in the value of ecosystem services in the sub-watersheds in the study sites.

Fig 4. Comparison of values under BAU and Development scenarios

This poster is undisclosed

Kyoto University International ONLINE Symposium 2020
on Education and Research in Global Environmental Studies in Asia

Waste to Food: Integrating organic waste management by insect saprophage to food production

Authors: Ramadhani Eka Putra*[1], Agus Dana Permana*[1], Mia Rosmiati *[1], Ida Kinasih*[2] , Muhammad Yusuf Abduh*[1]

*[1] School of Life Sciences and Technology – Bandung Institute of Technology
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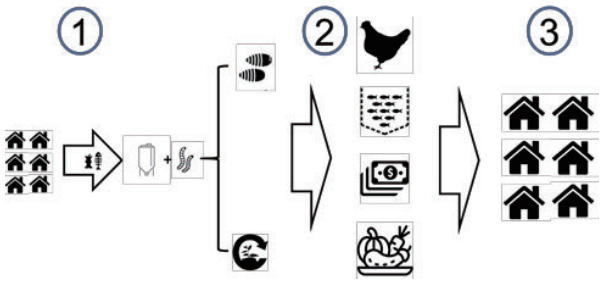
Background

In Indonesia, organic waste has been considered as major environmental problems. A upcyling method is required to improve the participant of the community to reduce the amount of organic waste to be send to sanitary landfill. The program is **Waste to Food**, a upcyling and circular economy model of organic waste management.



The insect saprophage

Black soldier flies (*Hermatia illucens*)

Principle of Waste to food program

There are three steps of **Waste to Food** program

1) To utilize insect saprophage to decompose and convert organic waste into (1) insect biomass which high in protein and lipid, (2) residues that consisted of insect frass, a uric acid-based material rich in nitrogen content which applicable as fertilizer.
2) Apply the conversion products as part of food production system (aquaculture, poultry, and agriculture)
3) Harvested product return to the community and provides monetary benefits to farmers due to production cost reduction and improve the food security of the local community

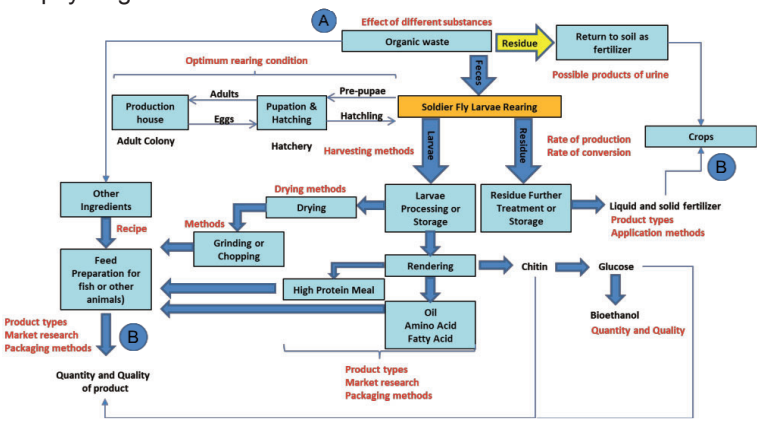
Conclusion

This study show the potency of integrating decomposition process of organic wastes by insect with food production in small urban farming set up.

Author acknowledge the support of Ministry of Research for the funding of this study

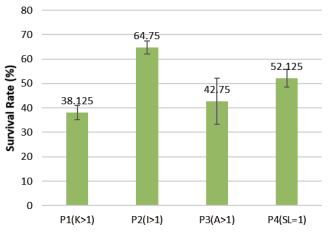
Methodology

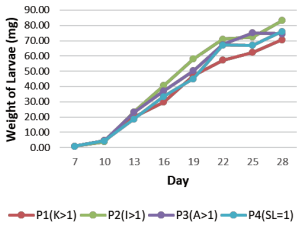
Waste to food program is part of studies on the organic waste upcycling research



The Results

A. The effect of substrate for larva biomass production

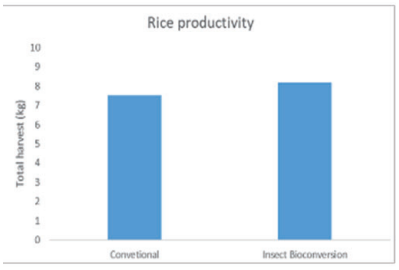


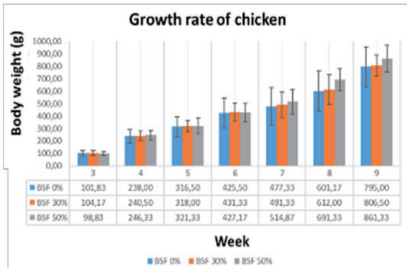


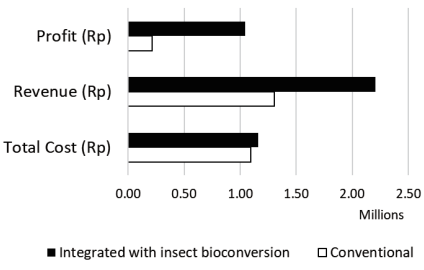
P1 : More fibers
P2 : More protein
P3 : More fat
P4 : Balanced

- Larva showed high survival rate in common municipal organic wastes
- Organic wastes rich in protein and carbohydrate more likely to produce heavier larvae, a common type of city wastes

B. Integrating organic waste conversion with food production







Integrating the larva production with food production

- Improve the quantity of the product.
- Created a significant profit for farmer.
- Further study on the safety of the products.

Greenhouse Gas Inventory of Falcata *[Falcataria moluccana (Miq.) Barneby & J. W. Grimes]* Lumber Production in the Caraga Region, Philippines

Authors: *Palma-Torres, Vanessa M., *Racelis, Diomedes A., **Espiritu-Cabral, Dalisay, ***Racelis, Elenita I., *Predo, Canesio D., *Carandang, Myrna G., and *Carandang, Wilfredo M.

*Institute of Renewable Natural Resources, College of Forestry and Natural Resources, University of the Philippines Los Baños, College, Laguna, ** Forestry and Environment Research Division, Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD), ***Training Center for Tropical Resources and Ecosystems Sustainability, College of Forestry and Natural Resources, University of the Philippines Los Baños, College, Laguna

BACKGROUND

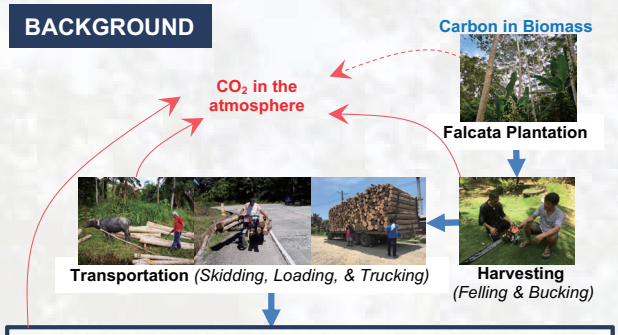


Figure 1. Carbon Emission and Storage in HWPs

The Caraga Region, known as the "timber corridor" of the Philippines, is well known for its Industrial Tree Plantations (ITPs) that produce Falcata lumber for the veneer and plywood industry. However, the carbon footprint of this Falcata-based industry has not yet been accounted for. During harvest, carbon is either taken out of the forests as harvested wood products (HWPs) or retained as logging residues (Kloehn & Ciccarese, 2005). Wood products, therefore, enhance the carbon sink capacity of forests by extending the period that CO_2 is excluded from the atmosphere and at the same time, by encouraging forest growth (CEI-Bois, 2006). Lumber as a harvested wood product is produced involving different operations (which emit carbon). Wood industries are required to respond to global climate change through their environmental compliance on GHG emissions. They need to understand the quantity of emissions that result from their activities to purchase sufficient carbon credits to meet their legislated obligations or to report their emissions to interested stakeholders. This study aimed to quantify the GHG emissions of the Falcata lumber industry in the Caraga Region by tracing the least and highest GHG emissions within each phase of production.

METHODOLOGY

In-depth interviews with representative ITP farmers, transport groups, and Wood Processing Plants operators in the Caraga Region were conducted to collect detailed and relevant data on each stage (harvesting, transport, and sawmilling operations) of lumber production. The system boundary shown in Figure 2 defined the unit processes included in the computation: harvesting operation (A1), minor and major log transport (A2), and primary wood processing (A3). The study computed the CO_2 net emissions or uptake value based on the total CO_2 stored per cubic meter of lumber produced out of the total volume of logs as input variable for lumber production based on the volume of logs per truckload (30 m^3). The potential C storage was calculated based on the volume of lumber produced out of the harvested wood using the wood density of falcata. The following generalized equations were used to calculate GHG emissions for each identified emission sources and the net GHG Fluxes:

EQUATION 1: Total CO_2e Emissions = ∑(Activity data x CO_2 emission factor x 1) + (Activity data x CH_4 emission factor x 28) + (Activity data x N_2O x 265)

EQUATION 2: Net GHG Fluxes = CO_2e Stored in Lumber – Total CO_2e Emissions

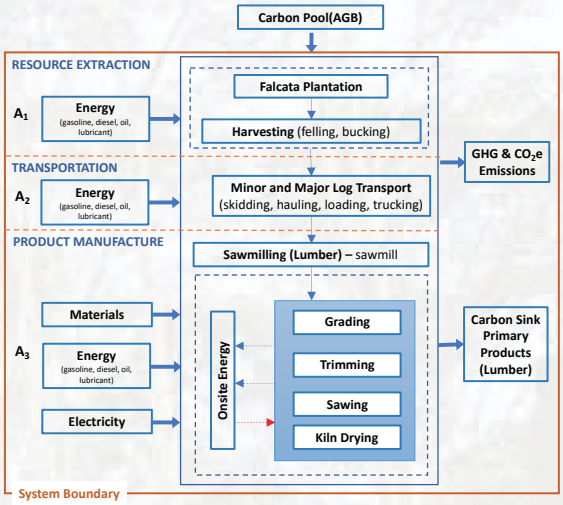


Figure 2. Operational boundary for falcata lumber production *(Modified from Bergman, R. D., & Alanya-Rosenbaum, S. (2017))*

RESULTS AND DISCUSSION

Emissions for minor and major log transport varied depending on the mode of transport combinations used. From the total volume of 30 m^3 per truckload of logs about 19.5 – 22.2 m^3 of lumber can be produced at a 65-74% recovery rate. The carbon stored in raw logs is estimated at 2.457 – 2.797 Mg m-3 per truckload. The net GHG emission was derived by deducting the amount of C stored from the total GHG emissions on all stages of lumber production.

Since 1t carbon equates to 3.67 t CO_2e, a 1m^3 kiln-dried lumber stores about **0.462 Mg CO_2e**. The amount of emissions from lumber operations (**0.146 Mg CO_2e m-3**) was further deducted from this value resulting in net emissions of **0.317 Mg CO_2e m-3** as summarized in Figure 3. About 94% of the total emissions come from transporting the logs from the plantations to the sawmills while only 2% is from the actual lumber production.

CO_2e (STORED) – CO_2e (EMITTED)

= Net GHG Fluxes

0.462 Mg CO_2e m^{-3} – 0.146 Mg CO_2e m^{-3} = 0.317 Mg CO_2e m^{-3}

Figure 3. Net GHG emission of lumber production (Mg CO_2e m^{-3})

REFERENCES: CEI-Bois, 2006. Tackle Climate Change: Use Wood, s.l.: CEI-Bois, the European Confederation of woodworking industries; Kloehn, S. & Ciccarese, L., 2005. Applying the IPCC GPG for LULUCF approaches for assessing changes in carbon stocks and emissions of green-house gas for harvested wood products in Italy, Rome: Report commissioned by the Italian Ministry for Environment and Territory and Sea (MATTM); and Bergman, R. D., & Alanya-Rosenbaum, S. (2017). Cradle-to-gate life-cycle assessment of laminated veneer lumber production in the United States. Forest Products Journal, 67(5-6), 343-354.

Estimating Corn Health Using High Resolution Aerial Images in at The Royal University of Agriculture

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1. Background

- In this studies, we are about to measure corn health by accessing chlorophyll contains;
- Chlorophyll contains are associated with fertilizer amount which over uses could cause environmental health issues;
- In this poster, we aim at evaluating chlorophyll contains using very high resolution image acquired Parrot Sequoia;
- This example is taken place over farmers fields and the technique applied in this poster to test the application;

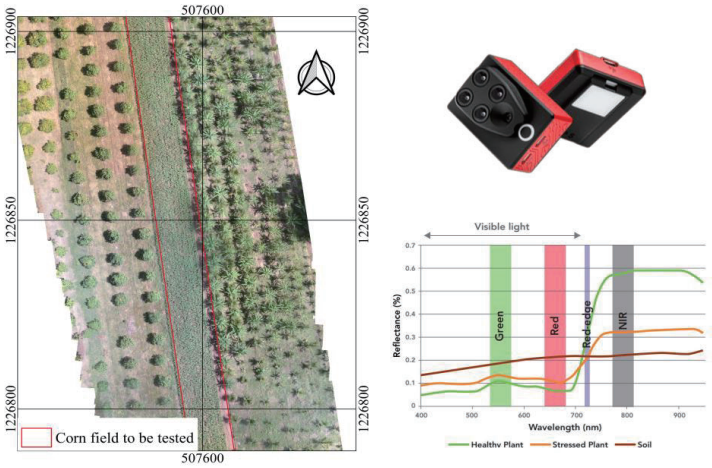

Figure 01: RGB Image of Corn Field (left), Parrot Sequoia Camera with Sunshine Senor (Top right [parrot.com]), and Green Vegetation Reflectance with spectral resolution (Bottom right [parrot.com])

2. Images Acquisitions and Preprocessing

- Date: 31 AUG 2020
- Flight times: 09.40-09.53 am
- Temperature: 34.3 C
- Wind speed 2.9 m/s
- Flight speed: 3m/s
- Altitude: 30m above canopy
- Platform: DJI M100
- Capture mode: GPS
- App: DroneDeploy
- Preprocessing: Pix4DMapper
- Adopted R Program (v. 3.6.3) and RStudio (v. 1.2.5019)
- Packages used: sp, raster, rgdal, randomForest, and Metrics
- Classifier: randomForest

Figure 02: Aerial Image Collection Using Parrot Sequoia Camera onboard DJI Matric 100

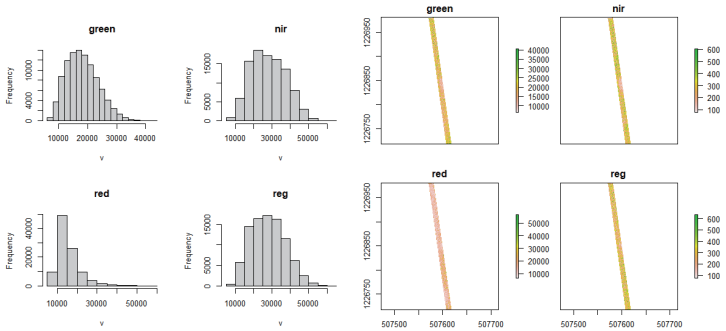

Figure 03: Each band reflectance frequency (left) and band visualization (right). Green is in top right corner, nir is in top left, red is in bottom right and red edge in is bottom left

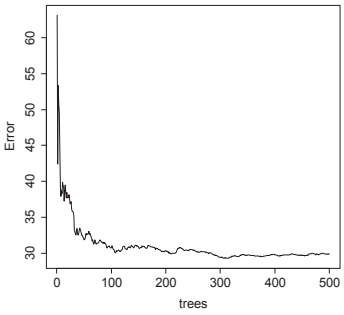

Figure 04: OOB Error Rate of Random Forest Algorithm with an error rate at 2.03% mean square residual at 29.42

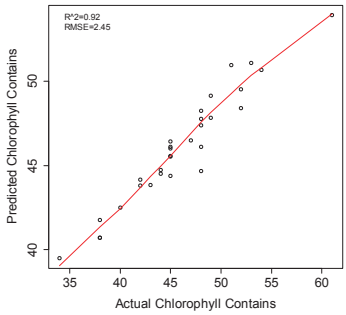

Figure 05: Relationship between Actual and Predicted Chlorophyll presenting R^2 at 0.92 and RMSE at 2.45

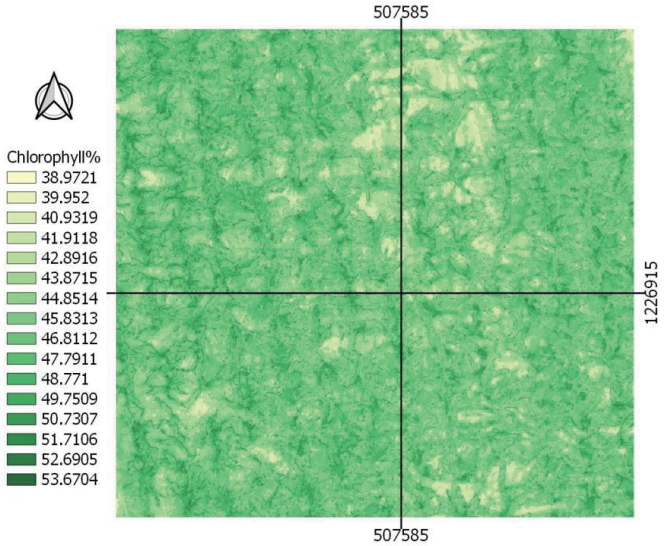

Figure 06: A close at the corn field illustrates chlorophyll contains from lowest (38%) to highest (53%) that represent corn health. The lowest are death leaf while the highest is the best.

Poster Presentations- Urban and Rural Planning

Kyoto University International ONLINE Symposium 2020
on Education and Research in Global Environmental Studies in Asia

Comparison of domestic water use behaviors in non- urbanized communities of four Southeast Asian countries

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Introduction

- Non-urbanized SEAs population usually lack access to **safe water and sanitation**.
- As a progress toward achieving **SDGs, Goal 6**, it is necessary to understand the situation of water and sanitation usage in those areas.

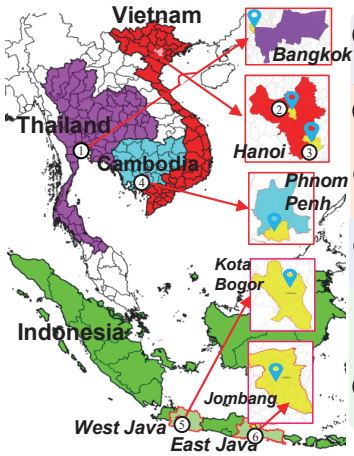
Objective

- To investigate water use behavior in six non-urbanized communities of **Thailand**, **Vietnam**, **Cambodia,** and **Indonesia**.

Methodology

- Interview-based questionnaire survey was conducted in each area.
- The questions mainly focus on **water sources**, **water end-uses,** and **wastewater handling**.

Study areas



① **Salaya subdistrict (n=38)**
(Dec 12-21,2018; 18.73 km²; 7286 HHs)

② **Lai Xa hamlet (n=32)**
(Oct 11-15,2019; 0.34 km²;1500 HHs)

③ **Trai hamlet (n=106)**
(Sep 9-Oct 4, 2019; 0.11 km²; 278 HHs)

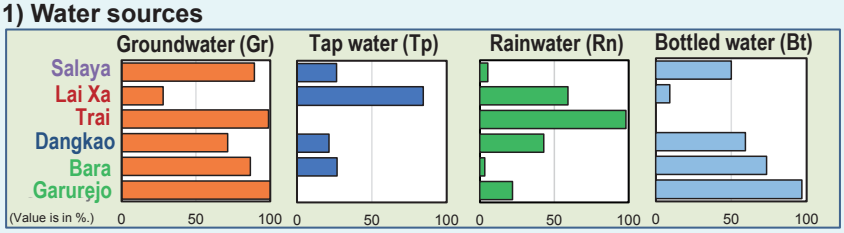
④ **Dangkao district (n=42)**
(Nov 15-24, 2018; 117.8 km²; 96100 ppl)

⑤ **Bara hamlet (n=30)**
(Nov 11-Dec 12, 2019; 0.1 km²;120 HHs)

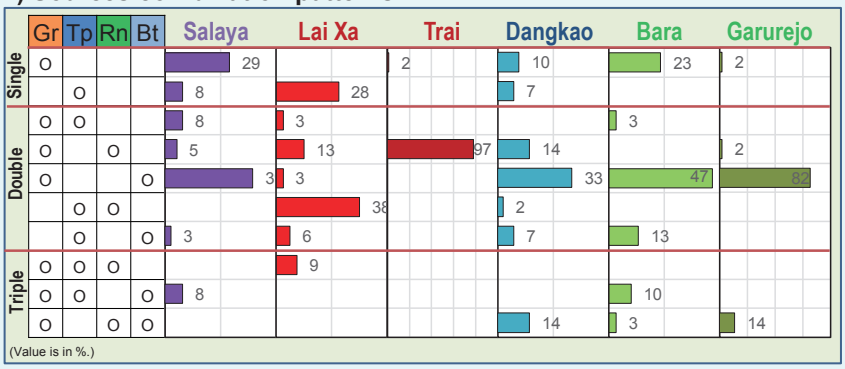
⑥ **Garurejo hamlet (n=44)**
(Oct 8-Nov 4, 2020; 3.36 km²; 102 HHs)

Results

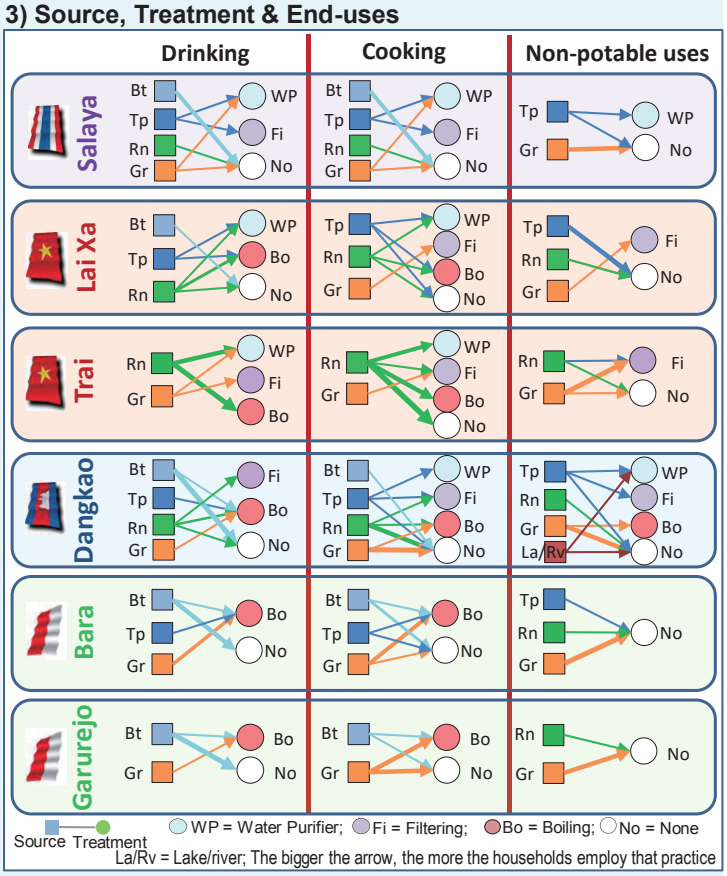
1) Water sources



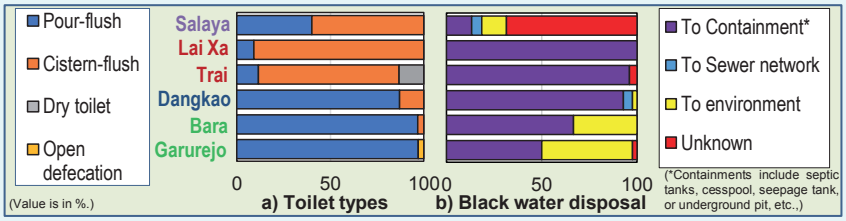
2) Sources combination patterns



3) Source, Treatment & End-uses



4)Toilet types & Wastewater disposal



Conclusion

- Groundwater is used by all communities.
- Double source (Gr & Bt) is the most popular pattern.
- Bara and Garurejo do not drink from rainwater.
- Boiling followed by water purifier and filtration are used to treat water.
- Almost all possess toilets while blackwater is mainly stored in the containment i.e. septic tanks or cesspools.

Kyoto University International ONLINE Symposium 2020
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Actual situation of social media use By rural hamlets across Kyoto Prefecture

Authors: Tanaka Hatsu*, Onitsuka Kenichiro*
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** Department of Environmental Science & Technology, Kyoto University

background

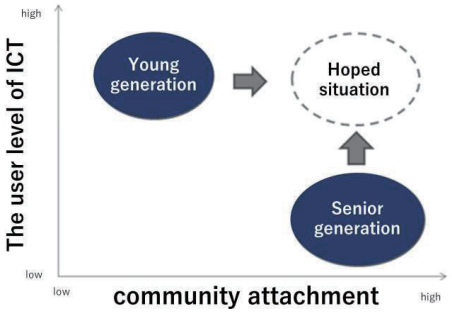
1.Changes in communication style

The 20th century was an era in which the media such as disseminated information in one direction. From the end of the 20th century, Social networking service(SNS) started due to the spread of the Internet. On SNS, Two-way communication between the sender and receiver of information is possible. As wearable terminals such as smartphones have become lighter, the devices have become easier to carry. As the result, the time spent in contact with such online communication has increased.

2. Problems in rural area using SNS

The introduction of SNS has made it easier to disseminate information not only inside the region but also outside the region. On the other hand, it has been pointed out that the opportunity of communication with people outside the region decreases the opportunity of communication with people within the region. This problem may induce reducing attachment to the region.

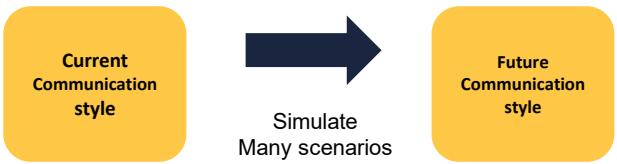
In addition, it has been pointed out that effective utilization of ICT requires human resources with local attachment and high IT skills.



The relation between the user level of ICT and community attachment

The purpose of this study

We investigate how future changes in communication style will affect the communication with people inside and outside the village. Before that, we clarify the current online communication on SNS in Kyoto Prefecture.



methodology

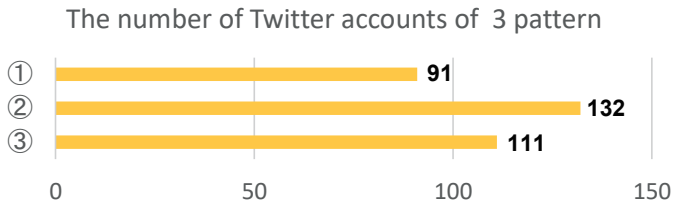
First, we surveyed Twitter users in Kyoto prefecture and clarified the current usage of social media.
Using search engine of Twitter, we searched the 1874 area in Kyoto Prefecture. As the result, we extracted only the account name from the information collected by crawling. We created three patterns of character strings.

Search string pattern

① “京都” + “each district“
② "ward / city name" + "each district“
③ “Character string excluding “市” from ward / city name” + “each district”

results

We obtained the best search results from the search string ② and extracted 132 Twitter accounts of stores, personal names, and local governments.
However, some accounts that were no longer in use.



discussion and outlook

Improvement points

・In this survey, some accounts could not be collected, so further improvement of the search method is required.
・Since the survey was conducted only on Twitter, it is necessary to survey other social media and clarify how people in the district communicate.

Outlook

Using this result, we collect the target area in which we investigate communication with people inside and outside the village and simulate the influence of future changes in communication style on the village function maintenance activities.

Challenges for Realizing Regional Revitalization Utilizing Traditional Industries in Rural Areas

Authors: Yukiho Yoshida*, Kenichiro Onitsuka**, Naoko Toyoshima*, Satoshi Hoshino** and Natsuki Shimizu***

* Graduate School of Agriculture, Kyoto University ** Graduate School of Global Environmental Studies, Kyoto University
*** Graduate School of Agricultural Science, Kobe University

1. Background

In Japan, it is difficult to secure the raw materials for traditional crafts. On the other hand, in rural areas, revitalization of local industries is required through the development of specialty products, and the introduction of traditional industries from outside the area is expected as one of the means. From these points of view, stable production of “Kyoai,” indigo plants endemic to Kyoto, is required in Hozu Town, Kameoka City, Kyoto Prefecture. However, farmers, who are expected to grow Kyoai, are not eager to cultivate it. In this study, we clarified the issues of Kyoai cultivation in terms of crop cultivation conditions and farmers’ consciousness, considering ways to expand its cultivation.

2. Methodology

We conducted a literature survey and a hearing survey on the cultivation conditions of crops. We also conducted a questionnaire survey on the farmers' consciousness and analyzed the results by path analysis.

3. Results

3.1. Crop cultivation conditions

In terms of profitability, the production value per area of Kyoai is higher than that of paddy rice, black soybeans and red beans (Table). In addition, a cultivation system using machines has been established for paddy rice, and the use of machines is expanding in the cultivation of soybeans and red beans, but most of the processes in Kyoai cultivation are performed manually. Regarding the land conditions, the soil is clayey, and drainage is not very good in the most part of Hozu Town. However, soil with good drainage and water retention is suitable for cultivation of soybeans, red beans, and Kyoai.

3.2. Farmers' consciousness

In this study, a hypothetical model was set with reference to the two existing models, and path analysis was performed using Amos (Fig.). As a result, the pass coefficient from interest in Kyoai cultivation was 0.703, and the pass coefficient from expectation for Kyoai to interest in Kyoai was 0.495, which were relatively high values.

Table Comparison of acreage, production, production amount and working hours between main crops grown in Hozu Town and Kyoai

	Acreage (ha)	Production (kg/10a)	Production amount (yen/kg)	Working hours (hours/ha)	Production amount per 10a (yen/10a)
Paddy rice	353.8	520	203	95.8	**105,560**
Soybeans	24.0	100	1,092	–	**109,200**
Red beans	63.9	100	1,076	110.5	**107,600**
Barley	82.8	180	101	43.9	18,180
Kujo green onions	25.3	5,000	650	1,038.0	3,250,000
Kamo eggplants	3.4	5,439	381	–	2,072,259
Onions	21.8	5,000	142	–	710,000
Chinese cabbage	3.0	5,667	53	–	300,351
Other	0.7	-	73	–	-
Kyoai	2.81	1,725	100	1,819	**172,500**

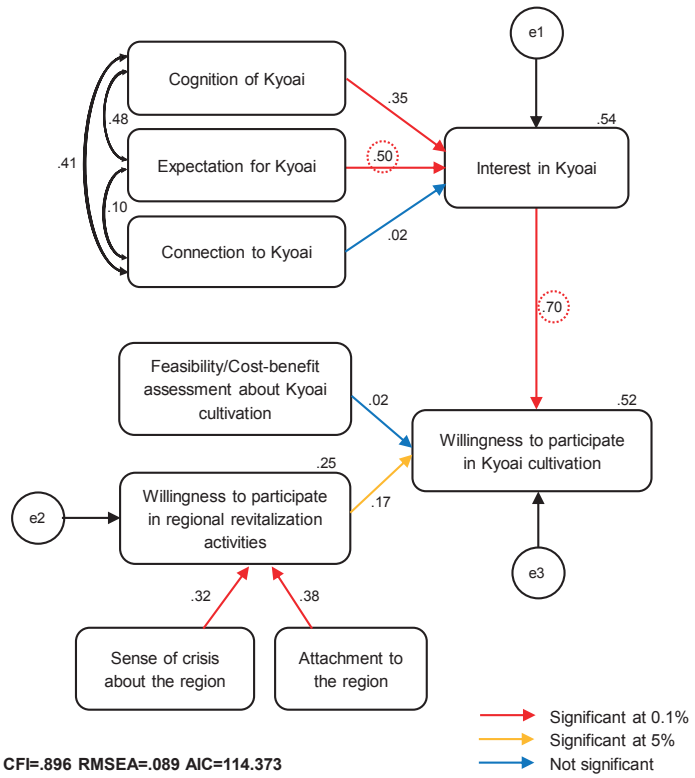


Fig. Analysis result

4. Discussion

Since Kyoai were newly introduced in Hozu Town, it is expected that few local residents recognize it as local resources of the region. From the results of the questionnaire survey, it can be seen that few farmers know about activities such as indigo dyeing and indigo cultivation. Therefore, it is necessary to disseminate information on activities related to Kyoai within the region. In addition, from the results of path analysis, it was shown that giving the expectation that Kyoai will be useful for regional revitalization may lead to interest in Kyoai, and whether they are interested in Kyoai is related to the willingness to grow Kyoai. Therefore, in order to spread the cultivation of Kyoai in Hozu Town, it is important to have the expectation that activities related to Kyoai will lead to the activation of the town. In addition, although it was not possible to show from the analysis of the questionnaire survey that cost-benefit assessment by farmers affect the willingness to work on Kyoai cultivation, there is no doubt that whether the crop cultivation can generate profits is a big issue for farmers. Although mechanization can be mentioned as a means to increase profitability, it is necessary to consider focusing on establishing a method of cultivating Kyoai by hydroponics. If production by hydroponics becomes possible, it can be expected that unused paddy fields will be utilized.

Rural Settlements Morphology in Disaster Prone Area: A Case Study of Arakawa Village, Shiga Prefecture of Japan

Jingying WANG*, Chiho OCHIAI*
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BACKGROUND

Arakawa village locates in Shiga region, the north of Otsu City. With a land frontier of 72km^2, the region measures 15.5km from north to south and 7.5km from east to west. Due to its special geographic location between Hira mountain on the west side and Biwa lake on the east, it experiences a significant elevation difference up to 1000m within the short east-west span. Therefore, the region has historically suffered frequent natural disasters like landslides and flooding, while the strong wind called “Hira-oroshi” (Hira-mountain downslope wind) still occurring throughout the year. To survive under the harsh conditions, villages in the past were built on the respect of natural environment with unique identities. The research aims to figure out the spatial features of traditional settlement forms in Arakawa village, and its relationship to climatic conditions and natural hazards.

METHODOLOGY

Rural settlement morphology is defined as a multi-disciplinary study of human settlement in its vertical and horizontal arrangements, dimensions as well as material composition by Jordan (1966). To acquire a comprehensive understanding of those features in Arakawa village, three scales of observation are defined, from the overall village structure (1:5000), to the arrangement of the settlements (1:1500) and explicit single building unit (1:100). Based on the arguments of C. Steinitz (2008), research at the village scale is to reflect strategy and policy, while the settlement scale contributes to findings of interrelationship and the building scale helps figure out detailed approaches. Besides, research objectives and methodologies vary under each study scale as listed in the table below.

Table 1. Study subjects, objectives and methodologies in different scales

Scale of Research	A. Village scale 1:5000	B. Settlement scale 1:1500	C. Building scale 1:100
Study Subject	Strategy, policy, allocation	Tactics, relationships, organization	Details, approaches, expression
Objective	Figure out the features of surrounding area at risk of natural hazards outside the traditional residential zone	Analyze the features of the settlement pattern inside the the traditional residential zone in consideration with local climate	Summarize local building technologies (material, structure and construction) that are responsive to natural environment
Methodologies	Literature review of related research and ethnographic documents; Unstructured and semi-structured interviews with local seniors and craftsmen		
	Visual analysis of historical maps from 13th to 19th century and satellite imagery from 1960s to 2010	Statistical analysis based on digitalization of the building ledger in 1899 and observation survey on- site	Participant observation in renovation and construction projects with local craftsmen; measurement survey on-site

RESULTS

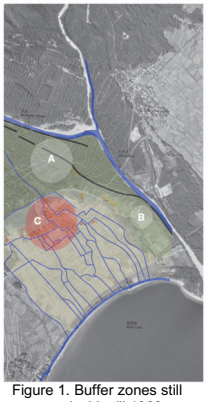

Figure 1. Buffer zones still recognizable till 1960s

At village scale, it is seen that two natural buffer zones (A&B) between Otani river and residential zone C were carefully managed by the community as countermeasures in face of the occurrence of flooding and landslide in the past (Figure 1). Zone A comprised protection forest with courses of stone dikes built by the villagers continuously in different time periods, while zone B was left as uncultivated fields to protect the safety of the residents.

Zone A and B together built up the riparian buffer zone (RBZ), which is scientifically defined as an area of trees, accompanied by shrubs and other vegetations along a river and delivers tremendous benefits such as interception of pollutants and provision of habitat for wildlife and movement within natural corridors. In regards of disaster prevention, RBZ can stabilize stream banks and minimize erosion, as well as decrease the frequency and intensity of flooding and low stream flows. (Horner and Sweeney, 2014)

At settlement scale, it is found out that in Meiji-era, up to 91.7% of the houses shared the same orientation and extended themselves along the northwest-southeast axis, corresponding to the direction of the downslope winds from Hira mountain towards Biwa lake (Figure 2). Besides, among those houses, 77.7% had the entrance at the southeast side with the northeast façade fully closed without windows (Figure 3).
Through the interviews with local craftsmen, it is further confirmed that the orientation of the houses is exactly out of the consideration of the strong wind, to better utilize the strength of the timber framework and remedy deformation.

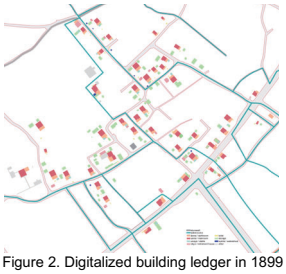
Figure 2. Digitalized building ledger in 1899

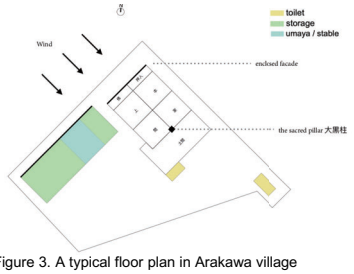

Figure 3. A typical floor plan in Arakawa village

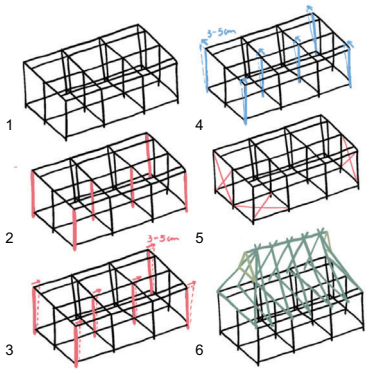

Figure 4. Construction process of tilted timber framework

At building scale, it is explained that the timber framework has been built tilted, leaning towards the wind direction about 1° in advance, with anticipation of deformation in next decades (Figure 4). It is still the tacit common sense among local craftsmen and will be conducted without records of plans or directions of the architect.

Besides, it is told that in the past various timber materials were used according to their specific characters in strength, humidity, termites and fire resistance, while recently just cedar and cypress trees are commonly utilized due to the abundant availability.

DISCUSSION

Ever since the open of JR Kosei-line along Biwa lake in 1974, Shiga region has seen an enormous expansion of residential areas, while most of them finally reside at the past buffer zones under high risks of flooding or landslides. It is the result of land transaction between local villagers and outside investors, based on the confidence in the strength of modern infrastructure such as concrete gravity dams. However, it also increases the vulnerability of the area, that merely relys on rigid **proactive** countermeasures, without thinking about adjusting approaches in after-disaster scenarios.

On the other hand, local building intelligence embodies the thinking of **reactive** resilience with anticipation of undesirable situations, and with full respect of nature. The valuable local knowledge inherited through generations deserves equal attention and the integration of **both proactive and reactive** measures would then truly strengthen the disaster resilience of the area.

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3. Horner, Wesley R., Sweeney, Bernard W. (2014). The Science Behind the Need for Riparian Buffer Protection. published by *the Pennsylvania Land Trust Association*, with support from *the William Penn Foundation, the Colcom Foundation* and *the Growing Greener Program of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.*

Statistical Cluster Detection of Built-up Area Changes using SaTScan – A case of Jabodetabek, Indonesia

Authors: Dianti Farhana Kamasela[1], Izuru SAIZEN[2], Narumasa Tsutsumida[3], Suwanna Kitpati Boontanon[4]

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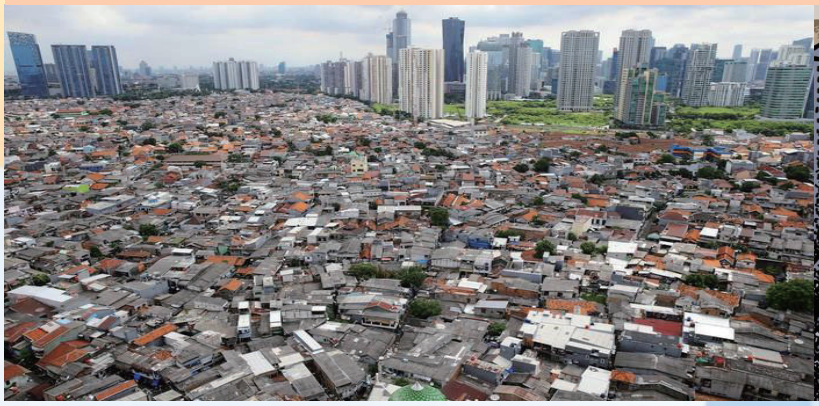
Background

No, 8 in 10 people don't live in urban areas. Not yet (Thecityfix.com 2018).



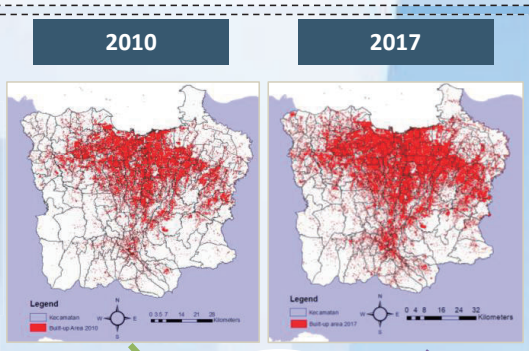
detik.com

deforestationassignment101.weebly.com

Jabodetabek are the center of everything for Indonesia which contributes the biggest income for Indonesia and consists of to 10% of Indonesia's population: 33 Million people in 2017 (BPS, 2017). This area has experienced extensive **urban expansion** which is a **serious problem especially** (Mondal et al., 2015) cause lead this city having several big city disease, such as; urban poverty, slums areas, traffic congestion, air pollution, degraded water quality, and floods (Rustiadi et al., 2015). The period of 2010-2017 is categorized as span of years with high developing rate. Thus, detection of areas that significantly changed over these seven years and potentially will expand in the future, would be necessary for realizing better city planning.

Methodology

1. **Identify Built-up area 2010 & 2017 using Google Earth Engine (Remote sensing and GIS approach)**
2. **Map accuracy assessment using Google earth Pro and ArcGIS**
3. **Detect significantly changed Area** (SaTScan using Bernoulli based model)



Should be ≥ 80 %

Control Data

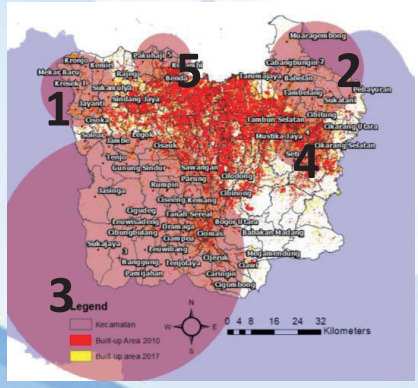
Case Data

SaTScan is an application usually used to detect the spread out of the disease, evidentally it could be used to detect built-up area changes as well.

"We assumed urban expansion is like a disease, it can be grow and spread out"

SaTScan simply detect which area in 2017 that significantly changes with 2010 (having the p-value < 0.50 and > 0.95 and being surrounded by areas that have the same characters).

Result and Discussion



5 Clusters Found

with 80 Regency as "Significantly Changed Area". Overall cluster happened in regency **not longer in a city**

These clusters were contribute **71%** Jabodetabek's total built-up area increased and produced higher risk for future built-up area. If we could manage these five clusters we can manage **71% future development.**

Recommendations:

Jabodetabek need **selective healthy development and investement** especially in the clusters area for better city planning. Moreover m**aking room before urban expansion will extremely needed,** sinceit would be difficult even impossible if the urban areas are managed after constructions of housing/building (Solly Angle, 2013).

References: Badan Pusat Statistik (BPS, 2017), Solly Angel (2013) NYU Marron Institute of Urban Management Youtube Video, detik.com, Deforestationassignment101.weebly.com, Thecityfix.com (2018), Mondal, Das and Dolui (2015) Modeling spatial variation of explanatory factors of urban expansion of Kolkata: a geographically weighted regression approach. Springer International Publishing Switzerland, Rustiadi E, D.O. Pribadi., A.E. Pravitasari., G.S. Indraprahasta., L.O.S. Iman. 2015. Jabodetabek Megacity: From City Development Toward Urban Complex Management System. from book Urban Development Challenges, Risks and Resilience in Asian Mega Cities (pp.421-445).

Research on the Future Image of Sustainable development in Suburban Rural Areas Based on Scenario Planning

Authors: Xiannan BU*, Kenichiro Onitsuka *, Satoshi Hoshino ** and Mrittika Basu **

* Graduate School of Global Environmental Studies, Kyoto University

Abstract

With the development of China's urbanization and the spread of large cities, the construction and development of suburban rural areas has become an important issue in urban and rural planning. This paper adopts scenario planning approach, reviewed the rapid development of Shanghai over the past 40 years, extracting the nodes that have significantly changed rural morphology and land use, and analyzing the causal influences. In the following study, different scenarios of the future development pattern of the study area will be developed, with different influencing factors, in order to provide a reference for the future sustainable development of suburban rural areas.

Background

Shanghai is currently one of the most developed regions in China in terms of economy and development. Chongming Island, due to its unique ecological environment and geographical location, it is very meaningful to discuss the sustainable development of Chongming Island from all aspects.

Disparity between urban and rural

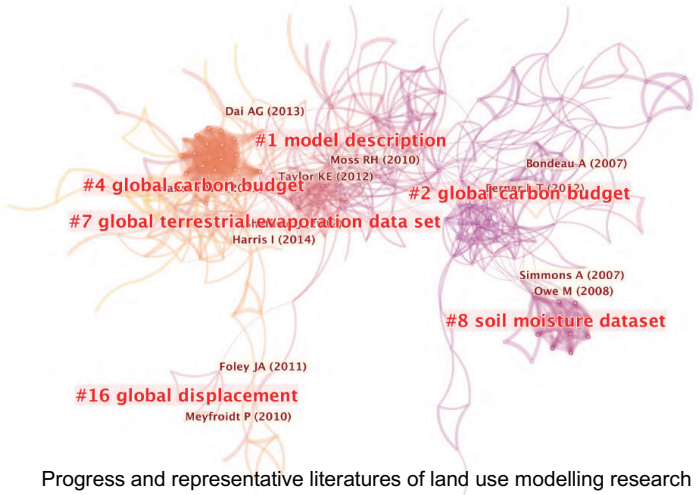
Urban sprawl

Climate Change

Theoretical Framework

Coupled Human and Natural System

ANN-CA（ Cellular Automata Model Based on Neural Network ）

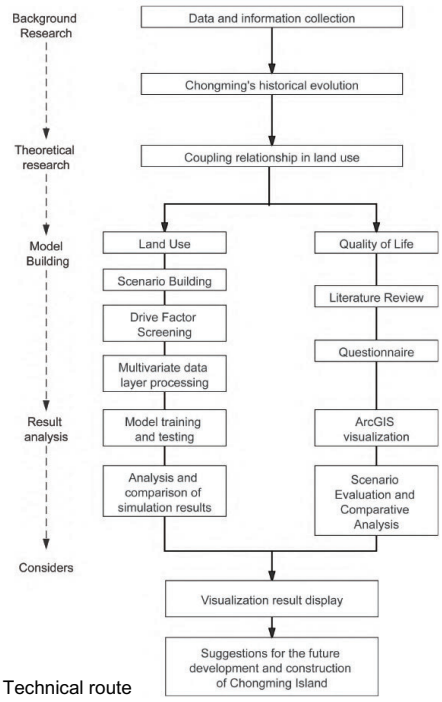


Progress and representative literatures of land use modelling research

Methodology

Combining land use changes, discussing the different possibilities of Chongming Island in the future under the superposition of two factors. The driving force factor composition of each land use scenario is different, and different scenarios will be constructed and different spatial results will be obtained.

The final spatial results will be transformed into interactive visual decision aids.



Technical route

Satellite Image in 1984

Satellite Image in 2000

Satellite Image in 2020

Temporary Result

So far, by observing satellite images of Chongming Island, we can see the evolution of land use on the three islands. Policies, reclamation and water conservancy projects will guide the development of Chongming Island. Behind the representation of the evolution of the landscape of the islands, the direct or indirect influence of human activities is reflected throughout Chongming's historical evolution and future development direction.

Future Work

Design the research questionnaire
Build CA-Modelling
ArcGis Visualization

Study on Sustainable Land Use Planning for the Revitalization of Senjo Marginal Village

*Author: Porte Leo

**Graduate School of Global Environmental Studies, Kyoto University

Introduction


View of Senjo terraces

Senjo village, located in the Japanese prefecture of Ehime, lays on a man-made landscape of 2500 terraced fields inherited of the 16th century.

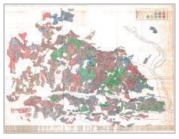
Reduced, aged and isolated by municipal merges the village community is shrinking and with it a unique historical landscape. Urban residents of the nearby Saijo city re-cultivating abandoned lands in the village have the potential to preserve this environment and support the local community.

Objective : Plan an efficient revitalization of the village agriculture based on a sustainable cultivation of available lands.

Method

1. Identify available lands → interviews of villagers, global positioning system and local land use maps.
2. Evaluate lands characteristics → observations, satellite imagery and GIS tools.
3. Rate characteristics and needs of crops → weight by local cultivators.





Interview, GPS identification and local land use map.

Fig. 1 Method flow displaying land characteristics, available lands and crops merits.

Results and Discussion

An effective agricultural revitalization, beyond saving a fading landscape, could also preserve the ancestral culture and practices linked to its management. The village community could in addition benefit from social interactions created by these activities, reducing adverse effects of its geographical and social isolation.

Fig.2 Assessment of sustainable land use for available lands.

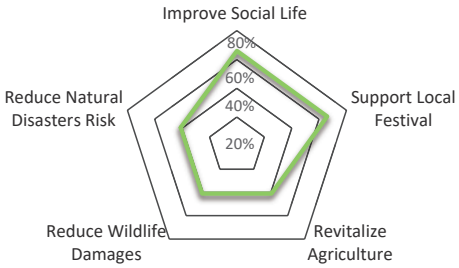


Fig.3 Villagers opinions on agricultural revitalization benefits for their community.

Overall, a better cooperation must be built between the village historical community and urban residents willing to help the village through opportunities to communicate and interact. Opportunities like the declining local festival craving for support and manpower.

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Kyoto University International ONLINE Symposium 2020
on Education and Research in Global Environmental Studies in Asia

U13 Urban Plant Diversity of Kyoto City: A Land Use Perspective

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HIGHLIGHTS

- 224 species of woody plants were recorded in Kyoto City
- Biodiversity pattern at city scale is different from that of quadrat scale
- Both total richness (γ diversity) and quadrat richness (α diversity) are higher in residential area among the land use types
- Richness can act as a good surrogate of biodiversity indexes, but it is better to measure evenness as a supplement

BACKGROUND

- Biodiversity is essential to Ecosystem Services in cities. Urbanization causes habitat loss, while human management and resources input also provide opportunity for biodiversity conservation and environmental education. Besides, local conservation contributes to global biodiversity target.
- **Research gaps** identified by literature review:
- Most research is for American and European cities, while less for the others like **Asian cities**, especially for cities of Japan.
- And **Richness was frequently used** in previous research, while there are other dimensions of biodiversity, like evenness and abundance of species.
- **The relationship between land use and biodiversity pattern** provides guidance for future ecological management of city, while it is less addressed for now.

METHOD

- **Research Goal:** Biodiversity pattern for different land use types in Kyoto city
- **Methodology**
- Field survey: Set 175 plots in Kyoto City, 20 m x 20 m quadrat for each plot. The species name of all woody plants in the quadrat are recorded, as well as some attributes, including number of trees or area of shrubs, planted or spontaneous, public or private.

Land Use Type		Number of plots
Com	Commercial area	14
Com-neigh	Neighborhood commercial area	10
R-low	Exclusively low-rise residential area	38
R-high	Mid/high-rise oriented residential area	41
R-other	Other and quasi-residential area	43
Ind	Industrial area	29

- Data analysis in R 4.0.2: biodiversity across land use types are compared at both city and quadrat scale; the correlations between quadrat biodiversity indexes are analyzed to test the effectiveness of Richness as surrogate of biodiversity in urban plant diversity research.

RESULTS

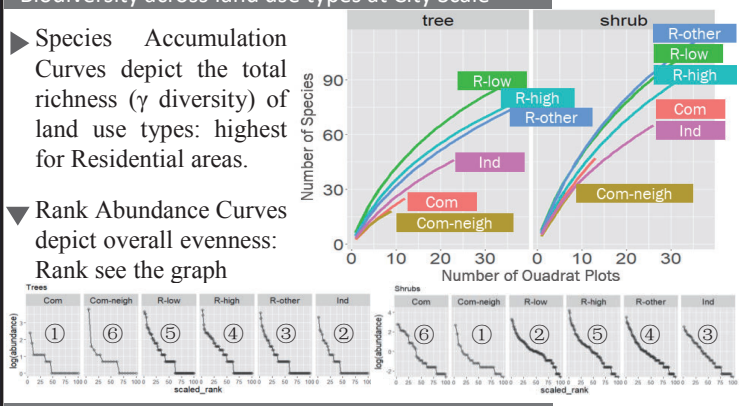
General Description

- **Number of species:** 224 species / 77 families: 141 species for trees and 192 for shrubs were recorded in this study.
- **Abundance:** 1400 trees and 1194 m² of shrubs were recorded; the most common families are Rosaceae Berberidaceae Oleaceae Theaceae and Fagaceae
- **Attributes:** 93% trees / 88% shrubs are privately owned; 75% trees / 75% shrubs are native species.

Biodiversity across land use types at City Scale

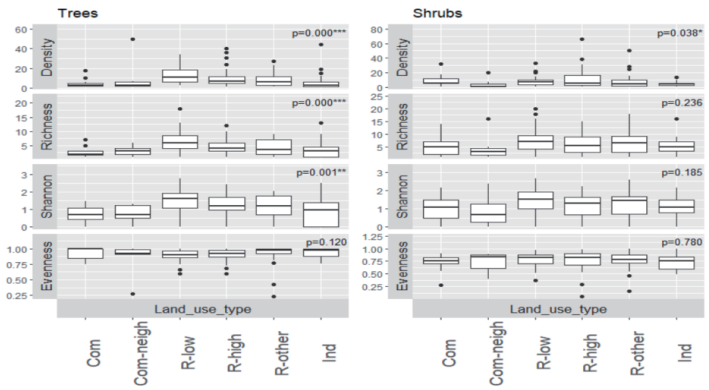
▶ Species Accumulation Curves depict the total richness (γ diversity) of land use types: highest for Residential areas.

▼ Rank Abundance Curves depict overall evenness: Rank see the graph



Biodiversity across land use types at Quadrat Scale

- The difference among groups was tested by Kruskal-Wallis test
- **For trees:** significant differences for **plant density, richness and Shannon index** across land use types; the highest indexes are generally in residential areas.
- **For shrubs:** significant difference only shows for **plant density** while not for other indexes - different from that at city scale.



Correlations between biodiversity indexes

Richness can act as a **surrogate of biodiversity indexes**: it is positively correlated to most indexes for both trees and shrubs; but **evenness** should be measured as a **supplement**: variety of relationships between evenness and other indexes.

Migration intention of young villagers: Comparison between peri-urban and remote rural areas of Indonesia

AR. Rohman Taufiq Hidayat *1, Kenichiro Onitsuka *1, Satoshi Hoshino *1
* Graduate School of Global Environmental Studies, Kyoto University

Background

The emigration of the villagers of developing countries has been investigated (Jedwab et al., 2017; Kojima, 1996). However, less study addresses rural typology in rural emigration. This research aims to compare the migration intention of young villagers between the peri-urban and remote rural areas of Indonesia. Source of information is essentials to overcome distance and information barriers of migration (Lee, 1966). Migration intention is an early stage of migration and established during adolescence and early adulthood when they consider a place to stay and to work.

Methodology

Variables: Migration intention, sources of information, internet use
Respondents: 630 Young villagers (15 to 24 years old)
Case study areas: 1. Watugedhe Village (Peri-urban rural area)
2. Arjowilangun Village (Remote rural area)
Malang regency, Indonesia

Analysis: Descriptive statistic

Fig. 1 Case study areas

Results

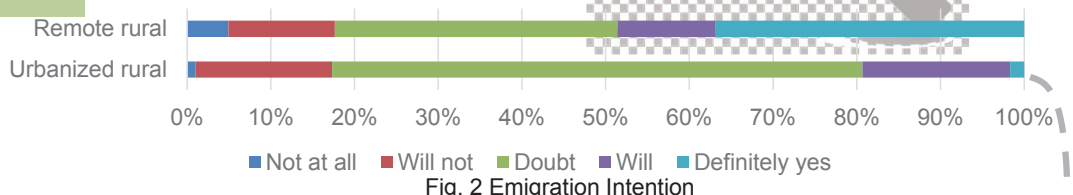
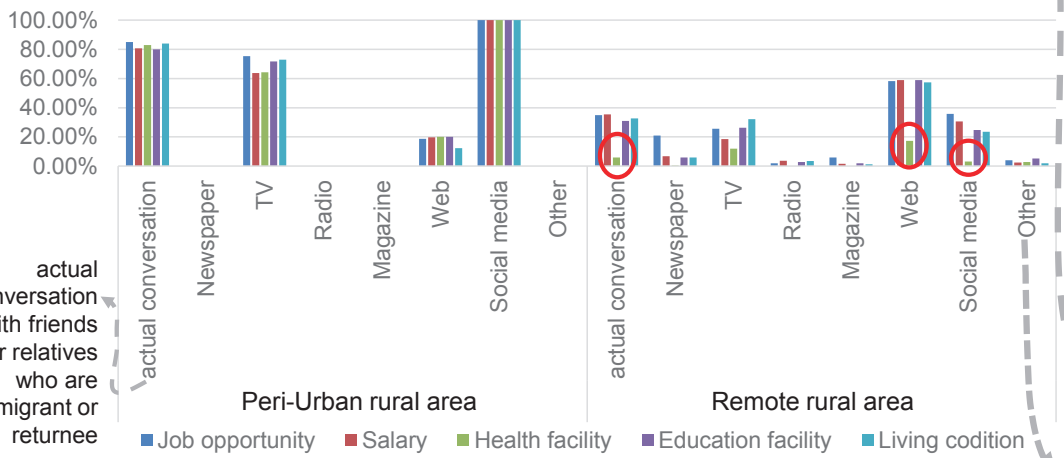


Fig. 2 Emigration Intention



actual conversation with friends or relatives who are migrant or returnee

Fig. 3 Source and kind of information comparison between rural typologies

Watugedhe Village (2018) : 10,5 km from Malang City; Built up area 43% of total area and has urban characteristics. Approx. 2.56% of villagers are farmers. Net out-migration: 208 people.

Arjowilangun Village (2018) : 40.4 km from Malang City. Agricultural village. International migrant worker: 25.63% of labor forces.

56.7% of respondents want to work in the city while living in the village

Other source of information: flyer, poster, etc.

Discussion

Migration Intention: respondents of peri-urban rural have less intention to emigrate than remote villagers because their village already is located close to the urban area and has similar characteristics to the urban area. They tend to work in urban areas because the urban area offers diverse job opportunities. Respondents of remote rural have a strong intention to emigrate to improve their livelihood where their village has fewer public facilities and diverse economic opportunities. Actual permanent emigration hit a low score. We argue they tend to temporary emigrate because this village is one of the main contributors of the international migrant worker in the Malang regency

Source of information: Respondents of peri-urban rural receive information from the internet, TV, and actual conversation. Their interaction with urban dwellers allows them to get information through actual conversation possibly on the daily basis. Respondents of remote areas utilize a diverse source of information to obtain information. The Internet is the main source of information. The actual conversation is second highest and limited because of less interaction with returnee and active migrants who temporarily visit the village.

Information regarding destination: Respondents of remote rural area less receive and obtain information regarding health facility (fig. 3 marked with a red circle) because their purpose of emigration is mainly improving economic condition. While respondents of peri-urban rural consider that all information regarding destination is necessary. Internet use is prominent source of information for both areas, especially internet for social media.

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Kyoto University International ONLINE Symposium 2020
on Education and Research in Global Environmental Studies in Asia

URBAN HEAT MITIGATION IN A DEVELOPING TROPICAL CITY: A CASE STUDY OF KUALA LUMPUR, MALAYSIA

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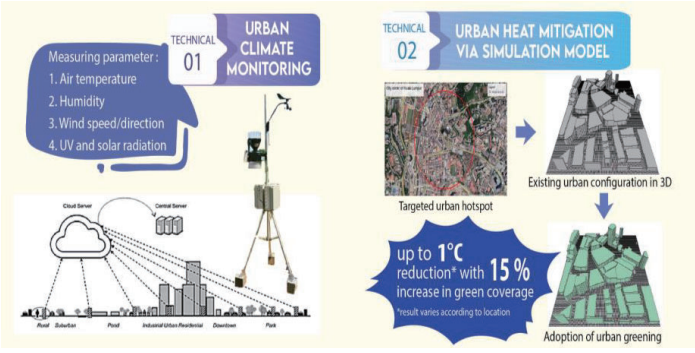
[c]Department of Chemical Engineering, Faculty of Engineering, University of Malaya

Background

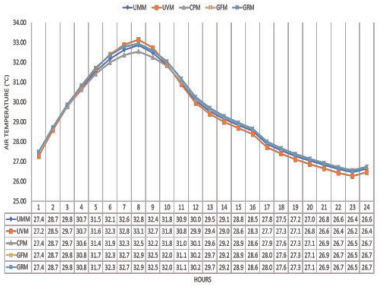
The escalation of global temperature and urban heat island (UHI) phenomena have disastrous consequence on the urban ecosystem and human population. With more than 50% of the world population living in urban areas, there is an urgency to ensure urban resiliency towards climate change especially in developing tropical cities. A study was conducted to explore strategies to mitigate UHI within a tropical urban setting using modelling and simulation approach.

Methodology



The study is conducted in two phase:
1) Weather stations are used to monitor key meteorological parameters such as air temperature, humidity, wind and solar radiation for the model input.
2) A modelling and simulation approach was carried out via case scenarios to identify the effectiveness of cooling pavement, urban vegetation, green roofing and green façade in mitigating urban heat.

Results & Discussion



Urban vegetation is the best model in mitigating urban heat. A 15% increase in green coverage can result up to 1°C temperature reduction.

Conclusion

The study have shown evidence for urban heat mitigation but more effort is needed to translate the findings into real-scale application.

Acknowledgements

We would like to express our highest gratitude to Kyoto University International Symposium 2020 and a special thanks to Prof. Dr. Yoshihisa SHIMIZU for the invitation to “Education and Research in Global Environmental Studies in Asia”.

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Conservation of earth vernacular architectural heritage as vector of sustainable livelihood development in Cote d'Ivoire

Celine Jamin*
* Graduate School of Global Environmental Studies, Kyoto University

INTRODUCTION : Background and Methodology

BACKGROUND: This study investigates the social, cultural & environmental potentials of conservation actions conducted in Cote d'Ivoire to promote the West African earthen vernacular heritage. By focusing on the case of the earthen Sudanese mosques (to which the Kong mosques belong), the study covers the new conservation mechanisms developed by Ivorian professionals, along with its linkage to local communities' sustainable livelihood.

RESEARCH SITE : Kong is a town of northeastern Cote d'Ivoire. Before its destruction in 1897, the city was the capital of the Kong Empire (1710–1895) an important commercial crossroads with the Niger River belt. It was a center of craft production, a large cultural and religious center, and a political capital. It is to this day home to two important religious cultural properties :
The Sudanese style earthen mosques.

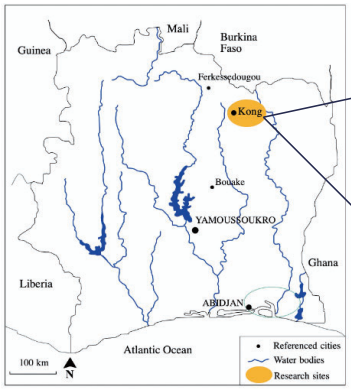

Fig 1. Map of Cote d'ivoire showing Kong town

Fig 2. Photos of the Kong mosques

METHODOLOGY: Data for the research were collected in 2018 in Kong town over participatory conservation activities led by the Ivorian government. On-site architectural surveys & interviews with both construction professionals & locals' habitants were also conducted by the author.

RESULTS :

A) Results of this study work extracted various important sustainable aspects of the earthen constructions conservation such as :

1) Cultural heritage preservation 2) Traditional knowledge transmission 3) Strengthening of sustainable local construction processes 4) Better indoor environments 5) Economical opportunities through tourism 6) Carrier opportunities for the youth 7) Autonomy & empowerment of community

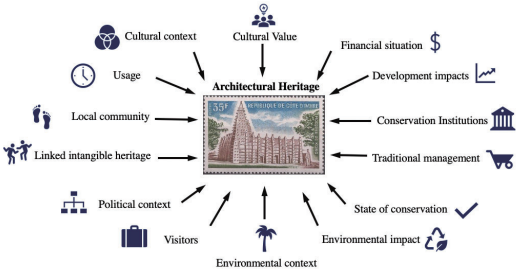

Fig 3. Characteristics considered in the Kong earthen mosques sustainable identity

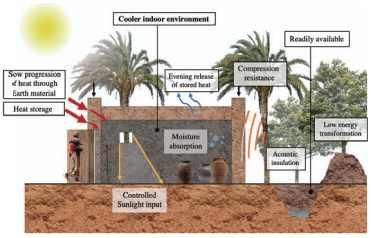

Fig 4. Sustainable passive features of the earthen traditional construction

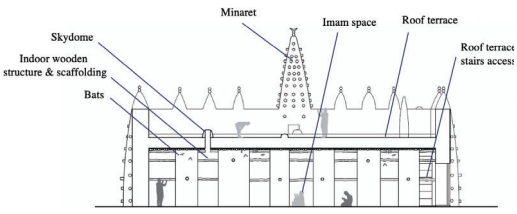

Fig 5. Section of Kong Great mosque showing its sustainable features

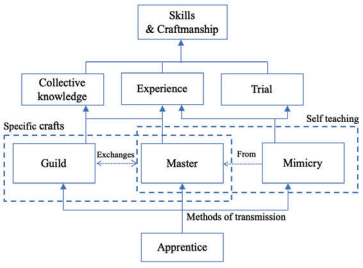

Fig 6. Transmission of traditional skills

Fig 6. Photos of conservation team working together with local community

B) Through-out the activities a **positive shift behavior** in the community was clearly observed. Showing the potential of co-operative conservation work toward a new cycle of thought. Interest of national government & outsider actors encouraged the local community pride and attention in their heritage.

All those aspects highlight that encouraging conservation efforts, can lead to amelioration of the environment and living conditions of traditional communities

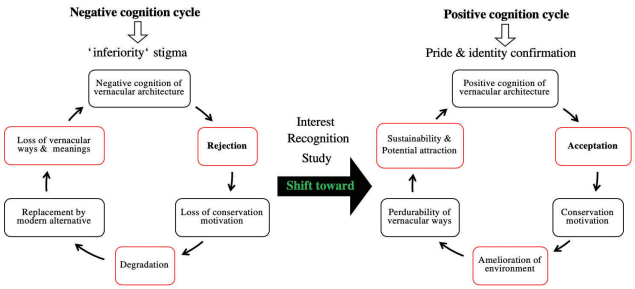

Fig 7.Negative to Positive cycle shifting implications for local communities

DISCUSSION :

- ❑ The latest advancement in the cultural conservation action led by the country is embodied by the tentative registration of Sudanese style earthen mosques Series on the UNESCO world list. Its achievement would set a precedent in the country history. All the previously presented aspects confirm the potential of vernacular conservation for local
- ❑ The Kong town habitant even expressed the importance of the mosque in the definition of their identity and their pride to be part of the first cultural Ivorian site to be potentially registered on the UNESCO World List.
- ❑ From the many positive aspects it generates, conservation of the earth vernacular architecture is to be seriously considered as a vector for sustainable livelihood and should be continue to be encouraged by both national & local leaders.

FURTHER WORK : A continuous recording of those conservation experiences is necessary and should provide in time a solid basis for the installments of long-term management mechanisms entrusted to the communities

** Note : All above presented Maps, Photos & Graphs were done by authors*

Kyoto University International ONLINE Symposium 2020
on Education and Research in Global Environmental Studies in Asia

Ecological Conditions for Sama-Bajau Fishermen's Villages: The Perspective from Maritime History and Analysis of Ecological Data

Authors: Makibi Nakano*
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Background

Sama-Bajau people, who were known as boat people and scattered in Philippine, Malaysia, and Indonesia, settled on coastal area with piling house or on the lands. In one of their village in Banggai islands, Indonesia, the population had grammatically increased in about this 100 years although it is just a coastal village in remote island.

Why Sama-Bajau people concentrated in Banggai islands?
And what is the cotemporally problems in their settlement?

Purpose

In this research, it is focused to the village with the largest population in Banggai islands, Indonesia, and consider why it became the densely inhabited area. Although previous studies about Sama people mentioned about the factors of migration from social aspects, this research aims to consider from ecological aspect and try to consider in total.

For this purpose, two works are needed as below;

- **To consider the push/pull factors by ecological environment**
- **To consider the problem to face in the future**

Methodology

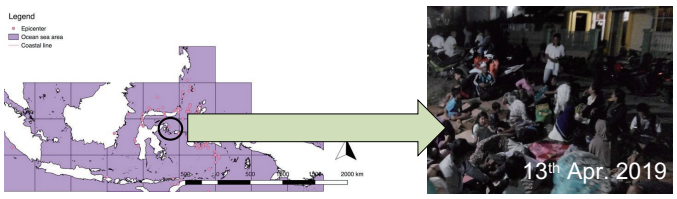
- **Step 1**: Extraction of inferred factors from previous studies and interview
- **Step 2**: Verification the push and pull factors from ecological aspects
- **Step 3**: Consideration of the factors of migration in Banggai islands

Results

Social factors
① Push Factor: Repellent to state power
② Pull Factor: More attractive actors

Ecological factors

③ Push Factor: Earthquake and Tsunami



Made by presenter — Photo by R.D (informant)

④ Pull Factor: More attractive natural resources

Economic resource and natural resources necessary for high mobility life

Discussion

- Sama people has substitutable/non-substitutable living conditions
- The pull factors are transformed to be depleted;

  the push factors have happened spontaneous and unpredictable

Conclusion

Before they settlement, Sama-Bajau people concentrated in Banggai islands in search of more attractive actors—a broker and markets for example— and natural resources; migrate from state power. After settling, however, they were to be affected by tsunami.

It means **the settlement brought them a "disaster experience"**

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Kyoto University International ONLINE Symposium 2020
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Seasonal and gender impacts on fecal exposure trends in an urban slum of Bangladesh

Authors: Min Li Chua*, Shotaro Goto*, Michiya Kodera*, Hidenori Harada**, Shigeo Fujii*, Md. Nazmul Ahsan***, Akira Sakai****

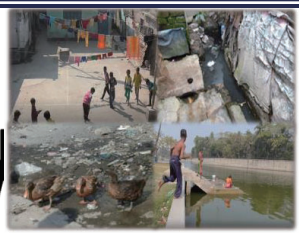
* Graduate School of Global Environmental Studies, Kyoto University
** Graduate School of Asian and African Area Studies, Kyoto University
***Life Science School, Khulna University
****University of Marketing and Distribution Sciences

Background

Slum children may be at high diarrheal risk due to
- Densely populated community
- Poor sanitation conditions

However, fecal exposure trends in slum environment are unclear, including season/gender-based contexts

Objectives
1. Do seasons and gender affect fecal exposure trends?
2. What are the main exposure pathways caused by season and gender differences ?



Methodology

(1) Study background
- Study area: Camp 1, Khulna city, Bangladesh
- Survey periods: November – December 2013, 2015 (dry season); September – October 2013, 2015 (rainy season)

(2) On-site investigation (human behavior study)
- Diary recording of children (*n* = 3 boys, 3 girls)
- Questionnaire survey of mothers (*n* = 30)
- Interview survey of children (*n* = 10 boys, 10 girls)

(3) Six transmission pathways and their associated media

Drinking	Eating	Bathing	Bathing	Outdoor play
(drinking water, cup)	(plate, hand, food)	(well water)	(pond water)	(outdoor soil, hand)

(4) Microbial *Escherichia coli* (*E. coli* tests)

E. coli were cultured by XM-G (Nissui, Japan) or Chromocult coliform agar (Merck, US), incubated for 22-24 hours and enumerated the blue profiles in culture plates as *E. coli* concentration.

(5) Exposure calculation by Monte Carlo simulation over 100,000 iterations

$$E_i = \sum_j C_j \cdot U_{i,j} \cdot F_i \quad \text{(Eq. 1)}$$

E_i = Exposure amount of activity *i* over a day (CFU/day)
C_j = Randomly determined *E. coli* concentration of medium *j* based on Probabilistic Density Function defined (CFU/medium *j*)
$U_{i,j}$ = Exposure factor or unit intake of medium *j* for activity *i* (amount of medium *j*/time)
F_i = Frequency or time duration of activity *i* per day(time/day)

Results & Discussion

(1) Seasonal impact in *E. coli* concentration

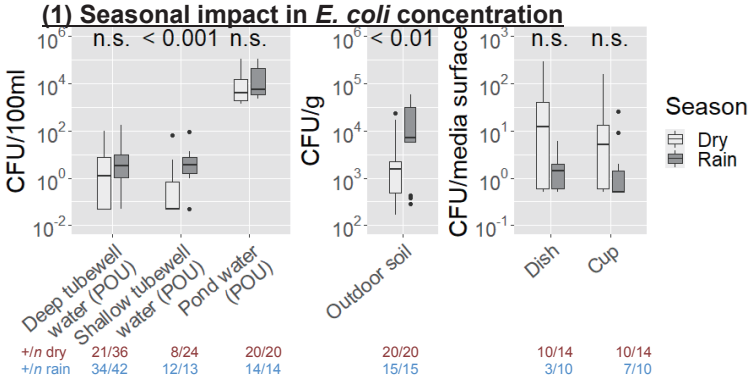
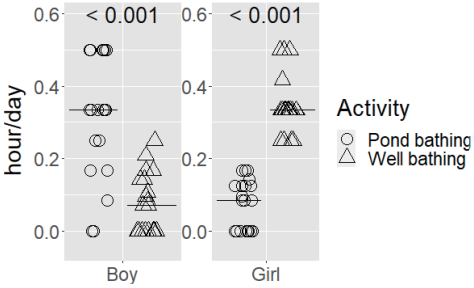


Figure 1 *E. coli* concentrations of environmental media in both dry and rainy seasons with the total sample number (*n*) and the *E. coli*-positive sample number (+) in dry and rainy seasons. N.s. means not significant. Not-detected (ND) data were set to half of their detection limits in this figure. POU means point-of-use.

- Contamination levels varied by seasons
- Significantly higher contamination in rainy season for shallow tube well water and outdoor soil

(2) Gender impact in daily time duration of bathing



- Selection of bathing location/source varied by gender
- A boy mainly did pond bathing; a girl mainly did well bathing

Figure 2 Daily time duration of pond bathing and well bathing for a boy and a girl by comparing in the types of bathing activities in each gender. The line plot represents the median value in each group of data.

(3) Seasonal and gender impacts in daily exposure per activity

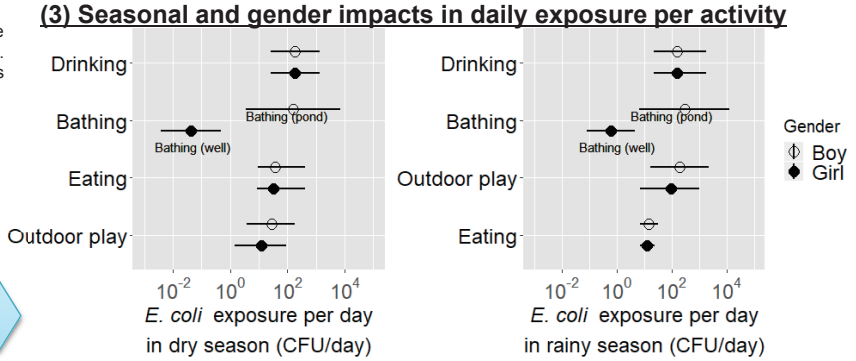


Figure 3 Daily *E. coli* exposure amount for a boy and a girl in a typical scenario for each season-based transmission pathway with plots representing 10th, 50th and 90th percentiles of each activity. In this scenario, the bathing activity for a boy and a girl was set as pond bathing and well bathing respectively.

- Exposures via outdoor-based activities varied greatly by seasons and gender
- A girl had less exposure than a boy, especially for well bathing; shallow tube well water was less contaminated than pond water (Fig 1)

Conclusion

Season and gender had significant impacts in *E. coli* concentrations, time duration of activities and daily exposure in a slum, especially for outdoor-based activities. These impacts should be taken into account as diarrheal- reducing mitigations for a slum child.

Acknowledgement: This study is funded by Research Institution for Humanity and Nature, JSPS KAKENHI (16H02748, 16H04436). We would like to thank all the supporting parties including participants in Camp 1, Khulna City Corporation, and JADE Bangladesh for their extraordinary commitment in completing this study.

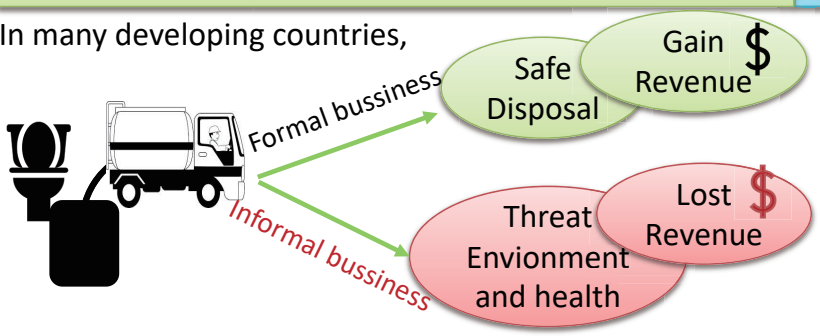
Financial comparison of **passive and active** fecal sludge management in Mandalay, Myanmar

Wutyi Naing* , Hidenori Harada** , Shigeo Fujii***, Myint Myint Than****

*Local Project Coordinator, Transforming fecal sludge emptying business, Mandalay, Myanmar , **Associated Professor, Graduate School of Asian and African Area Studies, Kyoto University, Japan
***Professor, Graduate School of Global Environmental Studies, Kyoto University, Japan, ****Committee member, Mandalay City Development Committee (MCDC), Mandalay, Myanmar

Background

In many developing countries,



Research Idea

Present: **Passive (waiting)** emptying service, based on sudden request

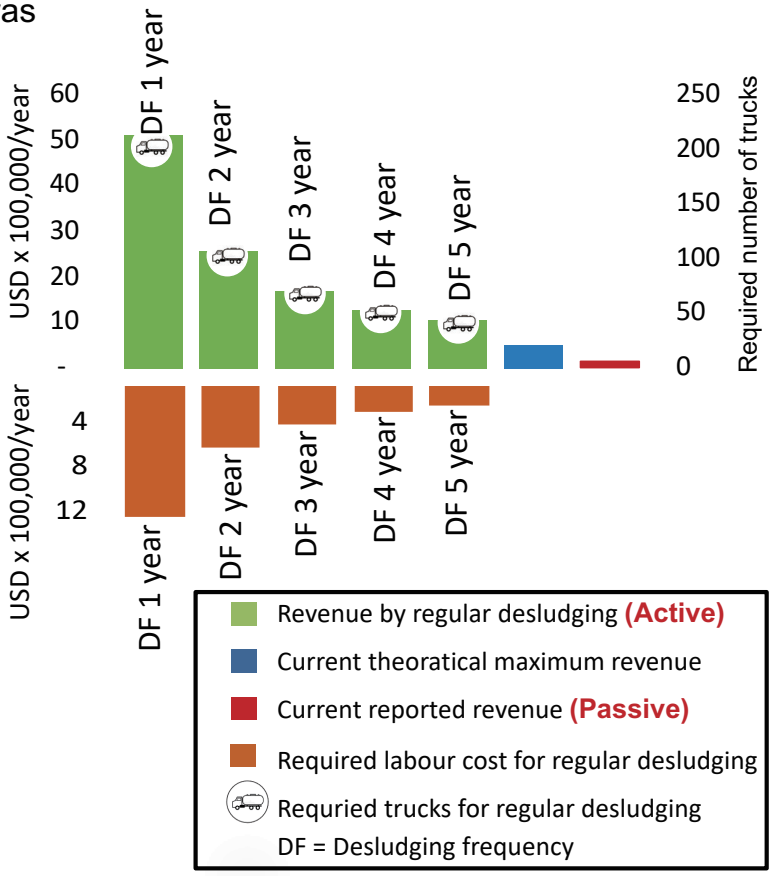
Future: **Active (creating)** emptying service, Registered & centrally monitored septic tanks, Well-planned **regular desludging**

Methodology

- ✓ Current theoratical maximum revenue (USD/year) was $C_f \times N_{os} \times F_{emptied}$
- ✓ Current reported revenue (USD/year) was $C_f \times F_{reported} \times D_y$
- ✓ Requried number of trucks was $\frac{N_{os}}{D_y \times DF_i \times N_{osd}}$
- ✓ Requried labor wages (USD/year) was $T_{required} \times WT_{required} \times CW_y$
- ✓ Revenue by regular desludging (USD/year) was $\frac{N_{os} \times C_f}{DF_i}$

C_f is official collection fee (21.9 USD/time) (MUSIP 2015),
N_{os} is number of onsite sanitation units (213,104 units) (GAD 2017),
$F_{emptied}$ is the average emptying frequency of onsite sanitation facilities (time/unit/year). (0.079 time/unit/year) (Naing., et al 2019),
$F_{reported}$ is officially recorded average number of emptying services (15 times/day) (MUSIP 2015),
D_y is number of working days of the FP in a year (220 days/year)
DF_i is Desludging frequency in i year (time/ i year)
N_{osd} is number of onsite sanitation unit supposed to be emptied per day (5units/day)
$T_{required}$ is number of required trucks per day
$WT_{required}$ is number of labor in one truck (2labour/truck)
CW_y is labour annual wages (3,135 USD/labor/year)
(*approximately equal to junior officer at government office)

Results and discussion



Next Step

The capital cost, maintainance cost for the trucks, the lifespan of the trucks, and
The impacts of increasing on population and onsite sanitation coverage, will be considered in the next steps.

Flood Vulnerability Assessment for Rural District in Danang City, Vietnam

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[2]Graduate School for Creative Cities, Osaka City University, Japan;
[3]Central and Highland Sub-Department of Natural Disaster Management, Vietnam Disaster Management Authority;
[4]Graduate School of Global Environmental Studies, Kyoto University, Japan.

1. Introduction

Danang is a coastal city in the Central Region, Vietnam which is considered as a sensitive area under the high risks of natural disasters and climate change. Hoa Vang district which is a rural district of Danang City is recognized as the most flood damaged region in the city due to its location and topography. This study develops a flood vulnerability assessment method for the Hoa Vang district, Danang City based on the Geographic Information System (GIS). The concept of vulnerability has been more widely studied from various perspectives. In this study, the flood vulnerability is evaluated using the approach proposed by the IPCC (Intergovernmental Panel on Climate Change) in which vulnerability is understood as a function of exposure, sensitivity, and adaptive capacities (Figure 1).

2. Methodology

In order to quantitatively assess the impact of flood, the Flood Vulnerability Index (FVI) is calculated based on the parameter set for each component of the vulnerability function. The parameters are standardized from 0 - 1 and integrating with the AHP method (Saaty, 2008) to determine the weights for component variables, thereby determining the FVI for each area. Results from this study have distinguished areas (at commune level) with different flood vulnerability degree from low, medium to high. This study is a baseline for proposing a number of adaptive solutions for areas under highly flood vulnerability.

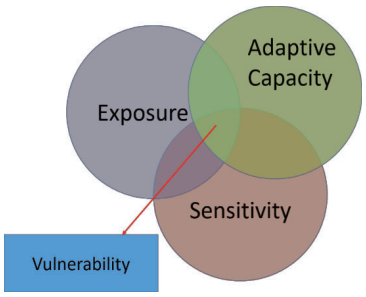

Figure 1. Research Approach for Flood Vulnerability Assessment based on (IPCC, 2014).

Table 1. Criteria and corresponding weights for evaluation flood vulnerability in Hoa Vang district.

Component	Criteria	Method of generation	Data Source	Weight
Exposure	Elevation	GWR	Global DEMs and Spot height data	0.46
	Flow accumulation	Hydrologic analysis	GWR DEM	0.1
	TWI	Hydrologic analysis	GWR DEM	0.16
	Distance to river channel	Euclidean distance	River channel	0.28
Sensitivity	Population	Statistic	Statistical Yearbook	0.16
	Percentage of Paddy	Statistic	Statistical Yearbook	0.29
	Percentage of Built-up	Statistic	Statistical Yearbook	0.54
Adaptive Capacity	Average Income	Statistic	Field Survey	0.5
	Poverty Index	Statistic	Statistical Yearbook	0.5

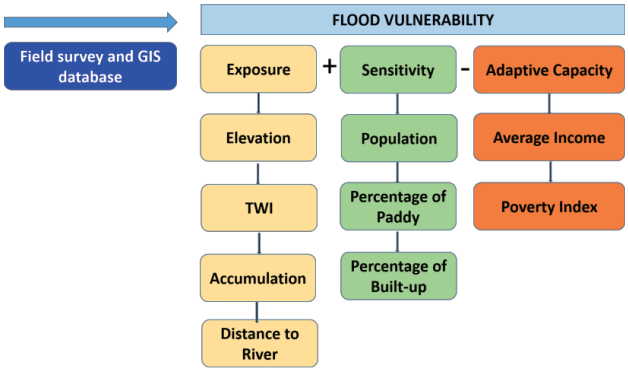

Figure 2. Flowchart of data processing for flood vulnerability assessment.

3. Results and Discussion

The very high vulnerability areas in Hoa Vang district belong to the lowland communes including Hoa Tien, Hoa Chau and Hoa Phuoc (Figure 3). These areas are characterized by the low topographic, nearest distance to river channel and very high density of population. Comparing to field survey data on flood sign, it is shown that most of flood pillar point in this study area located in the high vulnerable communes. The high correspondence with field flood pillars reveals the effectiveness of multi-parametric approach in flood hazard assessment.

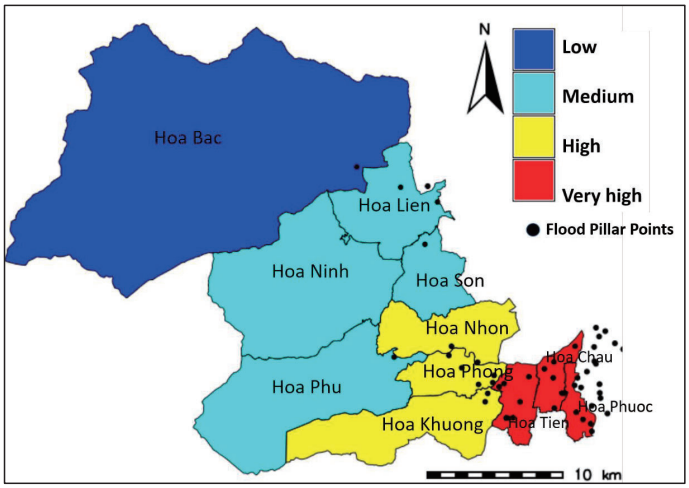

Figure 3. Flood Vulnerability Map for Hoa Vang District – Danang City.

Quantitative Zoning Method Approaches to Identify the Typology of Spatial Planning Inconsistencies in the Upstream of Ciliwung Watershed

Authors: Siti Wulandari *, Ernan Rustiadi **, Didit Okta Pribadi ***
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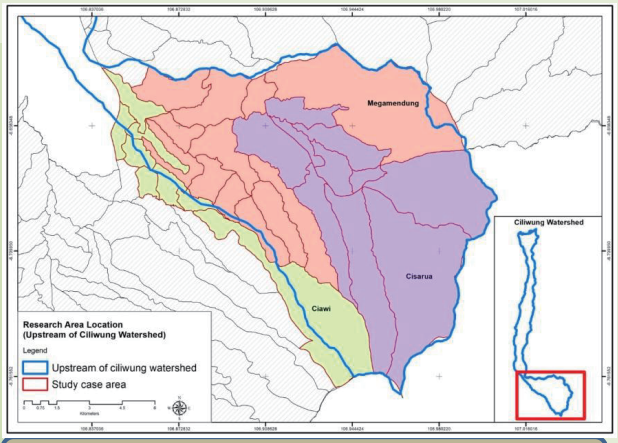
**) Regional Development Planning Division, Department of Soil Science and Land Resource, Faculty of Agriculture, IPB University,
***) Research Center for Plant Conservation and Botanic Garden, Indonesian Institute of Science, Indonesia

Background

The Puncak area of Bogor is a natural tourism area which is part of the upstream Ciliwung watershed. This area had a strategic role to protect the Ciliwung watershed ecosystem as protecting water catchment areas, controlling floods and soil erosion [1]. Reality, there has been inconsistencies between land use and spatial plan with the complexity of land tenure. The negative impact of environmental damage to the upstream Ciliwung watershed will affect the surrounding area, such as floods and landslides [2]. The Location of inconsistent areas are scattered in various spatial pattern typologies associated with various factors which have implications for the different approaches to control. One of the factors driving the inconsistency in the Puncak area is the complete facilities and natural resources that attract many investors to build villas, hotels, restaurants to support activities. The high interest of investors has resulted in a tendency for builders to be exploitative [3]. This study aims to determine the typology of inconsistency in spatial use in the Puncak area (using the Rustiadi Zoning Quantitative Method) and its relationship with land tenure



Methodology

This study uses Rustiadi spatial clustering method 1 and 2 to identify the typology of spatial planning inconsistencies in the Upstream of Ciliwung Watershed. Spatial Clustering I: Introducing geographical positions (X coordinate and Y coordinate of each spatial unit) and using spatial weight of contiguity ((B <1) strong, (B> 1) weak) as variables in clustering procedure, whereas Spatial Clustering II: Introducing spatial association in clustering procedure [4].

$$D_{ij} = \sqrt{\begin{matrix}(z_{1i}' - z_{1j}')^2 + (z_{2i}' - z_{2j}')^2 + \cdots + (z_{mi}' - z_{mj}')^2 \\ + \beta\{(X_i' - X_j')^2 + (Y_i' - Y_j')^2\}\end{matrix}}$$ ....(Spatial Clustering 1)

Where Dij is Euclidean distance value between object i and j; z is the standardized value of variables for object i and j; m is the number of variables used in the research; X and Y is a centroid coordinate of each spatial unit analyzed; and β is spatial contiguity weight.

$$Z_i'' = \sqrt{\bar{z}_i} = \sqrt{z_i \cdot \bar{z_j}} = \sqrt{\frac{1}{\sum_j^m W_{ij}} z_i \cdot \sum_j^m W_{ij}\, z_j} = \sqrt{z_i \cdot \frac{\sum_j^m W_{ij}\, z_j}{\sum_j^m W_{ij}}}$$ ...(Spatial Clustering 2)

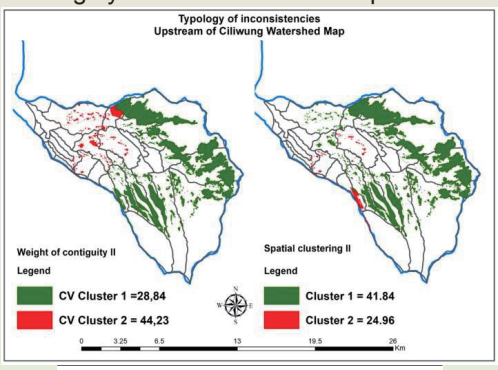
Where i is the unit of area; j is the neighboring area around of area i, zi "is the new attribute value for region i as a result of data manipulation i which is similar to its neighbor's value; zi is an attribute value of the unit of area unit-i; $\bar{z_j}$ is the value of the average attribute for all j regions around region i; zj is an attribute value of the neighboring region of j; Wij is the weight value of association / spatial relationship or distance between i and j, m is the number of neighboring areas around I.

- In the clustering process, for variables (8 Variables) were analyzed first with Principal Component Analysis (PCA,) new data (factor scores) were standardized automatically.

Factor	Variables
Factor 1 (The widespread area of inconsistencies)	Population density; *Class of Area, Total Edge, Largest Patch Index*
Factor 2 (The spread randomly area of inconsitencies)	Village development indeks (IPD), *Number of patch, Patch density, Landscape shape index)*

Results and Discussion

1. The results show that inconsistency in Puncak area divided into two clusters. Cluster 1 dominanted by inconsistency in the form of allocated agricultural land with occupied by settlement, while cluster 2 was dominanted by inconsistency the form of state forest land occupied by agricultural land use or settlement.
2. The area of inconsistency in cluster 1 is dominated by the individual private-hold ownership as well as non-registered state land, while cluster 2 is dominated by the status of land for Cultivation Rights (HGU) and non-registered state land.
3. Spatial use control in the Puncak Bogor area is carried out using two different approaches. 1) To solve problems in areas of randomly scattered settlement inconsistencies (Cluster 1), use a community empowerment approach by maintaining local cultural wisdom and regional functions. Whereas 2) To solve problems in areas of inconsistency in forest areas and land with HGU status (Cluster 2), prioritizing a legal approach (law enforcement) with a technology-based monitoring system to minimize disruption to the function of the area.
4. In this research, the best coefficient of variation (CV-Value) in the Rustiadi quantitative zoning method is spatial clustering 2 (the CV value is the smallest than the others)



Cluster	Factor 1	Factor 2
Cluster 1	Low	High
Cluster 2	High	Low

Reference

[1] Peraturan Presiden Nomor 54 Tahun 2008 Tentang Kawasan Jakarta, Bogor, Depok, Tangerang, Bekasi, Puncak, Cianjur. Jakarta (ID): Pemerintah Republik Indonesia
[2] Rustiadi E, Barus B, Prastowo, Iman LOS. 2012. *Pengembangan Pedoman Evaluasi Pemanfaatan Ruang Penyempurnaan Lampiran Permen LH 17/2009*. Bogor:
[3] Pribadi DO, Zasada I, Muller K, Pauleit S. 2017. Multifunctional adaption of Farmers as response to urban growth in the jabodetabek metropolitan area, Indonesia. Elsevier 55 (2017) 100-111
[4] Rustiadi E, Kobayashi S. 2000. Contiguous Spatial Classification: A New Approach on Quantitative Zoning Method. Journal of Geography Education. 43:122-136.

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Characterization of Hazards and Climate Change Projections in Southern Sierra Madre Region, Philippines

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** Laboratory of Regional Planning, Graduate School of Global Environmental Studies, Kyoto University

Background

- The Southern Sierra Madre Region is one of the richest areas in the Philippines in terms of Biodiversity.
- Despite its ecological value and importance, studies and historical events have shown that the region is generally susceptible to landslide while the coastal areas are susceptible to flood.
- Given the various climate change risks and disaster threats, it is necessary to generate the hazard information in Kaliwa and Kanan watersheds.

Figure 1. Landslide and Flooding Occurrences

Methodology

- Both the Kaliwa (476 sq.km) and Kanan (391 sq.km) watersheds are situated in the southeastern part of Luzon, Philippines.
- Majority of the Kaliwa watershed areas are located at around 400-500 masl while Kanan watershed areas are located at 300-600 masl.

Figure 2. Flow of Activities

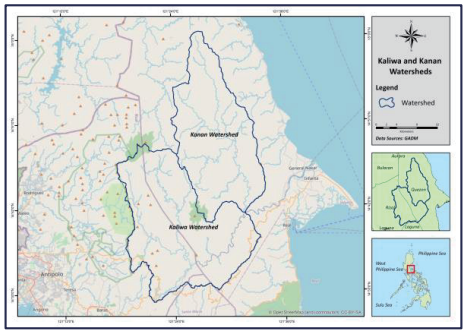


Figure 3. The Kaliwa and Kanan Watersheds

Results and Discussion

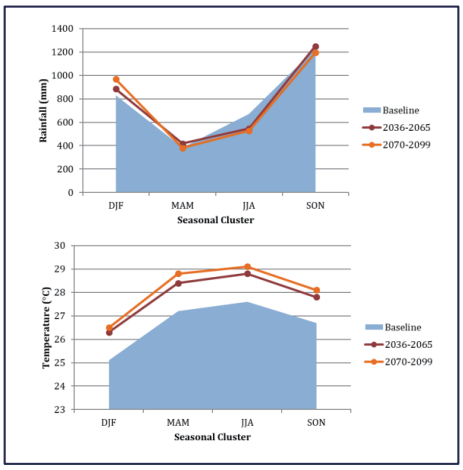


Figure 4. Seasonal median rainfall and temperature projections observed in the area based on RCP 4.5

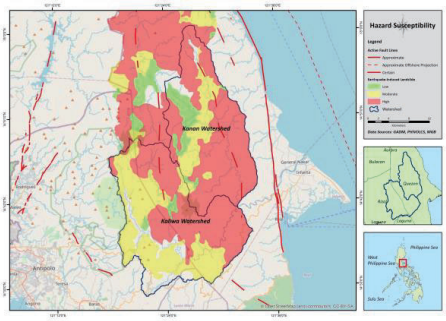


Figure 5. Active Fault Lines and Earthquake-Induced Landslide Susceptibility in the area.

Table 1. Initial Exposure Database and Available Data.

Element	CC	H
Population		
Natural resource-based production areas		
Critical Point Facilities		
Lifeline Utilities		
Urban Use Areas		

Geomorphologic, physical, and mineralogical characterization of Landslides in Mankayan, Benguet, Philippines

Jenielyn T. Padrones*, John Lendle Bardillon*, and Kenneth Andrei Bidania*

* Institute of Renewable Natural Resources, College of Forestry and Natural Resources, University of the Philippines - Los Baños, Laguna, Philippines

Background

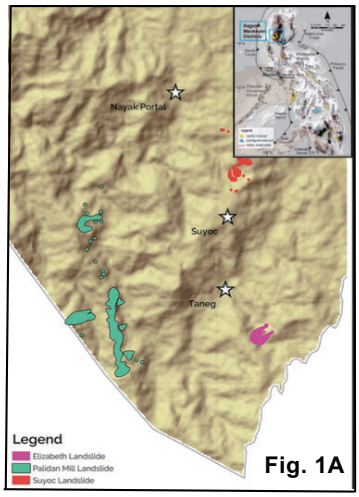


Fig. 1A

Understanding the predisposing factors that might cause landslides in Mankayan, Benguet Province, Philippines were investigated in this study. Mankayan is one of the areas with frequent shallow and deep-seated landslide occurrences. Fig. 1A shows the various landslides in the study area. Fig. 1B shows one of the landslides in Suyoc.


Fig. 1B

Methodology

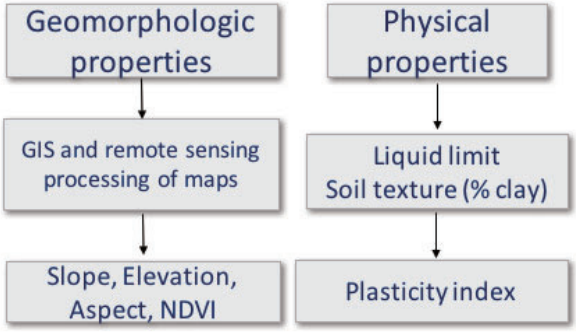


Fig. 2 shows methodology and the output result. The mineralogical analysis was carried out using X-ray diffraction (XRD) method conducted at Akita University, Japan. Relative abundance was computed based on the mineral intensity.

Results and Discussion

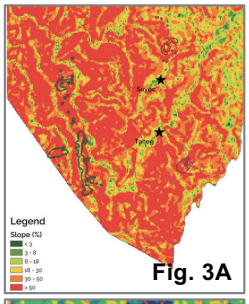


Fig. 3A

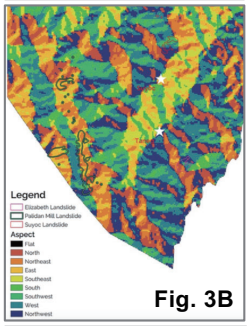


Fig. 3B

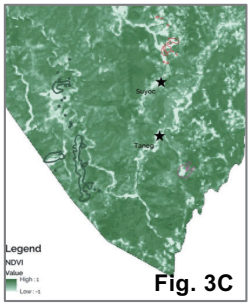
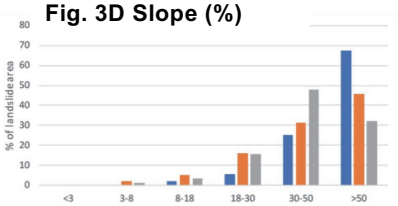
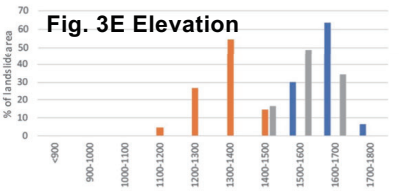
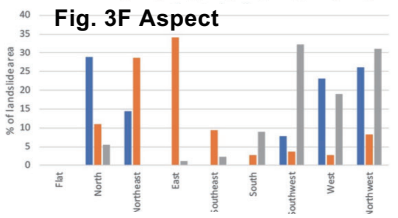


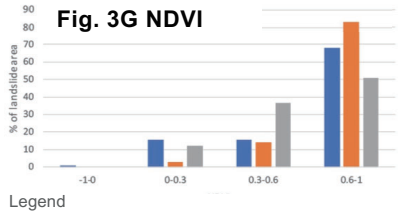
Fig. 3C

Geomorphologic properties









Physical properties

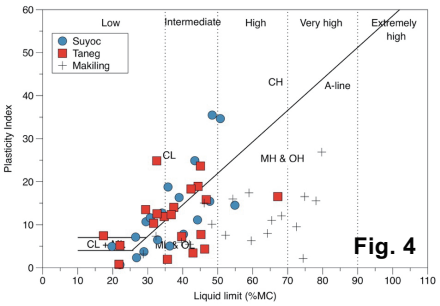


Fig. 4

Landslides in Mankayan, Benguet occur in areas with slopes that exceed 30% gradient (Fig. 3A,3D), and with elevations from 1200 – 1400 masl in Palidan area and > 1400 masl in Suyoc and Taneg (Fig. 3E). The aspect directions are variable (Fig. 3B, 3F) and most of these landslides occurred near areas with high land/ forest cover (i.e. normalized difference vegetation index (NDVI) of 0.6 – 1.0) (Fig. 3C, 3G). Soil samples from the landslide areas are mostly composed of < 40% clay while the plasticity of the samples ranges from low to intermediate. These plasticity values are lower than those established for volcanic rocks in Mt. Makiling in Laguna Province (Fig. 4).

Relative abundance of minerals

Minerals	Quartz	plagioclase	orthoclase	smectite	Alunite	Chlorite/ Kaolinite	halloysite
T11-1A	○	△		△		△	△
T11-1B	○	△		○		△	△
T11-1C	○	△		○		△	△
T11-1D	○	△		○		△	△
T11-3A	○	△		○		△	△
T11-3B	◎					△	△
T11-4A	○		△	○	·	△	△
T11-4B	○		△	△			△

Legend:
◎ abundant, ○ intermediate, △ small, · trace
(2θ=2-20°) ◎: >10%, ○: 10-1%, △: 1-0.3%, · : 0.3-0%
(2θ=20-65°) ◎: >20%, ○: 20-2%, △: 2-0.5%, · : 0.5-0%

Fig. 5

Representative XRD diffractogram interpretation in one of the landslide area in Taneg. Show primary minerals (with 2θ= 20 – 65) quartz, plagioclase, and orthoclase. The clay minerals (with 2θ= 2 – 20) identified are smectite, chlorite/kaolinite, alunite, and halloysite. Smectite is a shrinking and swelling type of clay that could affect the stability of the slope. Most minerals have an intermediate abundance (Fig. 5).

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Assessing the influence of spatial urban green space configuration on urban temperatures: A case study of Metro Manila, Philippines

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ABSTRACT

The study was carried out by utilizing cloud processing and machine learning algorithms in Google Earth Engine (GEE) to create a mean land surface temperature (LST) map from Landsat 8 and a high-accuracy, high-resolution urban green space (UGS) map from Sentinel 2. Spatial analysis of UGS using 21 spatial configuration metrics was performed with FRAGSTATS. A spatial regression model of the derived metrics vis-à-vis LST was shown to have statistically discernible influence on urban cooling. Hence, incorporating these in urban planning may lead to better designed UGS that more effectively reduce the effects of urban heat islands in Metro Manila.

INTRODUCTION

The urban heat island effect has been a growing concern as land uses compete for the limited space of many cities around the world. With temperatures projected to increase, UGS play a key role in its mitigation. However, the impacts of spatial configuration of UGS on the temperature of urban landscapes in the Philippines is yet to be analyzed. This study aims to undertake such a case study in Metro Manila.

DATA AND METHODS

GEE was used to create a cloudless composite mean LST map from Landsat 8; a support vector machine (SVM) algorithm used 15,000 points for training and validation of a 10m resolution UGS map from Sentinel 2. Spatial configuration was analyzed on 1-ha grids. R statistical programming was used to analyze the relationship between the UGS metrics and LST (Figure 1).

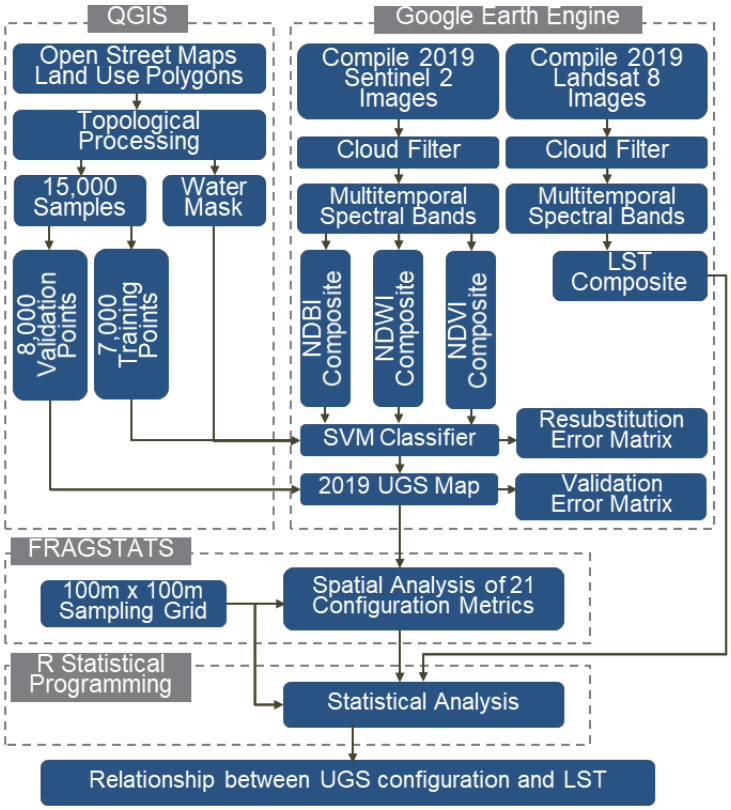

Figure 1. Graphical representation of study methodology

RESULTS AND DISCUSSION

Figure 2 shows the resulting high accuracy (κ = 0.9673) UGS, and LST maps generated from GEE. It is estimated that Metro Manila has around 7,810 ha of urban green spaces in 2019

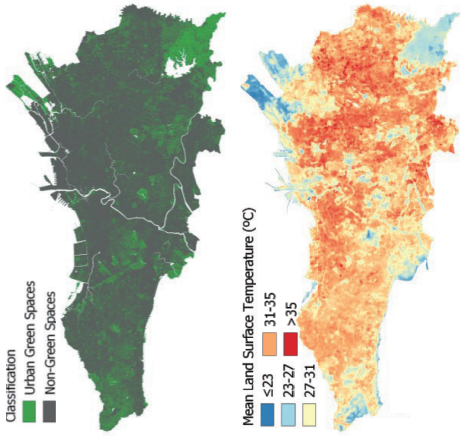

Figure 2. (a) UGS map and (b) LST map

Pearson's Correlation of the 21 spatial metrics indicated 14 were highly correlated and henceforth excluded. Multiple regression of the remaining seven variables had Prob > F of equal to 0.0000 and had all statistical discernible impacts.

Moran's I test of the data using Queen's contiguity and row standardized spatial weights matrix indicate spatial autocorrelation ($p < 2.2 \times 10^{-16}$; I = 0.9061). Similarly, the regression residuals also have high spatial autocorrelation ($p < 2.2 \times 10^{-16}$; I = 0.7453). Lagrange Multiplier diagnostics were used to determine the type of spatial dependence present in the multiple regression model.

A spatial lag model was fitted with the 7 variables and its z-test had a p value $< 2.2 \times 10^{-16}$ and R^2 of 0.23. Furthermore, all variables had p values of 0.0000 which indicates statistical significance.

Based on the model coefficients shown in Table 1, UGS with the following characteristics tend to have a statistically discernible impact to reduce urban temperatures at 1-ha scales in Metro Manila: (1) high density of UGS; (2) shapes of UGS with longer edge length or those that are more linear or elongated; and (3) series of small but highly interconnected UGS.

Table 1. Coefficients of the spatial lag model variables

Variable	Coefficient
PD	-2.3336×10^{-4}
LSI	-7.1473×10^{-2}
SHAPE_MN	8.9887×10^{-5}
CIRCLE_MN	-3.3211×10^{-2}
COHESION	-5.7537×10^{-3}
DIVISION	1.1331
SPLIT	-5.2310×10^{-5}

RECOMMENDATIONS

Further studies are eyed to measure the impacts of the proportions of UGS, the scale of the analysis, seasonal variations, and the quality or UGS. It is also suggested to expand analysis to other metropolitan areas and integrate field data for better predictions.

Effectiveness Assessment of Scenario Planning in Japanese Rural Area: Its Roles and Impacts for Rural Sustainability in VUCA World.

Authors: Yoshitaka Iwasaki*, Kenichiro Onitsuka* and Satoshi Hoshino*
* Graduate School of Global Environmental Studies, Kyoto University

Background 1: Importance of regional governance

The rural areas of Japan, where the population is rapidly declining, are facing various challenges. Aging, devastation of agriculture and forestry due to lack of workers, weakening of village functions, etc. Originally, the rural areas should take the initiative in formulating a rural plan on how to implement the solutions. However, after World War II, rural planning has been positioned as a "procedure" to justify the implementation of projects devised by the government. Therefore, in the future, **it will become important for rural residents, including various external stakeholders, to form new community-based organizations (Regional governance)** with their own awareness and actions.

Background 2: Difficulty of predicting the future

Currently, it is said to be the "VUCA" era. VUCA is a coined word that is a collection of acronyms for Volatility, Uncertainty, Complexity, and Ambiguity, and is a term that describes the unpredictable state of modern society. In rural planning, it is common to set a future image (goals and themes) through questionnaires and workshops of local residents. However, **especially in the VUCA era where external factors change irregularly, long-term future prediction and goal setting itself are extremely difficult**. Drawing the one expected future in a situation where various external stakeholders are involved can be a biased vision that strongly reflects the opinions of the most noisy stakeholders. Or, conversely, there is a possibility of falling into a mediocre vision that is not inconvenient for everyone.

Research Objective

Based on these backgrounds, "Scenario planning method" is attracting attention. The advantages of the scenario planning method are **1) expansion of the mental model of participants, 2) strategy formulation based on multiple future depictions, and 3) strengthening of relationships with stakeholders**. However, **there are no cases where the scenario planning method is practically adopted in rural Japan, and its effect has not been clarified**. Therefore, in this research, in order to formulate a sustainable rural plan, **we verify the effectiveness of the scenario planning method in rural area**.

About Scenario Planning

Comparison of Traditional planning method and Scenario planning method

	Traditional planning method	Scenario planning method
Purpose	Accurately predict the future	Assuming discontinuous changes and extreme risks, share them among stakeholders and **prepare for the future**.
Future appearance	Predict a single future from past experience and data. Draw an expected future.	Examine the possibilities and draw **multiple futures**. Draw the future objectively, including the worst scenarios.
Strategic features	Develop a strategy that is most likely to be feasible as an extension of the past. (Focus only on events with high certainty)	Develop a strategy by cross-cutting multiple possible future scenarios (Focus on events with **high uncertainty**)

Scenario planning procedure

1.Team Building
- Gather key members and set issues
- Gather various related stakeholders

2. Identifying and Prioritizing Uncertainties
- Listing and prioritizing uncertainties
- Understanding the internal and external environment, creating a wide range of trend list that may affect the future.

3. Scenario Development and Evaluation
- Development of multiple scenarios (deductive or inductive way)
- Understanding and verification of the structure of each scenario

4. Decision making and Execution
- Examination of strategies for all scenarios
- Repeat continuous learning while executing

Methodology & Future works

I. **Conduct a field survey on how to deal with uncertainty.**
- Through interviews and questionnaire surveys with rural villages in Kyoto Prefecture, we will clarify the status and issues of preparation for uncertain events.

II. **Theorize a new scenario planning method that can be used in rural areas of Japan.**
- Develop and theorize a new scenario planning method that can be used even in rural areas of Japan, utilizing the results of the field survey.

III. **Workshops using the new scenario planning method will be held multiple times in multiple rural areas in Kyoto Prefecture.**
- Workshops will be held in rural areas to verify the effectiveness of the three benefits of scenario planning (1) expansion of the mental model of participants, 2) strategy formulation based on multiple future depictions, and 3) strengthening of relationships with stakeholders) through questionnaires and interviews with participants.

Research Area:
KYOTO BY THE SEA, DMO(Destination Management Organization), consists of tourism associations of seven municipalities. Currently, the number of inbound tourists is drastically decreasing due to the Covid-19. Explore preparations for uncertain events.

Kyoto by the sea.(2020,November). Access. https://www.uminokyoto.jp/english/access/

Current result of the survey

At this point, we conducted the first hearing survey of the headquarters organization of "KYOTO BY THE SEA" and two of the seven regions. **None of the organizations found the fact that they intentionally made any special "preparations" for uncertain events**. However, in the headquarters organization, countermeasures were taken at an early stage by taking advantage of the private organization called a general incorporated association. They grasped the situation that the spread of the Covid-19 infection would affect inbound tourism, changed the business plan of this year immidiately, and implemented PR campaigns for domestic customers and infection prevention measures at an early stage. **It has succeeded in attracting micro-tourism customers, mainly domestic individuals, and as of this October, there are several regions that have recorded sales higher than the same month last year.**

At the moment, the following issues were extracted regarding the applicability of the scenario planning method for drawing multiple futures. **1)Difficulty for local residents to deeply consider uncertainties and draw scenarios, 2) creating multiple scenarios may divide the participants and make consensus difficult, and 3) The ability to respond quickly to uncertainty is more necessary than scenario planning.** Based on these issues, we will conduct continuous hearings and work on theorizing the scenario planning method that can be applied to rural areas in the future.

A Study on the Operation Improvement of Environmental Learning Facilities and Equipment in JAPAN

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* The Environmental Education of KUNISAKI CLEAN CENTER
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1. Background and Purpose

There are many waste incineration facilities nationwide, most of which are equipped with environmental learning facilities and equipment such as tour passages. As mentioned at last year's symposium, improvements are needed in the operation of environmental learning. Therefore, the purpose of this study is to get some methods to improve it.

2. Research method

2-1. From the basic plans and required specifications for Japanese waste treatment facilities issued from 2011 to 2019, 29 available facilities were selected. Then, the contents of the equipment and operation were investigated, organized by the classification method of Miyamoto (2018) also the installation time and relationship were considered.

2-2. We chose the presenter's own facility (Kunisaki Clean Center, which has been in operation for 12 years) as a model case facility. And we analyzed it to use a business tool which has a well-established reputation in analysis of platform-based businesses, to visualize facility operations of this model case and attempt operational analysis.

3. Results and consideration

3-1. Table1 shows the relationship between the equipment and the operation at the time of planning. Since the original purpose of the plan is to build a waste treatment facility, the operation of environmental learning must be adapted to the equipment installed earlier. The implementation flow is shown in Fig.1.

Therefore, the operation of environmental learning is restricted. This situation should be improved as shown in Fig.2. The equipment and operation are integrated from the planning stage. As a result, it is possible to produce the most suitable content for management. Moreover, it can be expected to respond (evolve) according to the operational status, such as flexible budget allocation and human resource development after the start of operation.

3-2. Fig.3 shows the results of analyzing the model facility with a business tool called "Business Model Canvas". It was abled to visualize the relationship between the facility and local stakeholders. It was found that it can also be used as a tool for improving facility management.

4. Conclusion

From the results of this research, the following was found. In order to improve operations in a facility, it is necessary to have an integrated plan that includes not only equipment but also operation at the facility planning stage. It was also recognized that the relationship with the region is an important barometer in the operation work and is a major factor in the work improvement.

However, this conclusion is subjective only in the model case facility. In future surveys, it is necessary to collect data for building an objective relationship model.

Also, in the application of business tools, trials by various methods and improvements are required, and we would like to aim to establish improvement methods for facility management operations after further research.

Table1. The relationship between the equipment side and the operation side at the time of planning

	Equipment	Content	Operation
Description	Equipment specifications only	Installation and Operation items name only	
Installarion	Mostly at the same time as facility construction	Parallel with facility construction	Often planned and implemented after the operator is decided
Relationship	Equipment used for operation (necessary for content)	Content required for operation	Operate the facility
onstruction order	→		
Required order	←		

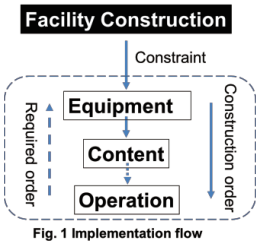

Fig. 1 Implementation flow

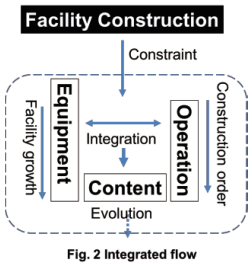

Fig. 2 Integrated flow

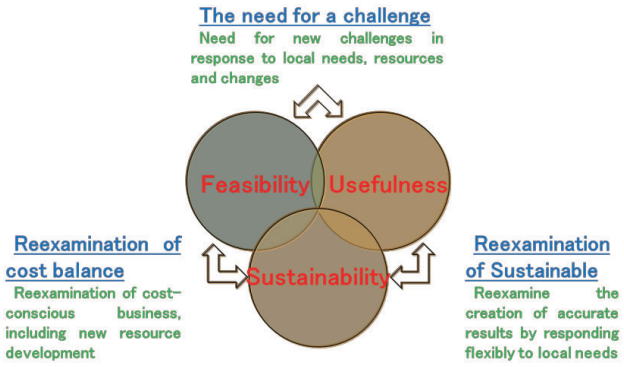

Fig. 3 The improvement points from using the Business Canvas Model

5. Reference

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Poster Presentations- Policy and Economics

Kyoto University International ONLINE Symposium 2020
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Development of a new participatory planning method using virtual reality technology

Authors: Nota Ohara, Kenichiro Onitsuka, Mari Miyaji, Satoshi Hoshino
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**Graduate School of Global Environmental Sutudies, Kyoto University

Background and research objective

1. Background

・The population decline in rural areas of Japan has continued since the 1965s, and it is expected that this trend will not change in the future. In this situation, what is required is a sustainable new way of preventing the weakening of local communities that have supported the environmental conservation of rural areas and the solution of problems in local communities by working outside the region.

2. VR in rural areas

・ICT can be used in rural villages such as the regeneration of existing local communities and the formation of new communities in that residents can communicate with each other without being restricted by time and space.
・ With the introduction of ICT, a new rural planning method that allows large numbers of people and remote participation is being developed.
・ The general understanding and interest in virtual technology has been rapidly increasing in recent years, but there are still few studies that utilize information spaces to verify their effects from the perspective of rural planning.
・ This study examines a new participatory planning method using a virtual reality technology, which facilitates people to express their opinions from remote.

3. Research objective

The research objective of this study is to evaluate the effects of a new participatory planning method using virtual reality technology.
We forecast that by introducing the VR-technology and partially virtualizing the place for residents to participate, more people can deeply understand the local situation and express their opinions, and the significance of residents' participation in planning.

Research flow and Material

1. Research flow

1:Collecting opinions from related parties locally

2:Creation of 3D model ① of the building

3:Show the current 3D model to the townspeople online and collect opinions

4:Setting of renovation design based on the opinions of the townspeople

5:Creation of 3D model ② of the promotion hall according to the renovation design

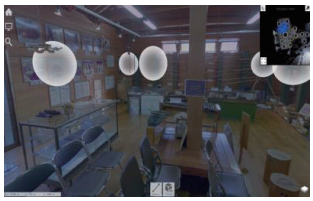
6:Show the 3D model ② to the townspeople and others online and collect opinions again, then re-evaluating the plan

2. Material

・The Kishubinchotan-Promotion Center in Minabe Town, Wakayama Pref. was selected as the target facility.
・We created a virtual reality model of Kishubinchotan-Promotion Center using a 3D laser scanner, Leica BLK360, and Matterport, showing the model online to collect opinions from people living inside and outside Minabe Town

*Kishubinchotan-Promotion Center

*3D model by Matterport



*3D model by Leica BLK360

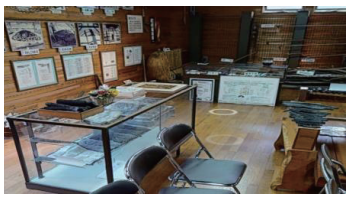
About 3D-modeling and VR technology

1. Matterport

Matterport is a camera + server service that uses a 3D scan camera released by Matterport in San Francisco, USA. High-quality VR images taken with the camera can be saved in the server and viewed as if you were actually walking around.

2. Leica BLK360

The Leica BLK360 is a 3D laser scanner that provides accurate point cloud data. In this research, the renovation design based on opinions is obtained by converting the point cloud data obtained from this 3D scanner into polygon data, and then constructing an exhibition design based on opinion gathering in cooperation with the Department of Architecture and editing accordingly.



As you can see in the picture above, we can get inside the 3D models created by these cameras.

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Farmers' Knowledge, Perceptions and Practices concerning Pesticide Use in Northern Vietnam

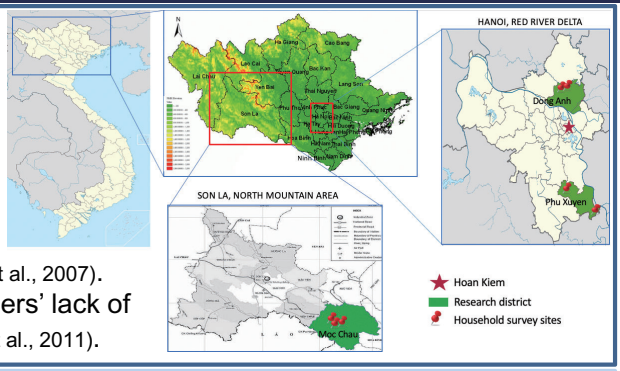
Vien T.T. Dinh* and Jane Singer*

* Graduate School of Global Environmental Studies, Kyoto University

BACKGROUND

Immense agrochemical uses and its impacts on the environment and human health have not been properly investigated (Pan Germany, 2012).
Small-scale farmers in developing countries are more vulnerable in terms of pesticide safety.

- Poor access to information and techniques related to safe pesticide practices and financial limitations (Matthews, 2008; Van Hoi et al., 2013);
- High rate of pesticide exposure: 35% of farmers being acute poisoning while using proper protective gears could reduce 44% the risk (Dasgupta et al., 2007).
- Personal protective equipment (PPE) is uncommon in LDCs due to farmers' lack of awareness of the risk, inaccessibility and weather constraints (Stadlinger et al., 2011).



METHODOLOGY

OBJECTIVE

To determine key factors influencing farmers' personal protective behaviors concerning pesticide uses in Northern Vietnam.

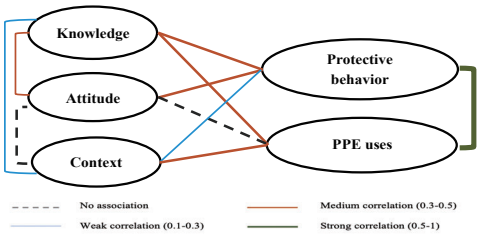
Framework: Knowledge, Attitude and Behavior (KAB) Model

RESEACH DESIGN

- **Location:** Northern Vietnam, including Red River Delta and Northern Midlands and Mountainous areas.
- **Methods**: Key informant interview (9), Household survey (138) and Focus group discussion (2).
- **Data analysis:** Descriptive, correlation and ANOVA analysis.

RESULTS & DISCUSSION

RQ1. What is farmers' KAB regarding pesticide use?



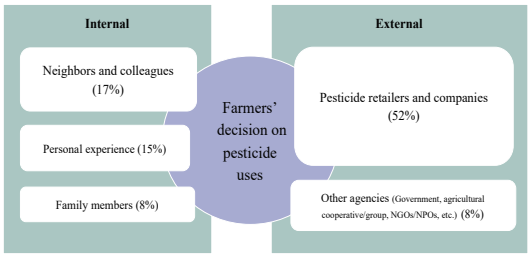
A strong correlation between farmers' **protective behaviors and uses of PPE (r=.551).** No significant or weak association between behavior and attitude even though knowledge and behavior have a medium connection.

RQ2. Which major factors influence farmers' self-protective behaviors?

The pushing factor of farmer using PPE is to protect themselves while main obstacles are unavailability, inconvenience while working in tropical weather, side-effects (ex. heat shock).

Personal protective equipment (PPE)	A	B	C	D	E	F	Count	Rank
A glove (thin rubber)	-	B	C	A	A	F	2	4
B mask (single-use/a piece of fabric)	-	-	C	B	B	F	3	3
C boot (long rubber)	-	-	-	C	C	F	4	2
D raincoat (single-use, upper part)	-	-	-	-	D	F	1	5
E goggles	-	-	-	-	-	F	0	6
F working clothes (long thick)	-	-	-	-	-	-	5	1

RQ3. What roles of different stakeholder play in facilitating farmers' pesticide safety practices?



While **external agencies, particularly agrochemical retailers and companies**, are greatly persuasive farmers' decision on pesticide choice and usage, internal factors like **personal experience and other farmers** contribute to only 40% of their preference.

CONCLUSION

The study reveals **a gap between farmers' knowledge, perceptions and their real pesticide use and protective practices**, farmers tend to choose and use any available protective gears regardless functions or materials. Also, pesticide retailers' instruction and personal experience have the most powerful influence on farmers' decision on choosing and using pesticides. It is recommended to **integrate practical safe pestide uses** into current effective use trainings, improve **farmers' access to proper protective measures** and facilitate the **trust connection between producer-consumer**.

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ANALYSIS OF WATER USE BEHAVIOR CHANGES IN ONE DECADE AT SUB-URBAN COMMUNITIES NEAR HANOI

Gugi YOGASWARA*, Shigeo FUJII*, Hidenori HARADA*, Seyha DOEURN*, Pham Huong GIANG*, Tomohiro KINOSHITA**, Pham Nguyet ANH***, and Nguyen Pham Hong LIEN****

* Graduate School of Global Environmental Studies, Kyoto University;**NTT Data Global Solution; ***Faculty of Chemistry and Environment, Thuyloi University; ****School of Environmental Science and Technology, Hanoi University of Science and Technology

Background & Objective

Rapid urbanization → Land use change

Rapid Population growth → Has people's water use behavior changed?

Methodology

298 Households Interview

- **Socioeconomic** — Income, Occupation
- **Water use flow** — Water source, treatment, water use
- **Wastewater flow** — Container, disposal

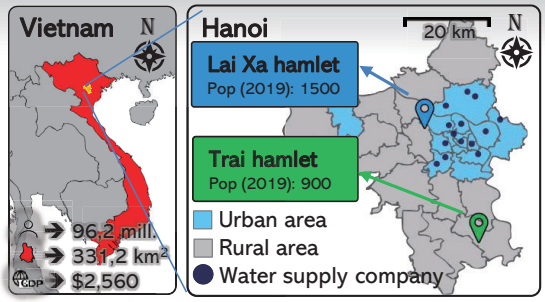
2011	2013	2018	2019
(Giang, et.al) **Trai** (*n*:100)	(Anh, et.al) **Lai Xa** (*n*:46)	(Kinoshita) **Trai** (*n*:20)	(Yogaswara) **Trai** (*n*:100) **Lai Xa** (*n*:32)

Conclusion

- **Trai Hamlet** (less income) → not covered by water supply
- **Reverse osmosis** entered both places within one decade

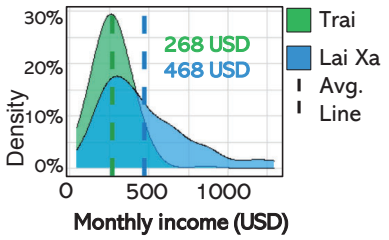
- **Dry toilet** reduced (**Trai**)
- Disposal changed significantly → **Agri. Field** (Trai)
- **Tap water** installation changed water source pattern (Lai Xa)
- **Lai Xa** (closer to urban area) → more land use changes

Study Site

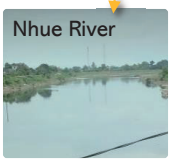


Result

Socioeconomic Comparison (2019)



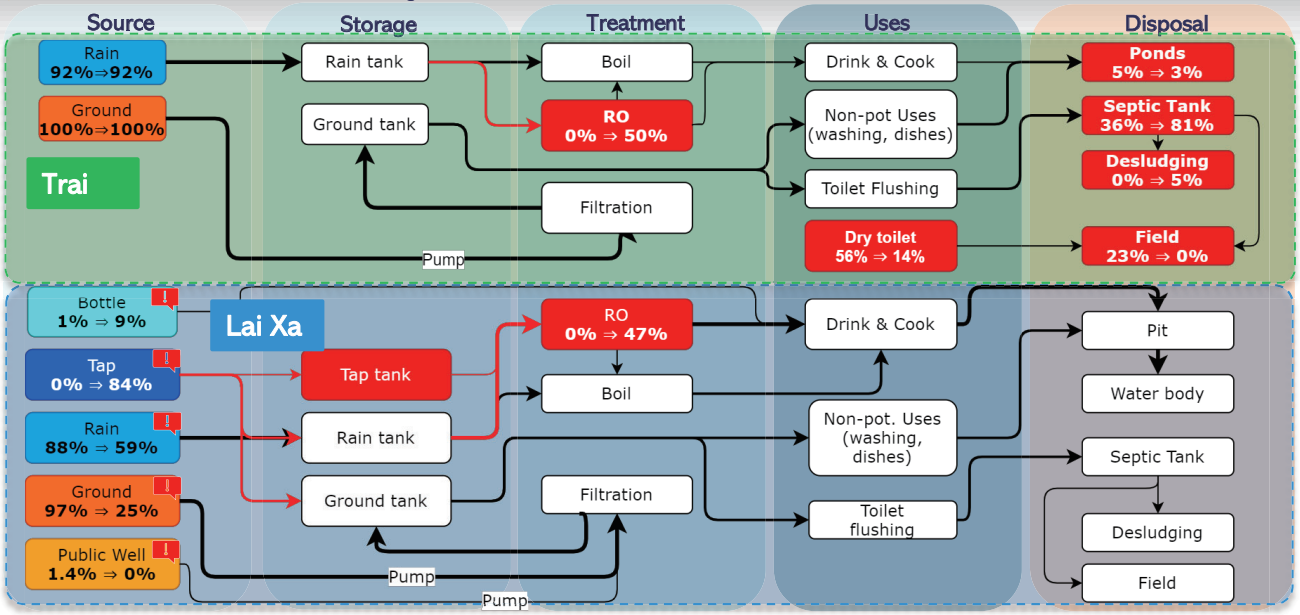
Land use Change

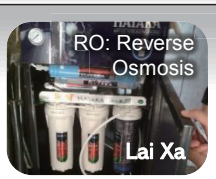


- land use → **not** changed significantly
- **Nhue River** → used for daily basis (20 years ago) but **polluted (now)**

- Public **dug wells** → **not used** anymore
- **Housing complexes** → expanding
- **Paddy field** → **changed** significantly
- **Thanh Do University** → **built** (2016)

Water use and wastewater flow changes





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Contribution of payment for forest environmental services (PFES) to the livelihood of ethnic minorities in central Vietnam

Authors: Le Thi Thu HA*, Hitoshi SHINJO*,

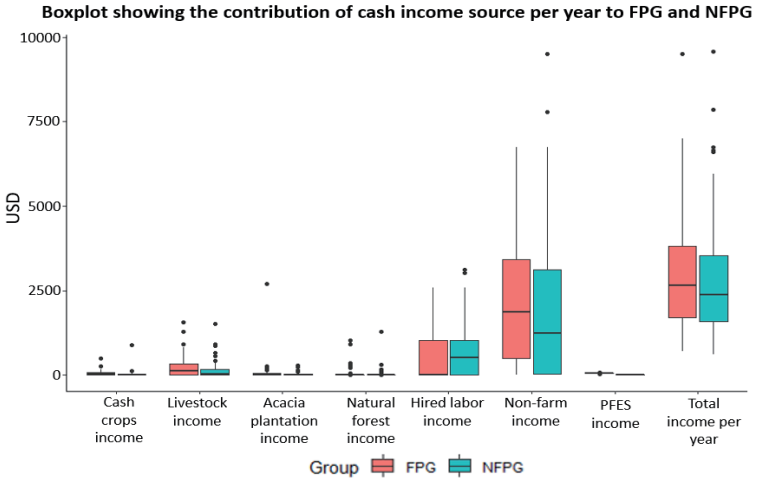
* Graduate School of Global Environmental Studies, Kyoto University

Background: Vietnam is the first nation in Asia introducing the PFES scheme on a nation-wide scale since January 1st, 2011. The PFES is considered as a main breakthrough to socialize the forestry sector by transferring money from forest resource users such as hydropower plants and water supply services to the local communities in charge of forest protection activities. There are so many challenges when the policy is introduced to reality. It is necessary to consolidate the effectiveness of implementing the PFES in Vietnam. This study aims to elucidate how the PFES is distributed to households, how it contributes to the livelihood of ethnic minorities in central Vietnam, and how the local people recognize PFES.

Methodology

Study site: Hong Kim commune, A Luoi district, Thua Thien Hue province, Vietnam. **Sample and data collection:** Focus group discussions, semi-structured interviews, and participatory observations were applied in this study. Out of 553 households in this commune, 133 households were randomly selected from calculated via the Slovin formulation (1960) and divided into two different groups named Forest protection group (FPG, n=67) and Non-forest protection group (NFPG, n=66).

2. How PFES contribute to livelihood income of FPG

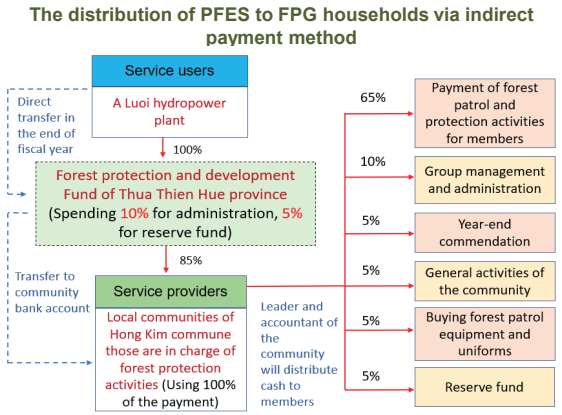


Although the total income per year of FPG (3,112 USD) seemed higher than those of NFPG (2,794 USD), they were not significantly different. This means that although FPG has additional income from PFES (50 USD per year), this source of income is negligible (accounted for only 2% of total income).

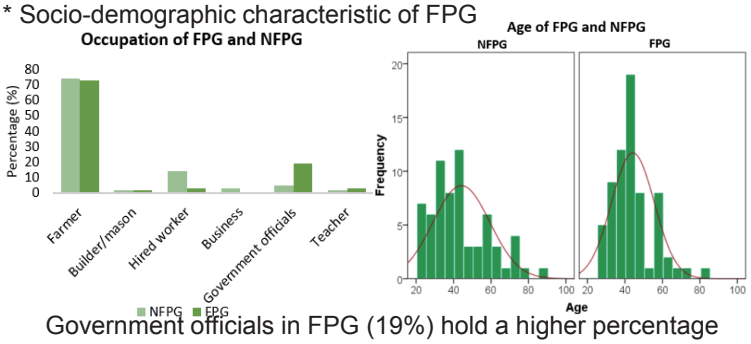
Results and discussion

1. How the PFES is distributed to households of FPG

Only 122 out of 553 households could become members of FPG due to the limitation of the allocated forest.

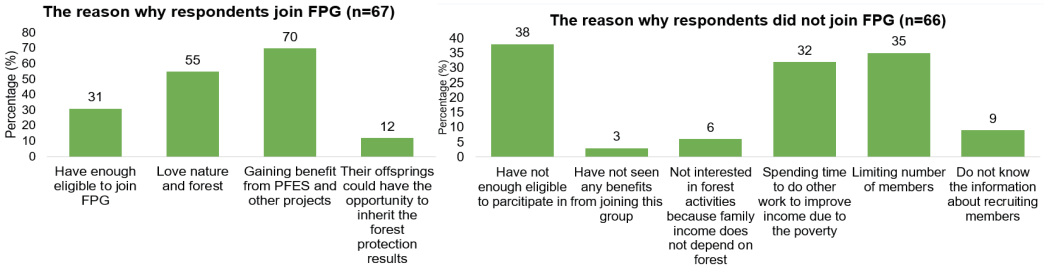


* Socio-demographic characteristic of FPG



Government officials in FPG (19%) hold a higher percentage than those of NFPG (5%), which might marginalize the opportunity of vulnerable households to become members of the FPG. Middle-aged (36-45) were willing to join FPG. Because young people prefer to do other jobs and are not interested in FPG, the elderly are not healthy enough to join this activity.

3. People perception of the PFES



The non-monetary benefits of PFES and other projects, which aim to restore and maintain the function of forest ecosystems in providing abundant water resources for agriculture and domestic use, reducing risks of erosion and landslide, providing NTFPs, saving culture and customs of the community, is a big motivation for interviewers to be members of FPG.

Conclusion & Recommendation:

Indirect payments have contributed to less payment received by FPG. Although PFES income (2%) is not really significant in the total household income, the non-monetary value is a great motivation for people to join FPG. It is necessary to expand receiving payment from other service users to support people's livelihoods. It is better to openly and transparently select members to ensure fairness and promote the effectiveness of PFES to involve the entire commune.

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Succession of Village-scale Rural Plan in Kobe City, Hyogo Prefecture

Authors: Beijun Song*, Satoshi Hoshino**, Kenichiro Onitsuka**, Mrittika Basu**

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

Background

Japan is facing with an aging population and low birthrate, especially in rural areas. As a result, local governments has begun to take measures. Kobe City, Hyogo Prefecture implemented a regulation called “Regulation on the Designation of Symbiotic Zone of Human and Nature” in 1996, which is an advanced rural development policy in Japan aiming to create a comfortable rural environment.

The regulation has been implemented for more than 20 years. According to interviews, however, the succession of these rural plans has not been implemented very well.

This research aims at identifying the current situation of succession of village-scale plans and increase the sustainability. It focuses on chairmen of rural planning council, who should act as leaders in planning activities. The following objectives are tackled:

1. To find out personal factors that affect the willingness of present chairmen to participate in planning activities.
2. To figure how the succession process of chairmen can affect the willingness of present chairmen and the succession of the plans.
3. To discuss how the perceptions of different participants can affect the succession of the plan in one village.

Methodology

“Regulation on the Designation of Symbiotic Zone of Human and Nature”, Kobe City, Hyogo Prefecture

It requires villages to create a rural planning council and make plans at village scale, including the following contents:

- designation of land use,
- designation of landscape protection area,
- rural planning council and plan,
- rural settlement and business, *etc.*

Research area: “Symbiotic zone of Human and Nature”

The area under observation is a rural area in Kobe City. It is designated by the regulation, covering 167 villages in 2 districts.

Table 1. Research Methods

Objective	Methods
To get an overall idea of the regulation	Semi-structed interviews; official documents
To find key factors and the succession process of chairmen	Questionnaires to all chairmen; interviews
To identify the perceptions of residents	Questionnaires to all residents in one sample village

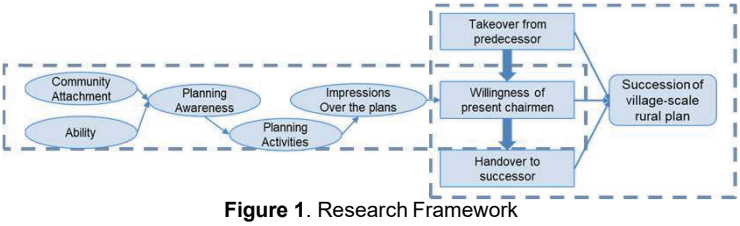

Figure 1. Research Framework

Results and Discussion

Current situation of the succession of village-scale plan

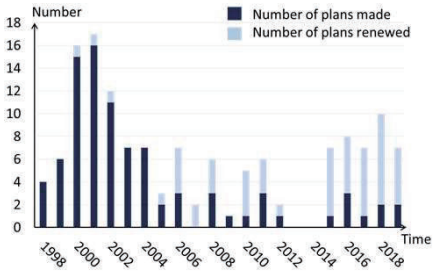

Figure 2. Numbers of Plans made and renewed

By 2019, 96% of the villages have created their councils, while 63% have made their plans.

In the beginning, people were willing to make plans, but the number decreased, after several years.

In recent years, villages began to renew the plans, because of a relaxed regulation.

Succession Progress of the Chairmen of Rural Planning Council

Most chairmen of rural planning council are also the chairmen of associations of residents. In most villages, chairmen serve for 2 years in the office. There is a rotation system for chairmen. Before becoming chairman, one may work as vice-chairman for 2 years. However, there is few additional training for now.

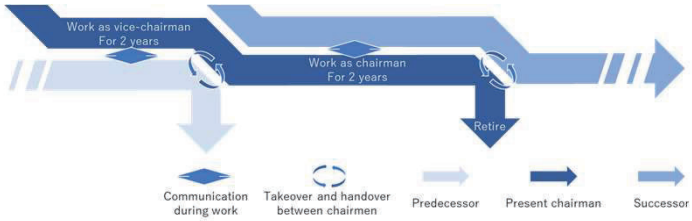

Figure 3. Succession of Chairmen

Willingness of present chairmen

Questionnaires were sent to 141 chairmen by mail during September 2020. The response rate was 83.7%.

About 13% of the chairmen said they were somewhat satisfied with the regulation, while 17% said they were not.

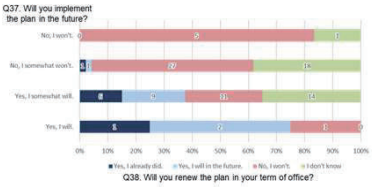

Figure 4. The Willingness of Present Chairmen

DISCUSSION

- The regulation has a strong influence in land use control. Villages will not renew their plans proactively, unless there are changes in land use.
- However, the regulation lacks flexibility to cover rural developing activities. Few villages can follow up these rural plans sustainably.

Next steps

1. Conduct further data analysis on the willingness of chairmen of rural planning council based on questionnaires.
2. Conduct questionnaire survey on the perception of residents in one sample village that is renewing their rural plan.
3. Conduct a long-term research to confirm the sustainability of village-scale plan (tentative).

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Applicability of low cost IoT system for river monitoring : a case study of Selangor river basin, Malaysia

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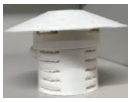
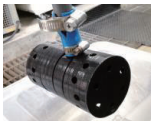
1 Background

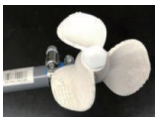
Water monitoring is one of the most important activities for watershed management. However, because of the limitation of labor and/or instrument cost, high frequency and broad monitoring are difficult especially in developing countries.
Selangor river basin, Malaysia has been facing high turbidity because of rapid urbanization.
To evaluate its effect to river water, low cost river monitoring system should be invested.


Water level sensor


Temperature sensor

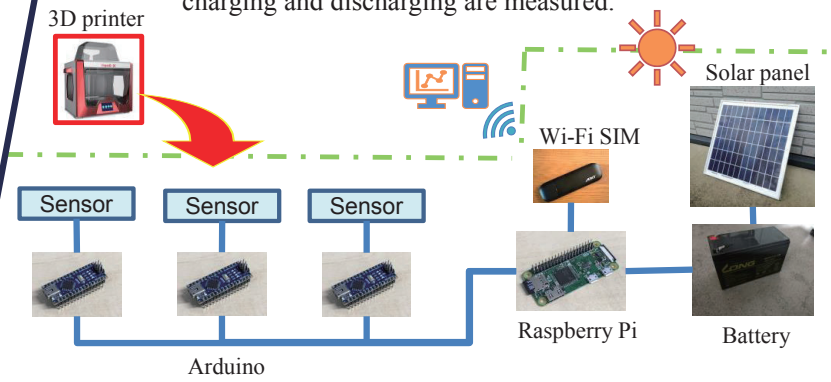

Rain gauge


Turbidity sensor


Flow velocity sensor

2 IoT river monitoring system

Using 3D printer, micro computer and a solar panel, water monitoring system is constructed.
The indices to monitor are water level, temperature, flow velocity, turbidity and rain intensity. These sensors created by 3D printer are operated by Arduino, a open source electronics platform. The obtained data are sorted by Raspberry-Pi, a micro computer, and sorted data will be sent to remote PC or Cloud database via Wi-Fi SIM attached to Raspberry-Pi.
Assuming to run this monitoring system continuously, Solar panel and battery are equipped to this system.
To compute maximum monitoring frequency, electricity of charging and discharging are measured.



3 Calibration

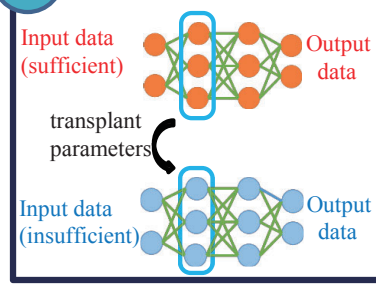
Sensors	Determination of Coefficient (R^2)	Optimum Range of Measurement
Water level	0.999	2 cm – 400 cm
Temperature	0.995	10°C – 50°C
Rain gauge	0.957	0 mm/hr – 50 mm/hr
Turbidity	0.999	0 FNU – 2,000 FNU
Flow velocity	0.989	0 m/s – 2.0 m/s

All sensors showed high accuracy for measuring with the R^2 of more than 0.9
Besides, the calibration range is reflected from the real environment in Selangor river basin except of rain gauge. The maximum rainfall in Selangor is about 300 mm/hr.
Using these sensors, test running in Malaysia and Japan will be conducted with sustainable solar energy

On going research

- Biofouling on contact type sensors under high turbid water bodies
- Test running and validation by mobile measurement
- Maintenance frequency for each sensor
- Determination of optimum river monitoring network in Malaysia using GIS techniques

4 Turbidity prediction with Transfer Learning



Conventional statistical models for time series prediction require many dataset. To reduce required dataset, transfer learning, an ANN technique is introduced. This technique transplants model parameter from completed model to target model which have sufficient and insufficient dataset, respectively.

Understanding perception and interpretation of Malaysian university students on renewable energy

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Introduction

Limitation of fossil fuel reserves that expected to be depleted in the near future and numerous problems stemming from the use of fossil fuels has shifted global attention to renewable energy (RE) sources [1].

It is highly critical to educate young generation as they will become future leaders. The consumption pattern and reliance on the energy grid is expected to rise, as well as ongoing climate change, Malaysia needs to enhance its RE sector. Awareness is one of the fundamental elements to flourish the development of RE in Malaysia.

This study aims to examine the perception and interpretation of university students, as the potential leaders for future generation on RE. The focus was given on education aspect and expressions towards RE resources in both, general and Malaysia context. The correlation of the perception with the socio-demographic profile including gender, educational background and family economic status was statistically analysed to reveal the most important factor that should be highly considered to increase the acceptance and awareness of young generation to RE.

Materials and method

- 3-section questionnaire was prepared based on awareness studies about RE adapted from [2] and [1].

Section	Contents
1	socio-demographic profile ▪ educational background ▪ family economic status
2	2 questions to obtain opinions on the type of clean energy that Malaysia should focus on and factors that influence the decision to use RE
3	2 statements about the influence of education and knowledge on future energy practice and RE choice

- All these 18 statements are self-reported statements with a five-point measure scale to discover the expression of university students on RE
- SPSS is used as analysis tools
- The descriptive analysis has been used to establish the norm and pattern, including chi-square test to analyse the relationship between socio-demographic profile and perception, as well as interpretation of university students on RE
- Cronbach's alpha (0.737) satisfactory level of overall consistency among individual responses in the reliability scale [3].

Results and discussion

- 2863 questionnaire retrieved

Demographic Profile		Percentage (%)
Background of studies	Science	50.6
	Non-Science	49.4
Family Economic Status	B40	45.5
	M40	32.1
	T20	21.7

- Type of clean energy that should focus on for the future of Malaysia

Background	Percentage (%)						
	Wind	Solar	Biomass	Nuclear	Wave	Don't Know	More than one
Science	4.1	**36.3**	13.5	7.5	4.1	4.6	29.9
Non-Science	6.2	**41.9**	15.2	5.3	4.4	5.6	21.4
B40	5.7	**38.9**	15.8	6	3.8	5.3	24.5
M40	4.8	**40**	14.2	6.2	4.4	5.4	25
T20	4.3	**38.1**	11.6	7.5	4.6	4.4	29.5

- What could influence your decision to use renewable energy?

Background	Percentage (%)						
	Cost	Efficiency	Environmental Responsibility	Patriotism & Energy Security	Policy	Don't Know	More than one
Science	13.8	20.5	**30.4**	3.5	2.2	3.7	25.9
Non-Science	9	19.7	**42.3**	5	2.3	4.5	17.2
B40	10.9	19.3	**38.7**	4.8	2.1	4.2	20
M40	10	21.2	**36.8**	3.9	2.3	3.9	21.9
T20	14.7	19.8	**30.1**	3.6	2.6	4.3	24..9

- Chi-square test: Significant differences ($p < 0.05$) in the type of clean energy between individuals in the two groups of educational background
- there is a significant difference for statements:

- The influence of education and knowledge on future energy practice
- RE choice between individuals in the two educational backgrounds

- Most of the respondents are not aware of current RE development, especially in Malaysia and the impacts of fossil fuels to the environment

- Non-science and B40 groups

- The proportion of subjects who respond the statement on capabilities of Malaysia to do more in RE development statement did not differ by both educational background and family economic status.

Conclusion

- Most of the university students participated in the survey agreed that solar energy should be the focus for the future of Malaysia.
- Environmental responsibility, Efficiency, Cost by order in ranks are factors that influence their decision to use RE.
- Students have positive perception towards RE resources in both general and Malaysian context.
- There is a gap on interpretation as most of the respondents are not aware on the disadvantages of fossil fuels and current RE development, especially in Malaysia.
- Intellectual activities are needed to promote and increase the awareness about RE among university students

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Energy consumption and CO_2 emission of building material industries: Input-Output analysis

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1. Introduction

+ The main building material products in Vietnam include cement, glass, and products from baked clay (tile, ceramic, brick). The production of these products consumes a lot of energy, resulting in large emission of GHGs. The common approach for estimating emission from the industries is to use emission factors and data collected through direct surveys for a single year.
+ This study focuses on analyzing and evaluating both energy consumption and greenhouse gas emissions over the time series 1996-2018 to show changing trends by the input-output analysis approach. The results will give readers an overview of energy consumption demand and potential greenhouse gas emissions from this sector in the past and easily make forecasts for the future.

2. Materials and Methods

The IO tables of Vietnam of 1996, 2000, 2007, 2012, and 2018 are converted into hybrid-unit tables in which energy sectors are presented in energy units. Three energy sectors are Coal, Gasoline, oil and Gas, and three industry sectors are Cement, Glass, and Products from baked clay.

The factors such as price index, energy conversion factors, growth index are yearly averaged according to country-specific data. These factors were used to determining energy consumption for three industries sector in kilotons of oil equivalent (ktoe) unit as the following:

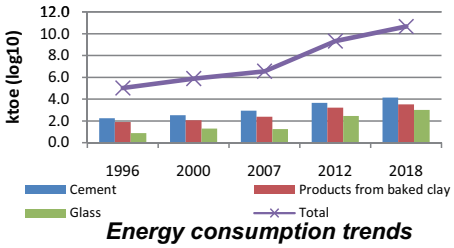
$$\text{Energy consumption (EC)} = \sum \text{Energy consumption (coal + oil + gas)}$$

Then, CO_2 emission is determined as the following:

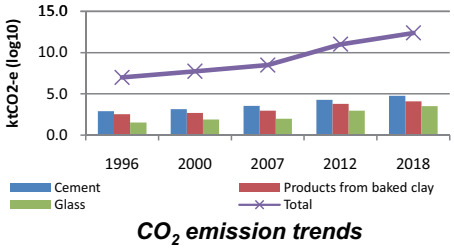
$$CO_2 \text{ emission} = EC * EF$$

Where EF is GHGs emission factor for each fuel type which is according to The Intergovernmental Panel on Climate Change (IPCC).

3. Result and discussion



Energy consumption trends



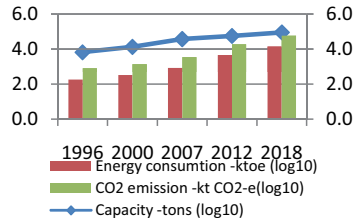
CO_2 emission trends

Since 1996, the demand for total energy consumption has increased nearly 70 times after 12 years. Total energy consumption was 264.03, 465.57, 1100.20 ktoe, 6415.21 ktoe and 18223.61 ktoe in 1996, 2000, 2007, 2012, 2018, respectively.

The total GHG emission of these sectors in 2018 was 73917.608 kilotons CO_2 equivalent (kt $CO_{2\text{-e}}$), an increase of 2.9 times compared to 2012, and an increase of nearly 62 times compared to 1996.

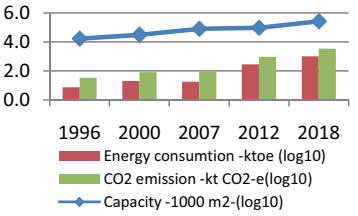
) Cement

Cement continues to be the biggest contributor to GHGs emission accounting average more than 73% of CO_2 emitted, peak in 2018 contributing over 78.8%.



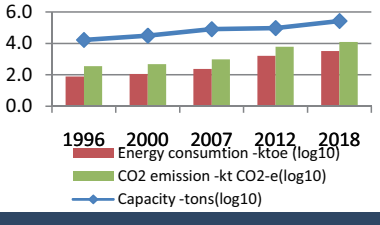
) Products from baked clay

The second-largest emission is the manufacturing industry of baked clay products with a total CO_2 emission in 2018 of 12.3 kt $CO_{2\text{-e}}$, accounting for 23.2% of the total emission on average. The emission increase is 37% per year.



) Glass

The glass industry is the lowest GHGs emission, accounting for 3.5% of the total emission on average. The emission growth ratio is stable, increases at an average of 3.2%/year from 1996 to 2018.



4. Conclusion

The IO table has been used effectively in determining energy consumption and CO_2 emission for building materials industries from 1996 to 2018. Total energy consumption has increased rapidly over the past 20 years, especially in the past 6 years (from 2012 to 2018). Along with increasing energy demand, the building materials industry also emits more GHGs into the environment. The cement industry is the biggest in both energy consumers and emission. The second-largest is the products from baked clay industry and the glass industry plays the smallest role.

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Health Benefits from $PM_{2.5}$ Reduction Policies for Road Transport in Bangkok Metropolitan Region

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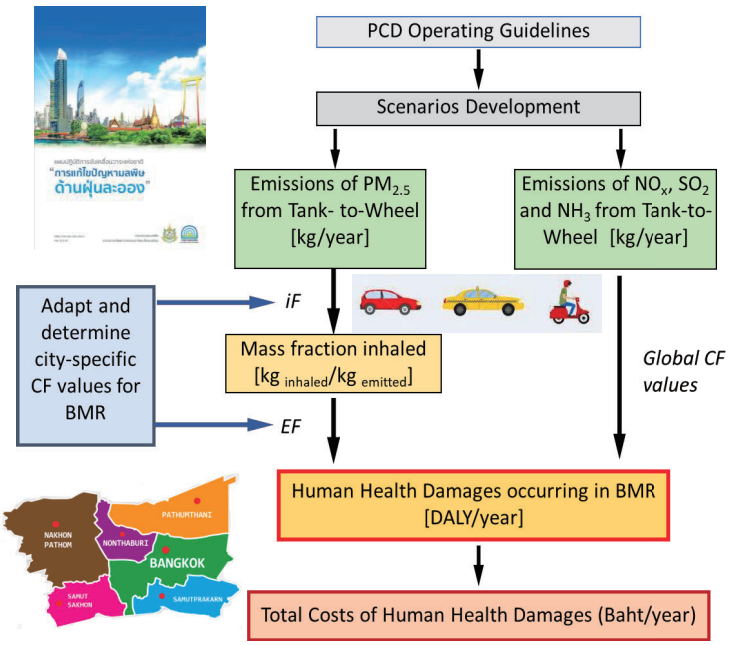
BACKGROUND

Fine Particulate Matter ($PM_{2.5}$) is an important environmental factor contributing to human diseases burden from lung cancer to heart disease. Bangkok Metropolitan Region (BMR) has high levels of $PM_{2.5}$, and one of the major sources is vehicle exhausts. Thailand's Pollution Control Department (PCD) suggested an Action Plan with a number of operating guidelines to reduce $PM_{2.5}$ emissions. A quantitative analysis of selected guidelines would be beneficial to policy makers in determining guidelines with the greatest health benefits.

OBJECTIVES

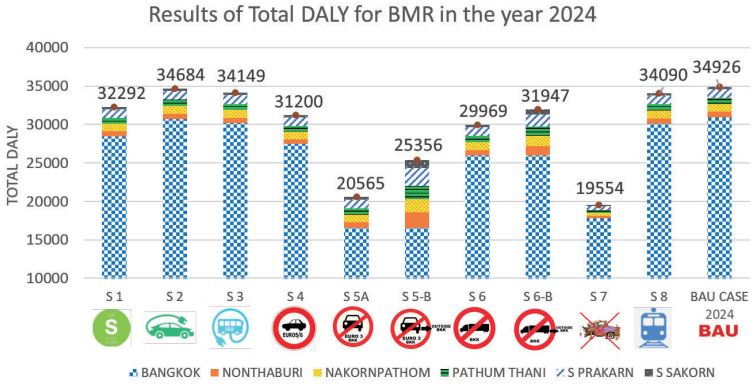
1. To estimate emissions of primary $PM_{2.5}$ and secondary $PM_{2.5}$ precursors: NO_x, SO_2 and NH_3, for proposed scenarios based on the PCD Action Plan.
2. To adapt and determine spatially-differentiated health impact characterization factors (CF) for $PM_{2.5}$ emissions for all 6 provinces in BMR.
3. To quantify human health impacts in unit of Disability-Adjusted Life Year (DALY) due to transportation-related $PM_{2.5}$ emissions as well as associated health benefits.

METHODOLOGY

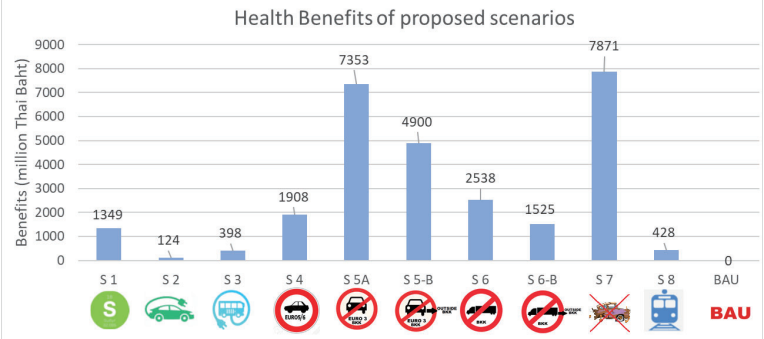


RESULTS & DISCUSSIONS

Eight scenarios were proposed as follows: S1-10ppm sulfur fuel enforced in BMR; S2-Electric cars make up 50% of new vehicles in 2024; S3-change all public buses to e-buses; S4-adopt EURO 5 and EURO 6 standard in 2021 and 2022 respectively; S5-Ban vehicles < EURO 3 from BKK with sub B case- removed vehicles added to provinces; S6-Ban all trucks from BKK with sub B case-removed trucks added to provinces; S7-Ban old vehicles > 20 years from BMR and S8-vehicle activity data reduced by 10%.



Results show that all scenarios provide reduction in health impacts compared to Business-As-Usual (BAU). The best case is S7-Ban old vehicles > 20 years from BMR. This suggests that old vehicles contribute a large portion of emissions. This is because old engine technology has high emission factors. Secondly, currently Thailand does not set age limit of vehicles on the road, hence, there is a large number of old vehicles > 20 years still in use.



In monetary terms, case S7 is estimated to has health benefit value of up to 7.87 billion Thai Baht. Results from this research provide ranking for each scenario and would aid decision makers in conducting a Cost-benefit analysis that would provide justification for the effectiveness of policy aimed to improve air quality in Thailand.

ACKNOWLEDGEMENT
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Policy Evaluation of Air Pollution Control Projects in Ulaanbaatar

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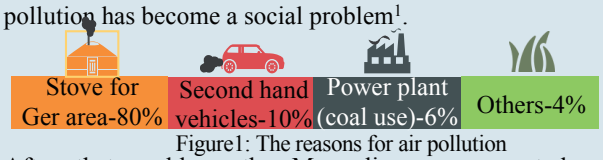
Introduction

Since around 2007, air quality has deteriorated in Ulaanbaatar and air pollution has become a social problem[1].



Source: Ulaanbaatar city government office

Figure1: The reasons for air pollution

After that problem, the Mongolian government has focused on comprehensive measures to reduce air pollution. In 2016, it has introduced nighttime electricity discounts for households in the ger area, encouraging people who use raw coal for heating to use electric heaters. In March 2017, they approved a national program on reducing air and environmental pollution. Those aims to reduce air pollutants by 80%, ban the use of raw coal outside of Ulaanbaatar's thermal power plants, and reduce air pollution by at least 50% by 2025. On Feb 28, 2018, Mongolian Government Resolution62 banned the use of raw coal.

Objectives

This research will carry out a policy evaluation of measures for the ger area represented by Resolution 62. In addition, clarify the impact of this policy on air pollution and the consistency of each policy.

Methods

A policy evaluation study is an objective, systematic, and empirical study of the effects that ongoing policies and public programs will have on the target population in view of the goals they are required to achieve[2]. Of the many methods of policy evaluation, logic model is considered to be useful.

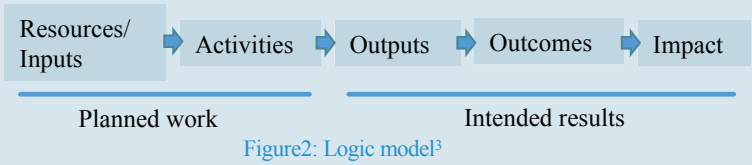


Figure2: Logic model[3]

Analysis

Resources /Inputs	Activities		Outputs	Outcomes		Impact
The main reason	Name of law and Policy	Other activities	Immediately after result	Short-term results	Medium-term results	Long-term results
			Smoke has decreased	PM2.5 decreased	Hazardous exhaust gas has decreased	Climate change gas has decreased
Stove for Ger area (80%)	• 2014.07.25 Resolution No.05 of the National Air Pollution Reduction Committee "About measures to be taken with improved fuel" Purchase from companies that meet the requirements. • February 28, 2018, Mongolian government resolution No. 62 bans the use of raw coal • Improved fuel production will start in April 2018. Providing free improved fuel to low-income households. Report of Ulaanbaatar City Air Pollution Reduction Agency 2018.02.26	Convert to improved fuel	The visible black smoke of coal and dirt are gone. (Reduction of PM2.5)	Decrease in smog (measured value of PM2.5 in winter)	1. Reduction of air pollution due to harmful exhaust in the city (reduction of CO, NOx, SOx) 2. Health problems due to air pollution have decreased. (Respiratory disorders decrease)	
		Switched to improved fuel	Smoke due to incomplete combustion during ignition has been reduced			
		Promotion of stove improvement	Burnup increased and smoke disappeared (PM2.5)	There is no smoke in the ger room (indoor PM2.5, CO concentration)	Eradication of carbon monoxide poisoning in the ger (number of carbon monoxide poisoning cases in the ger area)	
		Promotion of complete chimney	Exhaust gas no longer leaks into the room			
		Hot water supply to the ger area	No heating stove used	Reduced number of heating stoves installed		
		Promote migration to an apartment				

Conclusion

Using a logic model, it's able to clarify the consistency of the policies (Resolution 62) taken to reduce emissions in the Ger region, which is a major cause of air pollution in Ulaanbaatar.

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Risky Business: Natural Hazard Risk Perception and the Demand for Life Insurance by Foreign Residents in Japan

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** Department of Global Environmental Studies

Background

Japan is no stranger to **natural disasters** and has been plagued with several major earthquakes, tsunamis, floods, typhoons and volcanic eruptions (Clerveaux, Spence and Katada, 2008). These disasters have caused significant **loss of life** and **damage to property**.

Against this backdrop is increased migration. Currently there are 2.93 million foreign residents in Japan (Ministry of Justice, 2020). A foreign resident's lack of experience with, and knowledge about a specific natural hazard impacts perception of the risk and essentially makes one vulnerable. **Risk perception** impacts the demand for a specific type of coverage against loss. The demand for life insurance is dependent on how risk to life is perceived. Even though Japan is highly susceptible to natural hazards **the demand for life** insurance among foreign residents **remain extremely low**.

Methodology

The principal objective was to investigate if there is any relationship between how foreign residents perceive disaster risks and its subsequent demand for life insurance and if life insurance pricing affects risk perception of foreign residents in Japan.

- **Online questionnaires** designed along a three Likert scale.
- The target population- foreign nationals legally working in Japan for more than a year (**126 respondents**).
- **Focus group** : 10 participants

Results

Figure 1: Respondents' opinion on the relationship between perception of risk and demand for life insurance in general.

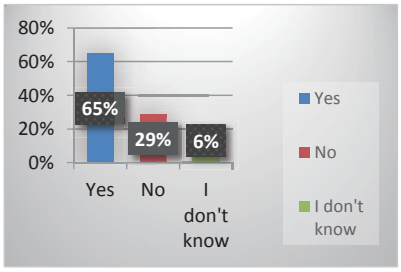
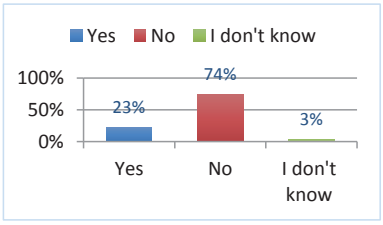
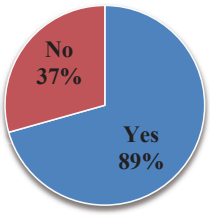


Fig. 2 Opinion on the relationship between natural disaster risk perception and demand for life insurance in Japan



Acknowledgements : Special thanks to Professor Makoto Usami

Fig. 3 Opinions on relationship between natural disaster risk perception and pricing in Japan.



Discussion

Relationship between risk perception and demand for life insurance in general

- Majority of the respondents believe that there is a significant relationship. They believe that the higher the level of the perceived risk is, the more the demand for life insurance will increase.

Relationship between risk perception and demand for life insurance in Japan

- 74% of the respondents believe there is not a strong relationship. This indicates that the perception of natural hazard risk to life is very low among foreigners and does not impact the demand for life insurance.

Price

- The data revealed that price influences the demand for life insurance. The cost of premiums In Japan are assumed to be expensive. Majority economic migrants, saving is a priority.

Not targeted

- Very little is known about the insurance market and the product offerings. Foreigners feel disregarded as a viable target market.

Language

- Limited Japanese impacts risk perception in Japan. Risk communication is limited outside of four main languages (Japanese, Korean, Chines and English). Insurance contracts as most are offered in Japanese.

Conclusion

Even though Japan is susceptible to several natural hazards, risk perception is low among majority of the foreign resident coupled with a lack of understanding about the insurance market in Japan. Price of the premiums, language barrier and the nature of the existing insurance tools impact the demand for life insurance. The lack of information or information deficit impacts perception which in turn impacts vulnerability. This can be explained by the Information Deficit Model which seeks to remedy gaps in disaster risk communication.

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A comprehensive collaboration framework in community post-disaster reconstruction between multiple stakeholders

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INTRODUCTION:

Background: In 2009, Taiwan was hit by Typhoon Morakot and brought about 3,000mm rainfall in a single day. This typhoon had caused serious landslide damage to many indigenous Taiwanese settlements in the mountain areas including the indiginous communities in Pingtung County.

Objectives: This research aimed to clarify the decision-making mechanism of the post-disaster reconstruction after Typhoon Morakot, explore the role of NGOs, and the cooperative interaction with other related stakeholers (Government, NGOs, architects, and residents), as well as suggest a better operational framework for the post-disaster reconstrcution. The case studied sites were Rinari and Changzhi Baihe--two post-Morakot relocated settlement (Figure 1).

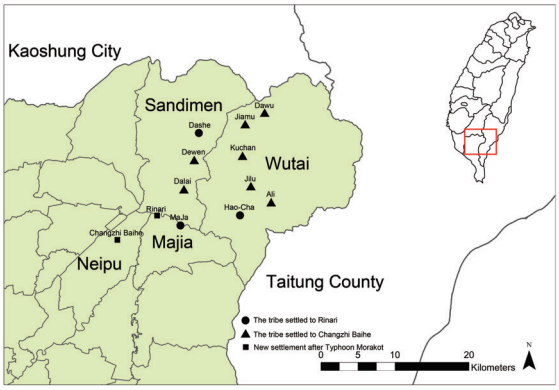

Figure 1. The location of Changzhi Baihe and Rinari settlement

Finding:

After the Typhoon Morakot, an unprecidented post-disaster reconstruction project had been launched by the Taiwanese government, with the asistance by local government and NGOs. The cooperation framework is summrized in Figure 2.

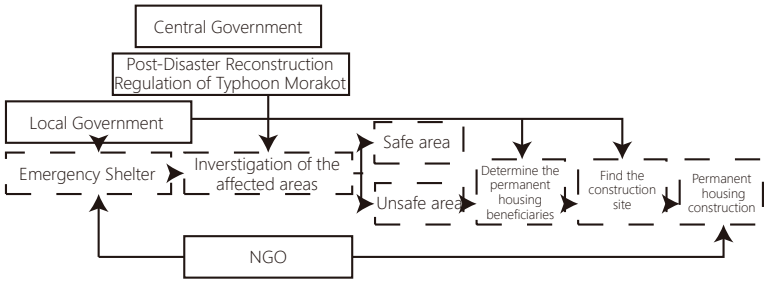

Figure 2. Cross-stakeholders framework of post-disaster reconstruction project

(A) Interaction between NGOs,government and NGOs

1.Temporary house or permanent house?

To solve the resettlement problem of the affected people and accelerate the reconstruction and resettlement operations after the disaster, the Central government propsed the aiding partnership framework with the NGOs. Due to the consideration of time limitation and budget restriction, the permanet housing policy had been priortized. The size of the permanent housing was allocated according to the number of people in the disaster-impacted households.

2.The major differences between three NGOs

The three major NGOs had various of reconstruction ideology and different dominance to the individual project, as well as the relationship with other stakeholders.

(B) Residents' interaction with NGOs

Changzhi Baihe had two construction phases of permanent housing, with an area of 29.6 hectares. NGO(A) built the first phase, which started on April 26th,2010, and a total of 164 units were completed on August 6th, 2010. NGO(C) built the second phase, which started on April 17th, 2011, and was completed on October 17th, 2011, with a total of 106 units completed;Starting from September 2009, the government invited NGO(A) to construct the permanent housing in Rinari. However, the proposal had been denined by the residents. The project therefore transferred to NGO(B), who completed the construction in December 25th, 2010.

Conclusion:

1.NGOs had influence over the government sector' s decision making based on their own interests and ideology.

2.NGOs gave architects different power of management to the reconstruction project according to their capability and concept of implementing PDR program.

3.Some of the NGOs attached great importance in the process of communication with the residents and some did not. The difference of community involvement resulted in a divergence of satisfaction of the residents.

4.Residents generally trust the capability of the NGOs. However, the capacity of NGOs was not equal to the satisfaction of the residents.

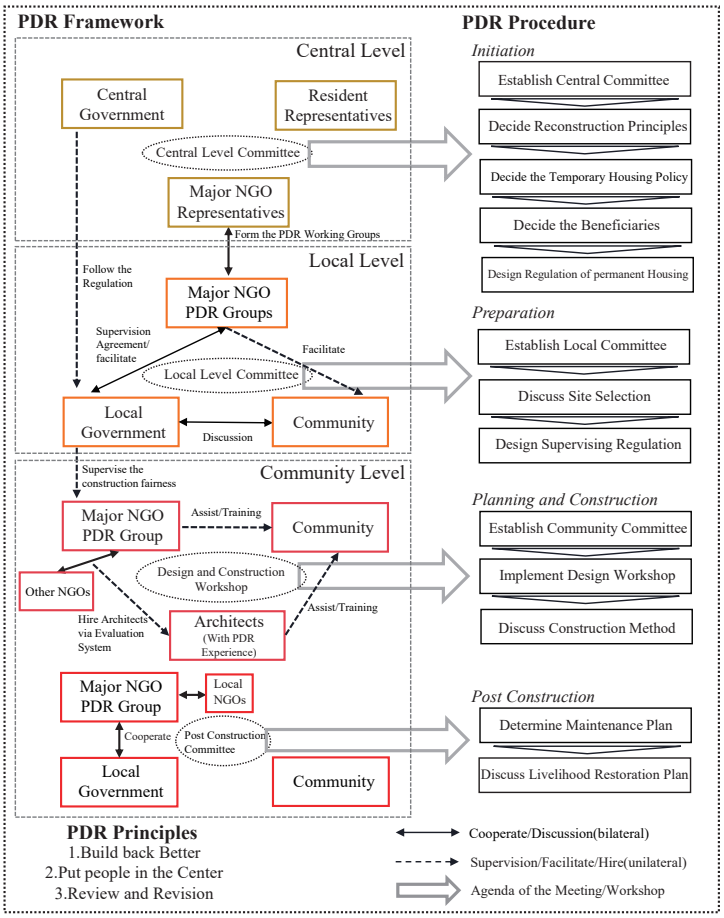

Figure 3. Cross-stakeholder cooperative framework suggestion

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Using the Analytic Hierarchy Process approach in evaluating water resource development scenarios in Lower Mekong Basin

Authors: Nguyen Phuong Lan
* Graduate School of Global Environmental Studies, Kyoto University
** Global Environmental Policy Laboratory

Research background

- The Lower Mekong Basin (LMB) which accounts for 70% of the basin's area refers to the river basin within the four downstream countries (Laos, Thailand, Cambodia and Vietnam).
- Mekong River Commission (MRC),an institutional framework established among the four downstream countries in 1995, has comprehensive missions to promote and coordinate sustainable management and development of water and related resources for the countries' mutual benefit.
- With the purpose of assisting the Member Countries in their planning, managing and monitoring of the water resources of the LMB, MRC has established a cumulative assessment of the consequences of current and planned water resource development projects in LMB, named MRC Council Study

Challenges

- ✓ MRC Council Study mainly focus on describing comprehensive impacts of water resource development on the whole region without clarifying which scenario has the largest impact relating to economic aspects based on choosing appropriate criteria for evaluation
- ✓ MRC itself does not introduce a revised cooperation framework among member states in reliance on the results of Council Study

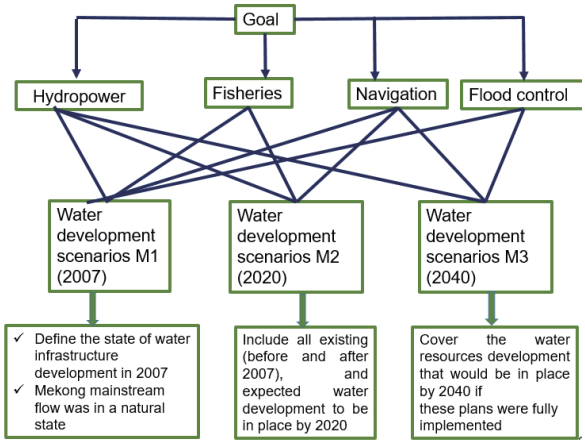
Research objectives

- ✓ Which criteria and sub-criteria should be employed to AHP model of the LMB case to evaluate its water development scenarios?
- ✓ How to calculate relative weight of criteria in the AHP model of the case?
- ✓ Which development scenario is the best for future planning of water using in the case?

Map of Mekong river basin

Methodology

- This study proposes an approach to conflict resolution in LMB based on **AHP** approach which is considered as a popular multi-criteria method aimed to support decision-making processes.



Results

Table 2.10 Overall priority weight of alternatives

Scenario	Criteria							Final ranking (%)
	C1	C2		C3		C4		
		C2.1	C2.2	C3.1	C3.2	C4.1	C4.2	
M1	2.506	0.677	1.310	1.506	1.805	1.077	1.118	9.492
M2	19.911	1.655	2.069	1.401	1.262	0.832	0.844	27.876
M3	44.283	7.668	6.621	1.094	0.933	0.742	0.688	62.632

- ✓ Mainly **hydropower** criterion is **more important** than the group of navigation, flood control and fisheries criteria

=> The **driving factors** of MRC decision- making system focuses on the economic benefit of **hydro-electricity generation**

Conclusion

- ✓ The water development scenarios should be consulted in combination with other disciplinary and thematic researches.
- ✓ Many changes might appear positive from an economic perspective, but could lead to unacceptable outcomes for other indicators, for instance food security or biodiversity

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Paradox of Peatland Conservation Governance from the Viewpoint of Social Structure : A Case Study in Riau, Indonesia

Authors: Maho Kasori*

* Graduate School of Asian and African Area Studies, Kyoto University

Research Purpose :

To make clear the challenges of peatland conservation policy by investigating of actor who enjoy the benefit from revitalization program.

Research Background :

2015 Almost 2 million ha of peatland fire was occurred. It will be international problem (Ex. Haze)

2016～ Peat Conservation Governance started based on Peat Restoration Agency (BRG)

～2020 Target : Restoring 2 million ha and revitalize the livelihood (Social and Economic aspect) in peatland area.

System design for revitalization （BRG 2017）
- Define about the rural areas in peatland as areas mainly based on agriculture activity.
- Local people in rural areas in peatland should be the largest beneficiaries of the benefits of the conservation peatland.

Previous Research about the Peatland Society.
- The social structure in peatland/peat-swamp-forest is full of diversity. （Takaya 1988, Furukawa 1992, Koizumi et al. 2018）
- Peat conservation and improvement of the rural economy are trade-off relationships (Murniati et al. 2018）

Research Question
- In rural area in peatland is full of diverse, can local people enjoy the benefit from the peatland conservation governance especially revitalization of the livelihood.

Research method : Actor analysis and actual condition of Income in R village, Riau province, Indonesia.

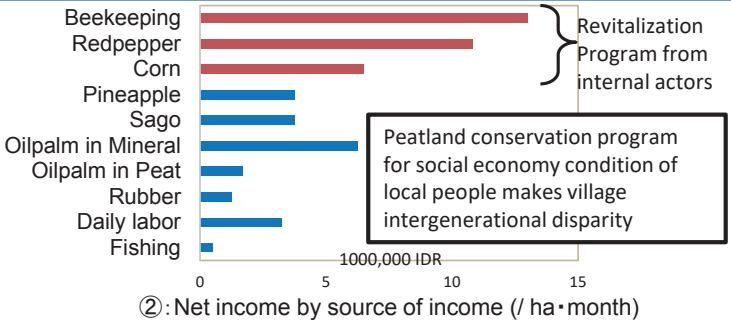
Result and Discussion

In R village, all of peat conservation programs by NGOs and companies were carried out through the village firefighting group. （①）

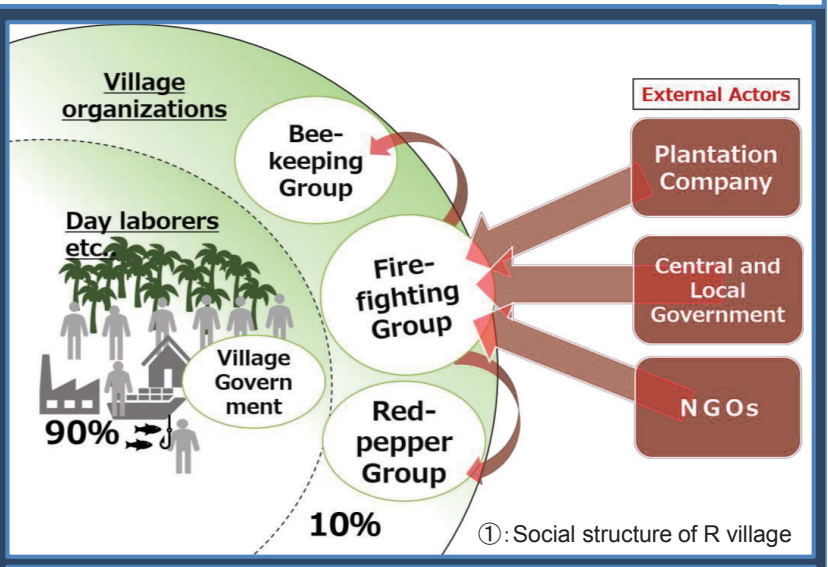
The firefighting group to prevent fires have been successful in collaboration with external actors, and R village has not developed into a large-scale fire since 2014.

However, it was suggested that the rich are getting richer and the poor are getting poorer (= intergenerational disparity)（②）.

In other words, in R village, it was possible to point out the fact that it goes against the “revitalize the livelihood of local residents”.



②：Net income by source of income (/ ha・month)



①：Social structure of R village

Consideration
In rural area in peatland is full of diverse employment structures such as Village R, the benefits of revitalization programs are biased and disparities between households are created.

Conclusion
In the introduction of revitalization programs, decision-making and equal opportunity by residents are essential for local people to be the largest beneficiaries of profits.

Research limitation
△ This conclusion is based on an empirical study only in R village.
It is necessary to examine the validity.

↓

Further plan : Additional research needs to be conducted in peat societies with different ecological environments and livelihoods (Ex. Reexamination in agriculturally dependent peat societies)

Dealing with distributional effects of carbon tax: Lessons for Iran

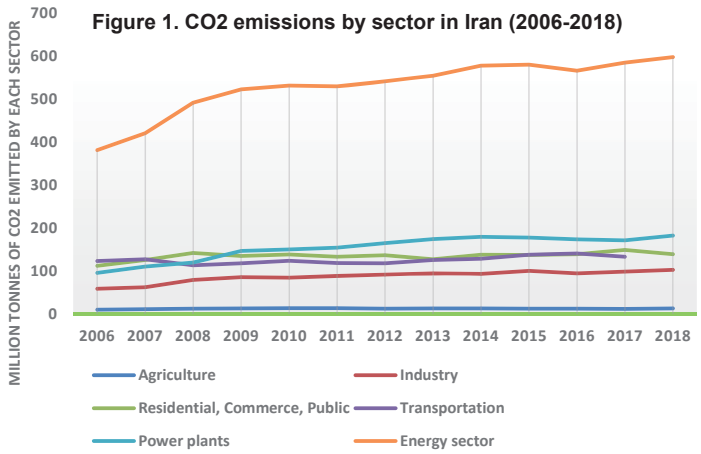
Author: Bahareh Ghafouri

Graduate School of Global Environmental Studies, Kyoto University

1. Background

Iran is a **major global** Carbon dioxide (CO2) **emitter** [1] with an increasing trend in greenhouse gas (GHG) emissions (Figure 1). In 2017, the **National Strategic Plan on Climate Change** consisting of several strategies for climate change mitigation including ***carbon taxation*** was [2]. A major concern, however, regarding the application of carbon tax is their **negative distributional effects** on lower-income groups. It is acknowledged that how the **tax revenues** are spent considerably affect this issue [3]. Therefore, this article tries to understand what type of revenue use better fits the Iranian context by looking at strategies of four other selected countries.

Figure 1. CO2 emissions by sector in Iran (2006-2018)



2. Methodology

Four countries/state from different parts of the world namely **Sweden**, Canada (**British Columbia**), **Mexico** and **South Africa** with carbon taxes in place are selected for comparison. **Gini coefficient** as a measure of the deviation of the distribution of income among individuals or households within a country from a perfectly equal distribution (lower numbers show more disparity in distribution of income), and **CO2 per capita** emissions (tonnes) will be explored as two economic and environmental indicators influencing the use of revenues.

3. Results

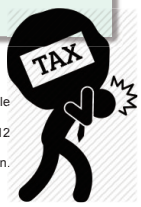
Table 1 summarizes the results of the review. Some of the most frequently applied strategies for using the tax revenues include **general budget, compensation for lower-income households and affected businesses**, further reducing emissions and other **environmental purposes**. Most countries use a mix of strategies in order to meet various goals [7].

Table 1- Countries comparison

	Gini [4]	CO_2 per capita [4]	Use of revenues
	29.2	3.9	General budget [5]
	34	14.9	• Provide carbon tax relief and protect affordability • Maintain industry competitiveness • Encourage new green initiatives [6]
	43.4	3.6	National budget [7]
	63	7.4	National revenue fund planned for environmental purposes and lower-income compensation [7]
	40	7.1	(no carbon tax in place)

4. Discussion

Whether a tax is regressive *mainly* depends on how its revenues are used. Different countries based on their context have opted for different strategies. Generally speaking, people better support the policies that are more **transparent** and have clear motives [8]. Therefore, directing the revenues towards general budget might lead to opposition to the carbon tax implementation. On the other hand, Gini coefficient shows an **unequal distribution of income** in all countries discussed here to different degrees. Canada and South Africa have allocated some part of their carbon tax revenues for **compensating lower-income** groups. Even in case of Sweden with the lowest inequality, the government has mentioned that it might use part of the revenues for addressing undesirable distributional consequences of taxation or financing other climate-related measures [5]. In Mexico, although the inequality is relatively high, the **low tax rate** does not affect either the distribution of income or emissions reduction. Based on these results, using part of the revenues for alleviating the regressive effects of a carbon tax sounds plausible for the Iranian context. By targeting the revenues towards the most affected groups, there might be also the possibility to further reduce the comparatively high emissions in Iran while avoiding serious distributional effects.



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The role of social capital in community response to cyclone Winston: Case study of three different communities in Fiji

Authors: Sainimere Veitata*, Mari Miyaji*, Ayako Fujieda**, Hirohide Kobayashi*

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** Kyoto Seika University, Kyoto, Japan

INTRODUCTION: Background and Methodology

BACKGROUND

- Small island are vulnerable to natural disasters and communities are usually the worst affected
- Social capital function as a **"safety net"** during disasters
- Community driven response to the cyclone impacts, particularly in traditional Fijian village
- There is a gap in the coordination of response effort between government and communities
- TC Winston – a category 5 cyclone in February 2016
- Affected 540,400 people (62% of the population)
- Damages amounting to US$1.8 billion and 44 deaths

PURPOSE

This study aims to **understand how communities responded** to TC Winston and to **analyze social capital** in their response activities. The case study will provide evidence demonstrating the role of communities in self- organized response actions.

METHODOLOGY:

Qualitative data was collected through, 171 household surveys and 5 focus group discussions in 3 villages sites. They and were all affected by TC Winston.

Fig. 1: Map of Fiji showing affected areas.

Fig. 2: Case study sites; Nabuna (left), Navala (middle) and Navuavua (right)

Results and Discussion

1. Community needs immediately after the cyclone

Table. 1: Timeline of community activities after TC Winston

Name of the villages and Need		Activities	YEAR 1 (months) F	M	A	M	J	J
All the villages	Cleaning	Village youth and men clean the village and women at home						
	Water and sanitation	Temporary fix water pipes and toilets from debries materials						
	Food	Salvage food from the gardens to share with families						
	Shelter	repair and construct temporrary houses from materials saved from the cyclone (eg, corrugated iron sheets, tember, beams and poles)						
Nabuna	Protection of the elderlies	Villagers transferred sick and injured by boat to hospital						
	Food	Village canteen/shop were distributing food to those that needed						
Navala	Shelter	Patching roofs of traditional houses from collected grass and reeds						
	Shelter	Collection of timber from the river (floated downstream)						
Navuavua	Cleaning	Villagers clean up individual homes						
	Food	Village canteen/shop were distributing food to those that needed						

Activities were priorities and outlines by the village headman as illustrated in Table 1. Cleaning, water & sanitation, food, and shelter were the priorities in all the villages and the individual village had other immediate activities. Due to the damages in communication lines and roads, relief supplies and assistance from government were slow to reach these villages. The communities had to organize and manage their response activities.

2. Bonding and bridging social capital (SC)

To meet the community needs, social capital was utilized in all the three villages. Bonding refers to networks with the village and bridging includes groups and networks outside of the village boundary (Fig. 3).

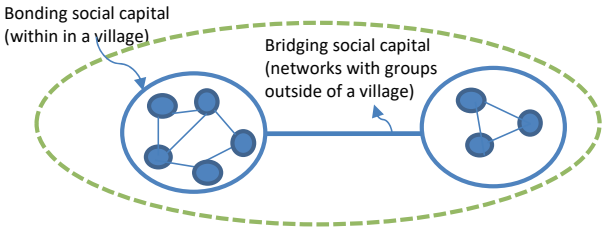

Fig. 3. Social capital illustration

Table. 2: Social capitals in the villages

Bonding SC	Bridging SC
Families	Family network
Community bonding	Chruch network
	Business networks

Bonding: The extended **family** in the villages provided the first point of assistance withing the village (mainly for evacuation and temporary shelter). **Community bonding** is shared through human resources. *Solesolevaki* (village cooperation) mirrors social capital in the Fijian context)

Bridging: **Family network** through marriage and urbanization address most of the immediate needs. **Church networks** that exist I the village from those attending the same church. Businesses provided a network with the villages; these groups were connected to the village through **businesses** that employed the villagers.

Conclusion

- There is a strong trust and mutual understanding placed on the leaders within the village and coupled with the traditional practice of *solesolevaki*, there are strong bonds with families and clans that is in existence in daily life and is utilized well during and after disasters.
- Networks in the bridging social capital provided the much-needed evacuation shelter spaces, transportation of the elderlies and providing materials for rebuilding houses and temporarily fixing water pipes and toilets.
- The networks formed through the bonding and the bridging social capital in the three villages shows an insight into the community capacities in Fiji.
- To bridge the gap highlighted in the National Disaster Risk Reduction policy, it is important for government to recognize these networks and to utilize and enhance them to build community resilience and to manage relief and response in future disasters.

ACKNOWLEDGEMENT
We are thankful to the people of Nabuna, Navala and Navuavua on their willingness to assist in this research. This work was supported by JSPS KAKENHI Grant Number JP 16H05630.

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Impact of PATBO Super Technology Dissemination on Participating Farmer's Knowledge and Income

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** Assessment Institute of Agricultural Technology for West Java Province, Indonesian Agency for Agricultural Research and Development, Ministry of Agriculture

BACKGROUND

- PATBO Super Technology is a package of technologies used for the cropping index enhancement in the rain-fed area in Indonesia.
- Consist of:
  1. New Amphibian Variety (NAV), 2. Water Management (WM), 3. Organic Matter utilization (OM), 4. Weed Controller (PW), 5. Machinery utilization (MU).
- The technology package on rice cultivation could enhance the cropping index from 100 to 300.
- Technology dissemination requires appropriate extension support to be adopted well with the farmer.

The study aims is to evaluate the impact of PATBO Super Technology dissemination on farmer's knowledge and income.

METHODOLOGY

Location

- Kebon cau Village, Ujungjaya Subdistrict, Sumedang Regency, West Java Province, Indonesia.
- 2 Farmers group.
- 30 Ha (14 Ha and 16 Ha).

Dissemination

- Demonstration Farming (Dem-Farm) as media of dissemination.
- Technical guidance as method of dissemination.

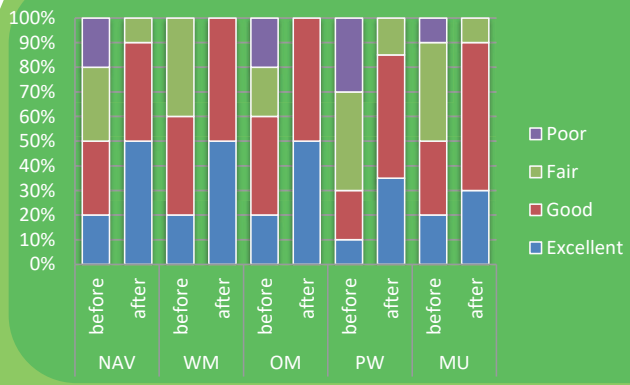
Data collection

Survey of technology components (before-after knowledge) to 60 farmers who actively participated in applying PATBO Super technology.

Interview about farming income with the Lead Person in each farmer group (the group head)

RESULT AND DISCUSSION

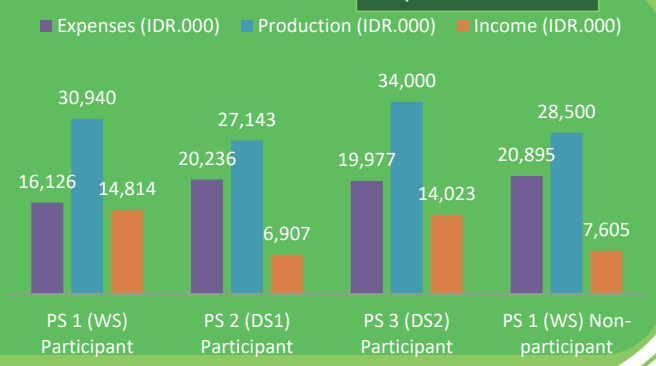
Impact to Knowledge



- After the dissemination process, the participating farmer's knowledge rate increased significantly to some aspects of the PATBO Super technology.
- Weed controller is a component that farmers gain knowledge significantly. From 30% poorly understand to become 0%.
- Water management and organic matter utilization are components which could easily be understood by all farmers .
- Overall, farmers have good or excellent knowledge of the PATBO Super technology at the end.
- The dissemination process is effective in increasing farmer's knowledge of better cultivation.
- Dem-farm and technical guidance could become a method to introduce new knowledge on cultivation.

Impact to Income

- The income of participating farmers escalated compared to the non-participating farmers.
- In Planting Season 1(PS 1), PATBO Super technology contributes to the increase of the participating farmers' income by around 95% compared to non-participating farmers.
- The enhancement of the Cropping Index could also contribute to the increase of participating farmers' annual income by almost twice the non-participating farmers' annual income.
- In the end, PATBO Super Technology could deliver positive influence to the participating farmers income.



Comparison Among Different ASEAN WQIs for the Assessment of the Spatial Variation of Surface Water Quality in Malaysia

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Introduction

The assessment of surface water quality is often laborious, expensive and tedious, as well as impractical, especially for developing and middle-income countries in the ASEAN region. The application of the water quality index (WQI), which depends on several independent key parameters, has great potential and is a useful tool in this region. WQI is a single indicative value/score or term which expresses the overall quality of water. Thus, the application of the WQI can help provide a simple, stable and reproducible water quality status to the public community and policy makers to make a less subjective decision related to policies.

At present, there are four ASEAN countries which have implemented the WQI system to evaluate their surface water quality, which are (i) Own WQI system: Malaysia, Thailand, Vietnam and (ii) Adopted WQI system: IndonesiaThis study aims to perform a comparative study amongst the ASEAN WQI systems in Selangor river basin (Fig.1), the largest source of public water supply, providing approximately 60% of the total water required in both Selangor and Kuala Lumpur.

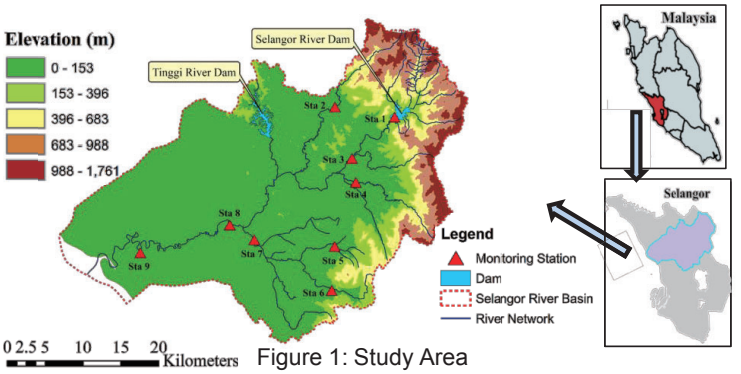

Figure 1: Study Area

Methodology

(i) Own WQI System:

Thailand : Focus on biochemical parameters

$$\text{PCD} - \text{WQI} = \frac{\sum(\text{SI}_{\text{DO}},\ \text{SI}_{\text{BOD}},\ \text{SI}_{\text{TCB}},\ \text{SI}_{\text{FCB}}\ \text{and}\ \text{SI}_{\text{NH}_3-\text{N}})}{5} - \text{Special score}$$

Malaysia : Focus on physicochemical parameters

$$\text{DOE} - \text{WQI} = (0.15 * \text{SI}_{\text{NH}_3-\text{N}}) + (0.19 * \text{SI}_{\text{BOD}}) + (0.16 * \text{SI}_{\text{COD}}) + (0.22 * \text{SI}_{\text{DO}}) + (0.12 * \text{SI}_{\text{pH}}) + (0.16 * \text{SI}_{\text{ss}})$$

Vietnam : Focus on biophysiochemical parameters

$$\text{MONRE} - \text{WQI} = \frac{\text{WQI}_{\text{pH}}}{100}\left[\frac{1}{5}\sum_{1}^{5}\text{WQI}_{\text{BOD, COD, DO, NH}_4^+-\text{N, PO}_4^{3-}-\text{P}} \times \frac{1}{2}\sum_{b=1}^{2}\text{WQI}_{\text{TSS and turbidity}} \times \text{WQI}_{\text{TBC}}\right]^{1/3}$$

(ii) Adopted WQI System:

Indonesia

STORET & Pollution Index methods – Any parameters (Biological, Physiochemical, heavy metal)

Results & Discussions

Table 1: Description of River Classification in this study

River Class	Description
Class I Good	Used as raw water supply and/or other designation which requires same water quality
Class II Fair	Used for water recreation facilities/infrastructure, tropical fish preservation, livestock, irrigation and/or other areas which require the same water quality.
Class III Poor	Used for tropical fish preservation, livestock, irrigation and/or other areas which require the same water quality.
Class IV Very Poor	Used for irrigation and/or other areas which require the same water quality.

A comparative study was performed using five different ASEAN WQI systems over nine monitoring stations in the Selangor river basin, Malaysia, to analyze the river quality status in 2016 as shown in Figure 2. Due to the different aspects of parameters and standards included in each system, the grading of the river quality is varied. The MONRE-WQI, STORET and PI methods which consider both biological and physicochemical aspects tend to be the most stringent systems for ranking the quality of surface waters in the Selangor river basin, whereas the DOE-WQI and PCD-WQI ranked the water quality of Selangor streams as "Fair" and "Poor" respectively in almost all cases. Integration between the WQIs and GIS enables more in-depth analysis and provides more valuable information to evaluate the water quality status in river basins for necessary actions to be taken.

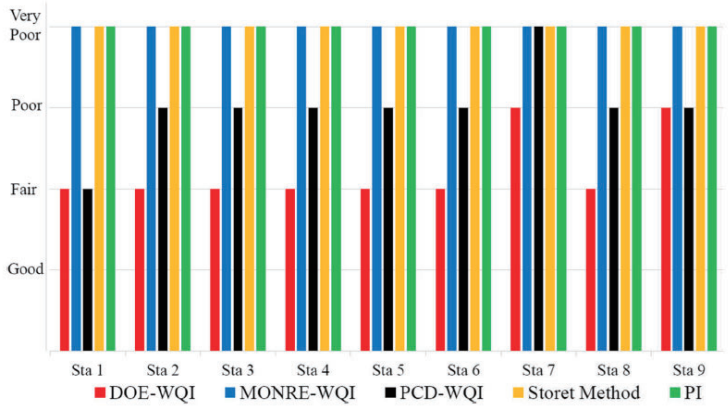

Figure 2: Comparison of river quality classifications using different ASEAN WQI systems

Conclusion

The application of the WQI with several independent key parameters which can reflect the overall water quality status is a useful tool in this region for reducing the cost and labour required for water quality monitoring. As a future direction, the subject of assessment/specific purpose and the level of treatment required should be defined to ease policy makers in designing, formulating and implementing pollution abatement strategies.

Beyond coal?: Regime resistance, path dependency and the politico-economic barriers to transition

Author: Julie Ann de los Reyes
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Research aim and objectives

To critically examine the Philippines' continued reliance on coal for electricity generation and the conditions that impede its phase out or decline in the power generation mix
To identify sources of political and economic 'lock-ins' (L) that reinforce coal use
To recommend solutions to facilitate the shift away from coal

Background

Coal dominates the power mix
In 2019, coal accounts for 54.6% of total generation (GWh).

Net importer of coal
Bulk of supply is imported, contributing to volatility and high electricity rates—one of the highest in Asia.

Renewables lag behind
despite high potential for solar, wind, aside from geothermal which the country already produces in abundance.

Results and discussion

L1

- ✓ CURRENCY RISKS
- ✓ FUEL RISKS
- ✓ PRICE VOLATILITY

Economic incentives favor coal energy

The government's automatic pass-through provision allow power producers to pass on coal-related business risks to consumers, while renewable producers absorb the full costs of their operations.

Pass-through model, built into power purchase agreements, effectively guarantees returns which disincentivizes producers from transitioning away from coal.

L2

Approximately
50%

Of the installed capacity of committed and indicative projects are attributed to 5 companies:

SMC Global Power
MERALCO
Aboitiz Power
DMCI Holdings
Lopez Holdings Corp[2]

High market concentration

A handful of large energy companies dominate the country's energy landscape and their investment decisions heavily influence the energy mix.

Coal constitutes a firm part of their portfolio, setting the country onto a high carbon pathway.

This also limits the options available to end-users that may prefer renewable energy as these companies supply the main power grids.

L3

Coal-fired power plants have the effect of locking in future emissions

for the length of time it takes to recover the investment attached to building them--typically 40 years. Despite recent moratorium on new coal projects, the exclusion of committed and indicative projects, representing 13.8GW, will ensure coal remains a key energy source.[1]

Tax payers and rate payers are poised to bear the cost should coal power plants face early retirement, i.e. due to shifts in energy policy.

In photo: Coal-fired power plant in Mariveles, Bataan[3]

Methodology

Semi-structured interviews, secondary and archival research; gathering of numerical, statistical data and analysis

Energy transition will require not only a technological shift but a power shift

WITHIN ENERGY MARKETS
Eliminate the economic incentives for coal to at the minimum even the playing field between fossil fuel and renewable sources.

AMONG MARKET PLAYERS
Incentivising renewable energy can bring in new players, diversify energy sources, and dilute the market share of established, predominantly coal-based producers.

FROM PRODUCERS TO RATE/TAXPAYERS
Empowerment of tax payers and rate payers, allowing them to opt out of paying for coal-related risks (i.e. by including a carve-out clause in power supply agreements) and exercise preference for renewable sources.

Sources: [1] Statistics, Philippine Department of Energy (2020) [2] Greenpeace (2019). Dirty Business. Greenpeace Southeast Asia: Manila [3] Photo by P199, Creative Commons

This poster is undisclosed

Sustainable Practices in a Coastal Community-Based Tourism: The Case of Donsol, Sorsogon

Frechie Belle Otivar Lo
College of Forestry and Natural Resources, University of the Philippines Los Baños

BACKGROUND

Sustainable tourism is important for the Philippines for two reasons. First, the country is a biodiversity hotspot but with high number of threatened species (Biodiversity Management Bureau, 2015). Furthermore, the Philippines ranks third in the world that is most vulnerable to climate change. This intensifies the need to develop and operate tourism sustainably. Among the places with the most interesting biodiversity in the Philippines is Donsol. It hosts the second largest known population of whale sharks in the world (whaleshark.org, 2019). However in 2013, the community observed the decline of whale shark sightings that resulted in the decline of local and foreign tourists which negatively affected the tourism revenue of the municipality (PhilStarGlobal, 2013). Possible reasons are rising of sea temperature due to climate change; stress from many interaction activities; and lack of food due to plankton harvesting by fishermen and the presence of E. Coli contamination in the Donsol River (Arguelles, 2013, p.1). Tourism is vulnerable to climate change and when tourism becomes unsustainable in nature, it can have disastrous consequences on the environment (Zeppel et al., 2014; Lan, 2019). This study was conducted to assess protocols of the community to examine its conformity to the sustainable practices to alleviate the negative impacts caused by unsustainable practices to the environment using the sustainability concepts of Global Sustainable Tourism Criteria for destinations (Global Sustainable Tourism Council, 2018) and Green Globe's standard criteria and indicators (Green Globe, 2019).


Elysia Resort by Eric Kim


WWF-Phils

METHODOLOGY

This study utilized a qualitative research specifically, the descriptive case study design. The goal is to develop a deeper understanding on the four areas of sustainable tourism among the five cluster of stakeholders in order to examine the community's conformity to the sustainable practices based from GSTC and Green Globe indicators. The five cluster of stakeholders includes the tourists, residents, tourism industry, government and academe. There are a total of 62 respondents across all clusters. The data was gathered using semi-structured interview guide which was validated via two stages. The first stage was the consultation from tourism experts. The next stage is through contextual analysis validation from a language expert from both English and Filipino. The data interview with tourists were gathered from two of the largest accommodation establishments in the municipality. The researcher gathered the data from the residents and government from each barangay. The data from the academe were set on a different day through focus group discussion. The data were analyzed using a combined narrative and framework analysis.

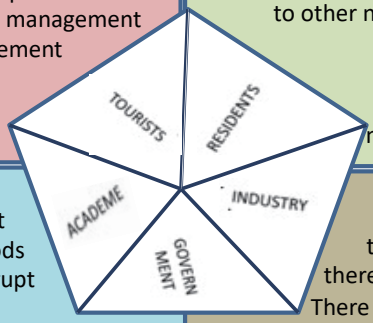
RESULTS AND DISCUSSION

Sustainable Tourism Management

Donsol have few but significant sustainable tourism practices. Its best practice is centered around sustainable tourism management specifically in its whale shark activity. Adaptive management must be employed to minimize the impacts of tourism activities on whale shark and a well-planned tourism development and marketing.

Waste Management

Current efforts were only enough for tourism barangays compared to other non-tourism barangays. It is recommended to standardize waste management efforts for all barangays. Alternative management approaches may be effective to educate community and tourism stakeholders. Sewerage system must also be reviewed and established in the community.



Resource Consumption

Donsol have low consumption of resources but present resources on energy, water, and other consumable goods cannot accommodate sudden influx of tourists and abrupt big-scale tourism development. It is recommended to develop micro and small enterprises to maximize economic benefits while avoiding overconsumption of limited resources.

Interaction

There is a great opportunity for local-tourist interaction that will boost positive socio-cultural exchange however, there is a problem in terms of collaborative decision-making. There is a need to enhance the participation by involving each barangay in tourism development master plan as active involvement from various groups opens for collaborative dynamics.

Arguelles, M. (2013). Climate change, stress keeping butanding away, say local officials. *Inquirer.Net.* pp. 1.
Global Sustainable Tourism Council. (2018). GSTC destination criteria. Retrieved from https://www.gstcouncil.org/gstc-criteria/gstc-destination-criteria Green Globe. (2019). Standard and criteria indicators. Green Globe Standard Criteria and Indicators (2020). Green Globe. Retrieved from URL https://greenglobe.com/standard/

Supply Chain Analysis of Manila Copal in Palawan, Philippines

Authors: Kharmina Paola A. Evangelista*, Rogelio T. Andrada II*, Margaret M. Calderon*, Analyn L. Codilan*, Vanessa Palma-Torres*, Canesio D. Predo*, Lawrence Adolph M. Amada*, and Ramon A. Razal**

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Background of the Study. The potential of Manila Copal or Almaciga resin as a source of livelihood for several indigenous communities in the Philippines continues to emerge as the demand for processed resin escalates. Aside from an export value of US$114,000 recorded in 2019 (FMB 2019), the Manila Copal is also highly valuable to local industrial manufacturers of paints, varnishes, lacquer, and ink. Despite this, many resin tappers in the country remain poor. This study aimed to:

(1) assess the supply chain of Manila Copal in Palawan, Philippines;
(2) determine problems encountered from the harvesting of raw materials until the product reaches the industrial user, and;
(3) identify areas for improvement along the chain

Methodology. The study was conducted in two sites in Palawan – South Palawan (SP) and North Palawan (NP) (Figure 1). Supply chain actors were traced from the resin tappers up to the industrial users and exporters of resin. There were a total of 37 resin tappers, 1 assembler, and 2 traders interviewed through surveys and KIIs. Profit margins earned and costs incurred at each level of the chain (where data is available) were computed.

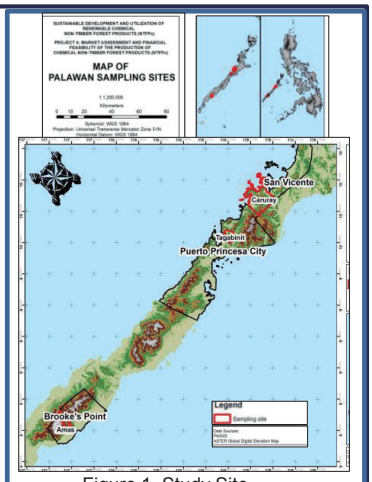

Figure 1. Study Site

Results

The Supply Chain

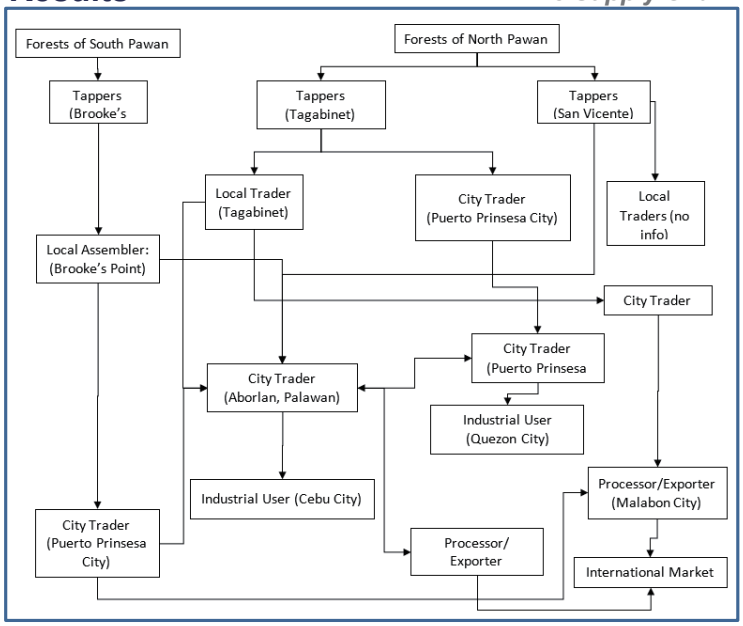

Figure 2. Supply chain of Manila Copal in North and South Palawan, Philippines

Key Actors

Resin Tappers Gatherers who travel by foot or bamboo raft in the case of NP, to tap and harvest the resin from the forests. Most of them borrow money from their buyers to shoulder their costs

Local Assemblers Buy resin directly from tappers and store the resin in their storage area until a buyer picks up the resin

Local Traders Collect resins from remote areas (either directly from tappers or through an assembler) and sell in bulk quantities to city traders

City Traders Cover both NP and SP and sell either to another city trader, to an industrial user or to a processor who exports Manila copal.

Industrial users (paints, varnishes, lacquer, ink) **and processors** who export Manila copal


Figure 3. Resin tappers in SP in their storage area


Figure 4. *Tipak*, the highest class of resin in SP

Discussion. Figure 2 shows the route of Manila copal from the forests of Palawan to the industrial users and exporters. The supply chain in SP is shorter than the supply chain of copal in NP mainly because of the presence of an assembler in SP. The unstable pricing of copal from different traders made the resin tappers of SP choose to sell their harvests to a local assembler, which in turn sells only to two traders. Manila copal goes through several middlemen as large traders source the copal from numerous small traders. This can be attributed to the remoteness, bulkiness, and dispersed nature of resin sources. Costs incurred by resin tappers in NP is much higher than those in SP mainly because of the huge difference in volume traded. Profit margins in SP and NP range from 39-67% and 15-62%, respectively, depending on the quality. The high profit margin indicates high value for Manila copal at the user's level. Harvesting resin is not easy as tappers walk an average of ten hours to get to the resin source and another ten back. To ensure the sustainable supply of resin, it is thus recommended to provide more incentives to the resin tappers who bear the hard labor of providing the raw materials to the entire chain.

Reference: Forest Management Bureau (FMB). 2019. Philippine Forestry Statistics 2019. Department of Environment and Natural Resources. Accessed from https://drive.google.com/file/d/1Cuy-Sup929NPoxqBdVcDml-3iYfG2Nhn/view

Study on the resettlement impacts on the habitat and perception of residents in the world heritage site of Hue citadel

Authors: Le Ngoc Van Anh*, Nguyen Ngoc Tung*, Hirohide Kobayashi**

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** Graduate School of Global Environmental Studies, Kyoto University

BACKGROUND

Hue citadel is located on the north bank of Huong river (Hue, Thua Thien Hue) with around 520 ha of area. The Citadel wall has circumference of 10.5 km, 6.6m height, 21m thickness including two area named Thuong Thanh(TT) and Eo Bau(EB) (fig.1) Under Nguyen Dynasty in the beginning of 20th century, EB area were allowed for residences. After 1945, the number of people living inside the Citadel grew rapidly, especially after 1968, many households migrated from the countryside and the north to TT. Residences might be harming to relics. Some part are damaged and sunk by multi-functions of residents (living space,open space, agriculture, local market, ect). The urgent need to protect the monument, therefore, the government has projects related to the zoning of protected areas including the relocation of population and ground clearance.

Fig.1. Thuong Thanh & Eo Bau area

(a) (b) (c)

Fig.2.(a)residences in TT, EB (b)ground clearance processing (c)resettlement in Bac Huong So

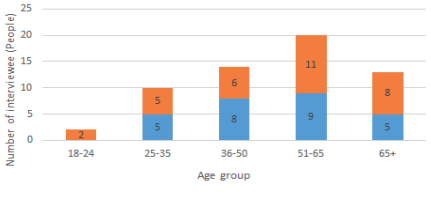
OBJECTIVE

- To provide information about how the people's living environment has changed
- To provide information of positive (or negative) change of residents about their perceptions of world cultural heritage.
- To find out what factors affect the residents' perceptions.
- To be references for government, policy makers, people involved in the implementation of resettlement projects when applying policies or resettlement projects directly related to heritage.

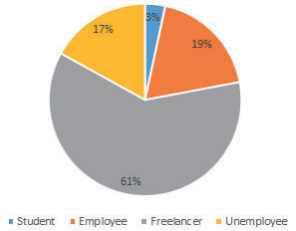
METHODOLOGY

- Collecting secondary documents(background, history, situation about resettlements)
- Semi-Structured Interview to collect database
- Conduct analysis based on tables, charts.

RESULTS AND DISCUSSION



(a)



(b)

Fig.3.(a)The relationship between age and gender (b)education level

	Strongly agree	Agree	Neither	Disagree	Strongly disagree
Increased commercial investment opportunities	2%	12%	61%	24%	2%
Improved employment opportunities	3%	19%	42%	31%	5%
Improved living standard	10%	25%	44%	15%	5%

Table 1.The impacts of economic

	Strongly agree	Agree	Neither	Disagree	Strongly disagree
Improved school conditions for children (conveniently go to school and choose a school)	2%	5%	54%	36%	3%
Expanded social circles	5%	22%	58%	3%	0%
Worse neighborhood than before	2%	42%	46%	10%	0%
Traditional values faded	8%	39%	36%	17%	0%

Table 2.The impacts of sociocultural

Questionaire surveying was conducted June to October 2020, inclusing 2 component: Recidents are living in TT and residents were built new house in resettlement areas. In total 59 surveys (32 females and 27 males) most of interviewees were in range of 51-65 year-old. Elder interviewees have lived for a long time (max: 75 yrs and min: 3 yrs),they are well-informed about the origin. Interviewees in range of 36-50 year-old were the second major in the sample including 61% of freelancers, 17% of unemployed. Besides, the income were low toward <1mil (29%),1-3mil(24%),3-5mil(20%),>7mil (10%).

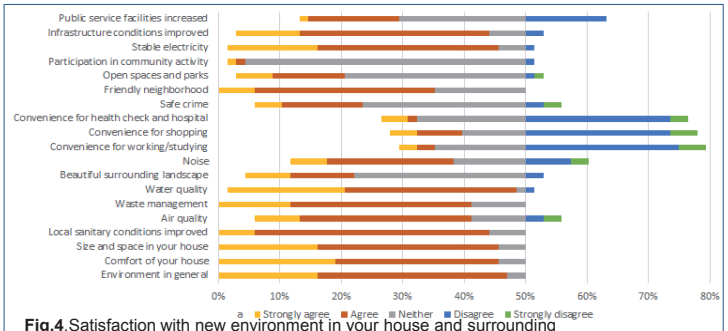


Fig.4.Satisfaction with new environment in your house and surrounding

	Strongly agree	Agree	Neither	Disagree	Strongly disagree
Natural eco-environment recovered	27%	42%	29%	2%	0%
Tourism landscape resources effectively protected	27%	41%	31%	2%	0%
It is a place without soul and vitality, a place just to see/ visit	2%	22%	47%	24%	5%

Table 3. Perception of environment impacts

	Strongly agree	Agree	Neither	Disagree	Strongly disagree
Resettlement policies neglect residents' interests	12%	25%	27%	31%	5%
Resettlement policies only benefit for people who have enough papers	19%	53%	24%	5%	0%
Supportive measures are imperfect (survey before resettlement, paper works)	10%	20%	41%	27%	2%
Lack of supervision on policy implementation	10%	14%	51%	22%	3%

Table 4. Perception of resettlement policy

Answers about the satisfied level on new environment were very positive compared with previous (fig.4).Most of residents have lived for a short time (1-3m), so, they are limited in knowing the economic opportunity (tab.1). Resettlement affect significantly on traditional value and neighborhood (tab.2)The significant number (68%) of people agree with the positive effect of resettlement on the environment (tab.3) About perception of resettlement policy, interviewees were not satisfied about the resettlement policy. In particularly, land costs and repayment term are the crux of the matter.

CONCLUSION

Most of the residents are satisfied with the new habitat. Residents have positive perceptions about the effect of resources and environment. However, the impact on economic and sociocultural issues after resettlement are negative, especially, settlement policies. The project's authorities should be consistent about policy, finance, monitoring the process of resettlement. The government should enhance the resident perception, especially those who are low level of education and low or no income, on the positive impacts of resettlement. Besides, residents should be supported on the administrative registration and connect with new area by sociocultural activities.

ARCHITECTURE FACULTY

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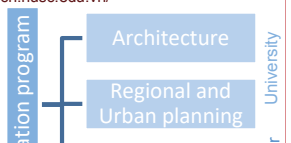
Organizational structure

Dean of Faculty: Dr.Arch.Nguyen Ngoc Tung
Deputy Dean: Dr.Arch.Nguyen Vu Minh
The affiliated department:

- Department of Interior Architecture and Construction Technology
  Head:Dr.Arch.Nguyen Vu Minh
- Department of Civil and Industrial Architecture
  Head:Dr.Arch.Truong Hoang Phuong
- Department of Planning, Conservation and Landscape
  Head:Dr.Arch.Nguyen Ngoc Tung

Lecturers: 24 (7 doctors, 2 PhD students, 11 masters, 2 engineers & 01 bachelor).



international cooperation

France	Lille Uni. of Architecture, Grenople Uni.
Italy	Polytechnic Uni. of Marche
Japan	Kyoto Uni., Osaka Uni, Showa – Tokyo Uni, Waseda Uni,
Laos	National Uni. of Laos
Thailand	Khon Kaen Uni., Chiang Mai Uni., King Mongkut institute
Australia	University of South Australia

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Land rental in a multi-ethnic society: Insights from Southwest China

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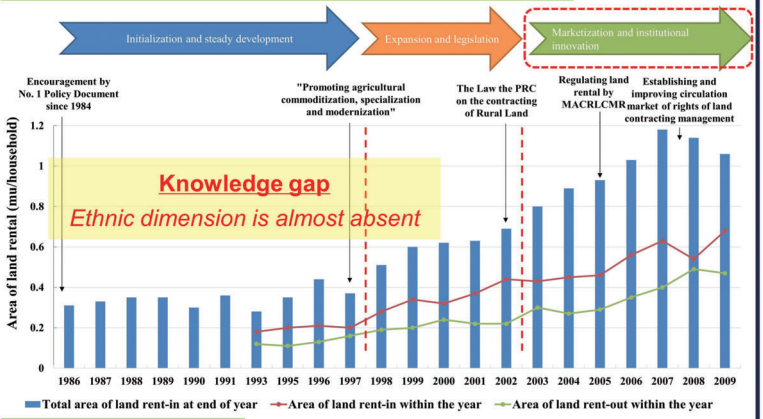
** School of Geography and Environment, Jiangxi Normal University, China
*** Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, China
**** Dehong Institute of Tropical Agricultural Sciences in Yunnan Province, China

Background

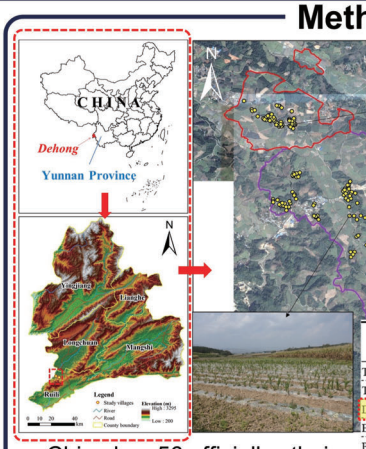
Land rental policies in China: Stages and trends



Research question

- Is the land rental trend in a multi-ethnic society the same or different from the process in a single-ethnic society? What outcomes? Why?

Methodology



Fieldwork

	Upland	
	H Village (2015)	J Village (2015)
Total number of households (HHs)	82	97
Total number of individuals	346	341
Dominant ethnic group	Han	Jingpo
Elevation (Unit: m)	950.8	970.3
Per capita income (Unit: Yuan RMB*)	11,250	7,566

Fieldwork (below)			
Household survey	No. of sample HHs	55	72
	No. of sample Individuals	264	277
Land plot survey	No. of paddy fields	10	10
	No. of dry land	10	10
Key informant interview	No.	5	1

- China has 56 officially ethnic groups
- Yunnan is inhabited by 25 ethnic groups
- **Han** and **Jingpo** are dominant ethnic groups in Ruili

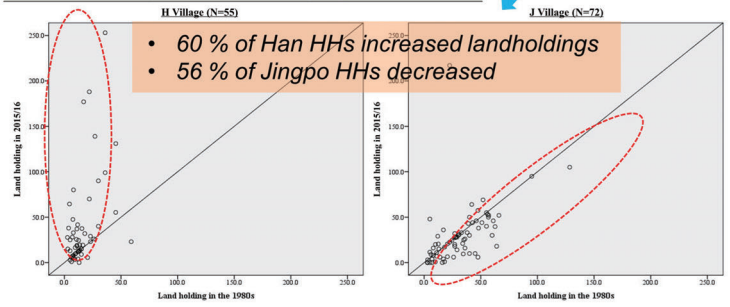
Results

1) Changes in landholding: process and current situation

Household Responsibility System →	Land holding in 1982	Land holding in 2016/17
H Village (HHs=55)	15.64	39.47
J Village (HHs=72)	31.99	26.40

Land rental market

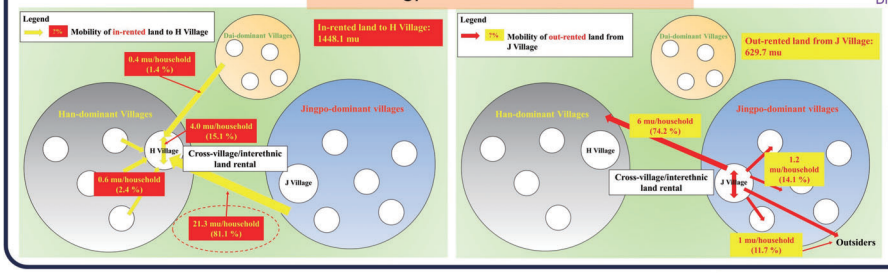
Farm size transition



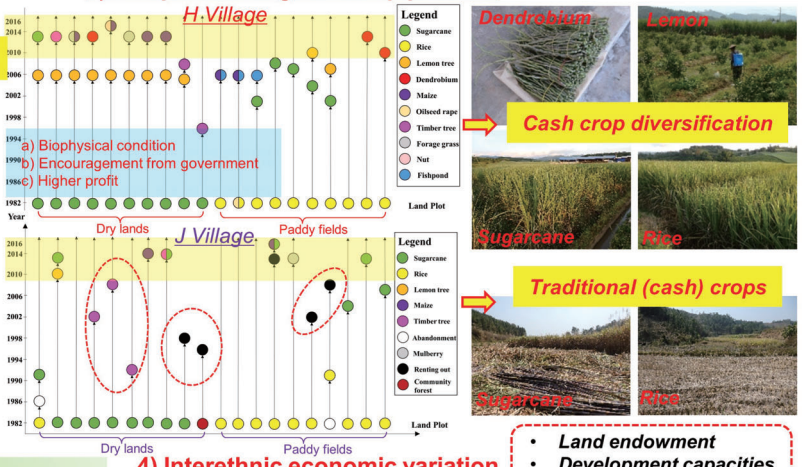
- *60 % of Han HHs increased landholdings*
- *56 % of Jingpo HHs decreased*

2) Interethnic land rental

Han-Jingpo interethnic interactions

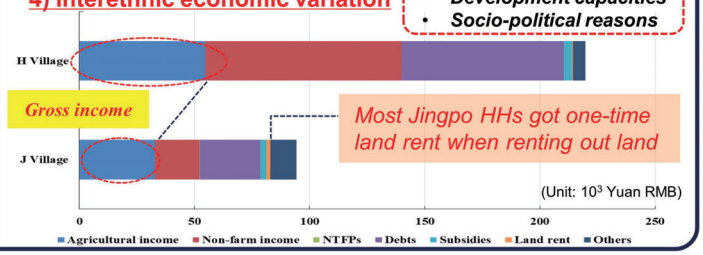


3) Temporal changes in crop patterns



4) Interethnic economic variation

- *Land endowment*
- *Development capacities*
- *Socio-political reasons*



Conclusion

a) Households in H Village have increased their income by diversifying their livelihood strategies and land use practices, while households in J Village are experiencing an increasing income gap due largely to declines in farmland.

b) In the upland multi-ethnic society, multi-ethnic mosaic resulted in the mobility and release of land resources and created opportunities for households in H Village achieving agricultural commercialization and intensification.

c) Interethnic land rental is mainly triggered by differences in resource assets due to ethnic living patterns, and different development awareness and modernization capabilities. We need to concern the uneven agricultural development and rethink land rental policies in China.