

KYOTO UNIVERSITY INTERNATIONAL SYMPOSIUM
ON EDUCATION AND RESEARCH IN GLOBAL ENVIRONMENTAL STUDIES IN ASIA

POSTERS

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System Modeling on National Rice Stock Management for Policy Making Support in Bangladesh

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Background:

- The proper management of national staple food stock like cereal grains storage is very important and fundamental requirement for any national governments to feed the people effectively and efficiently.
- The mismanagement, improper and conventional prediction of cereal production and consumption system often greatly affect the national economy, not limited to inflation that also causes human made disaster.
- The system simulation modeling is a very useful tool to solve the real world problems especially for policy making and decision support systems. The present study on simulation modeling is to design national rice stock dynamic model for supporting policy making in Bangladesh.

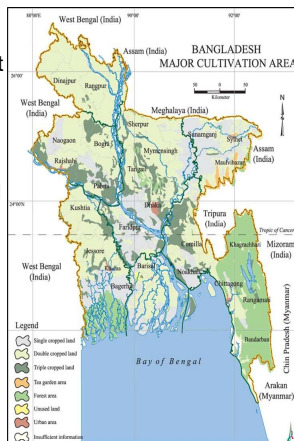


Figure 1. Major cultivable zones in Bangladesh?

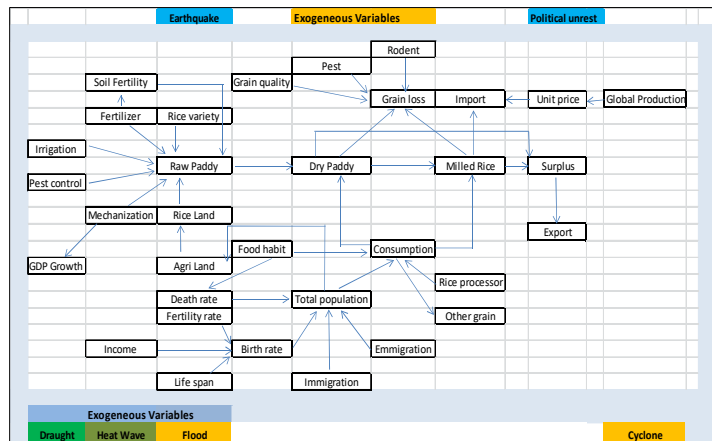


Figure 2. Conceptual diagram on national rice stock system

Methodology:

- Problem identification and objectives setting, system definition and model construction based on secondary data for national rice stock management in Bangladesh have been designed in this simulation study with medium resolution mechanistic model.

Table 1 Secondary data used in rice stock system modeling in Bangladesh^{1,3}

1.	Total Crop Land	6.5% of total land (13.88 million ha)
2.	% Reduction of net crop land	1.61% (Avg. of 18 years)
3.	Total rice land	81% crop land (10.81 million ha)
5.	% Land conversion to rice land	2.83% (Avg. value of 18 years, BBS)
6.	Total rice production in 2013	34.5 Million ton (DAE)
7.	Rice yield per hectare per year	3.19 MT
8.	Increase rate of rice production	3.5%
9.	Grain loss	05%
10.	Drying loss of paddy	10%
11.	Milling loss of paddy	32%
12.	Total population of Bangladesh	160 Million
13.	Population growth rate in 2013	1.34
14.	Average life span in 2013	69 years
15.	Per capita rice consumption	166 kg/year
16.	Immigration rate	0.26% (IOM)
17.	Rice processor increasing rate	02% (Calculated)
18.	Expected Buffer stock	1.0 Million MT (Assumed)
19.	Deforestation rate	4.4% (Assumed)

[1 hectare=2.47105381 acre]

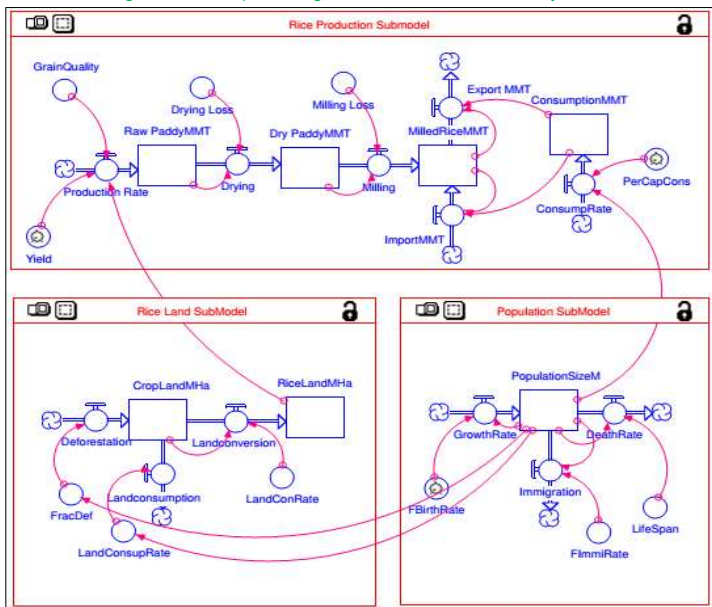


Figure 3. Flow diagram of national rice stock dynamic model in Bangladesh context

Results and Discussion:

- This model might help for national goal setting in agricultural land uses,
- crop management,
- population management,
- desirable changes in food habit,
- finally, foreign trade policy.
- This system thinking can also be helpful to solve similar problems and to develop some similar models of other countries.

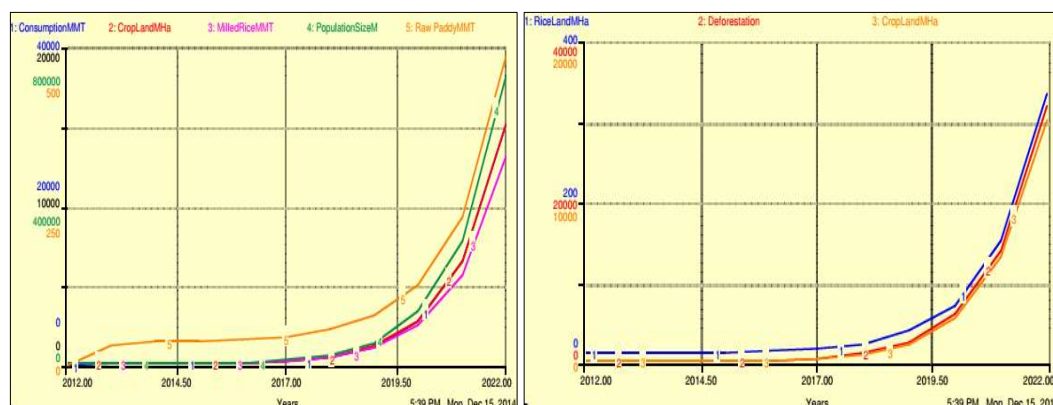
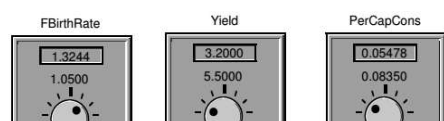


Figure 4. Rice stock dynamic model with three control parameters (Birth rate, Yield and Per capita consumption of the model)

References:

- [1] BBS.2013. Statistical year book. Bangladesh bureau of statistics. Access from <http://www.bbs.gov.bd/Home.aspx..>
- [2] Banglapedia. 2013. Crop. National Encyclopedia of Bangladesh. Accessed from http://www.banglapedia.org/HT/C_0444.htm#
- [3] Wikipedia.2013. Agriculture in Bangladesh-Wikipedia, the free encyclopedia. Accessed from https://en.wikipedia.org/wiki/Agriculture_in_bangladesh

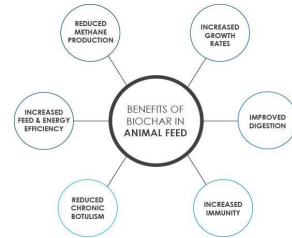
EFFECTS OF DIFFERENT LEVELS OF BIOCHAR WITH BREWERS' GRAIN AND ENSILED CASSAVA ROOT FOR FATTENING NATIVE CATTLE IN LAO PDR

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** Graduate School of Global Environmental Studies, Kyoto University

ABSTRACT

Nine local "Yellow" cattle (116 – 122 kg LW). The experimental design was arranged in randomize completely block design (RCBD) with three blocks. The factors were control (without), 1 and 2 % of biochar in total diet DM. 84 days of experiment with an extra 14 days for adaptation to the pens and diets. 30 % ensiled cassava root and 30 % rice straw were used as a basal diet, supplemented with 3% urea and 30 % brewers' grain (protein sources) in total diet DM. The addition of biochar had not effects to total feed intake and feed conversion rate, adding 1, 2% and no-biochar were not shown difference of growth rate of cattle were 0.55, 0.48 and 0.52 kg/day, respectively. However, when observed the growth rate period of 24 – 84 days was found trend to improve the live weight gain of cattle (0.706 kg/day) when supplied 1% biochar ($P = 0.072$).



INTRODUCTION

Biochar is a charcoal-rich product obtained when biomass (wood, manure, leaves, and organic waste can be used as starting material) is pyrolysed by high-temperature (>500°C). Biochar is intended to be applied to soil in order to achieve an agronomic and/or environmental benefit. (Woolf et al., 2010; Rodríguez et al., 2009; Lanh et al., 2016; Orosco et al., 2018).

Biochar Uses as ingredients in cattle feed. The impact of biochar on rumen fermentation can be related to the potential gas sorption capacity of biochar, as biochar usually combines a porous structure and large surface area. Biochar mixed with either grass or silage may provide an ideal system to enable biochar to be incorporated into agronomic systems (Calvelo et al., 2014).

OBJECTIVES: To evaluate the capacities of biochar as additive feed for fattening native cattle in Lao PDR.

MATERIALS AND METHODS

Location and duration

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



Animals and housing

Nine local "yellow" male cattle (116 – 122 kg LW) confined in individual pens, made from wood and bamboo with the size of each pen 1.5*2 m. Vaccinated epidemic diseases and drenching against internal parasites.



Treatments and experimental design

Three treatments

Ingredients (DM diet)	CT	BIO1	BIO2
Rice straw	37	36	35
Ensiléd cassava root	30	30	30
Brewers' grain	30	30	30
3% Urea	3	3	3
1% biochar	-	1	2
Total	100	100	100

BIO1: biochar 1%, BIO2: biochar 2%, Control: no biochar



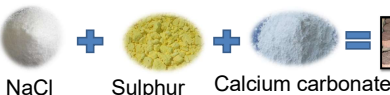
The experiment arranged in randomize completely block design (RCBD) with three replications of each treatment

Feeding and management

Rice husks were carbonized in an "updraft" stove to produce biochar



0.2-0.3 cm, ensiléd (5 days) by using plastic, ensiléd condition (pH of <4)



Chemical analysis

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

Data collection and measurements

- The cattle 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.

MATERIALS AND METHODS

Statistical analysis

Data were analyzed by the general linear model option of the ANOVA program in the Minitab (2010), model was:

$$Y_{ij} = \mu + T_i + B_j + e_{ij}$$

For $i = 1, 2, 3; j = 1, 2, 3$

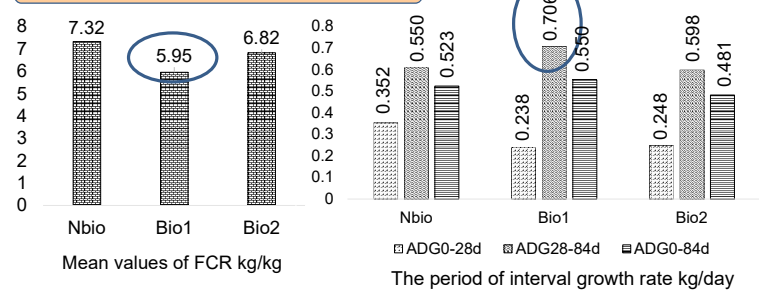
Where: Y_{ij} = dependent variables; μ = overall mean; T_i = effect of biochar; B_j = Random Block Effect; e_{ij} = random error.

RESULTS AND DISCUSSIONS

Chemical composition of feeds

Items	DM, %	CP	Ash	NDF	ADF
		As % in DM			
Rice straw	94.75	3.5	13.1	65.5	41.1
Ensiléd cassava root	35.6	2.07	0.81	34.8	27.5
Brewers' grains	25.9	28.4	5.91	31.8	21.6
Urea	100	280	-	-	-
Biochar	100	-	-	-	-

Growth and feed conversion



Discussions

Positive response from feeding biochar are in line with previous reports: cattle (Leng et al 2012; Sengsouly and Preston 2016), goats (Sivilong et al 2018; Thuy Hang et al 2018), pigs (Sivilai et al 2018), hens (Prasai et al 2017) and fish (Lan et al 2016).

Conclusions

The growth rate period of 24 – 84 days was found trend to improve the live weight gain of cattle (0.706 kg/day) when supplied 1% biochar.



Acknowledgements

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

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

Professional Education on Land Management in Cambodia: Current Status and Future Plan

Authors: CHIN Dyna, POK Sophak, YIN Chan Eng, SENG Soksan, ANN Kimheng, EUN Sambath, HOR Sanara
Faculty of Land Management and Land Administration, Royal University of University

Introduction

The Faculty of Land Management and Land Administration has been established in 2002. Between 2002-2016, the faculty is technically supported by German International Cooperation and Technical University of Munich. In 2006, the education program in this faculty was internationally published (Setha and Mund, 2006). Since the establishment, the study program have never been evaluate for higher performances. Due to the student numbers increase, the faculty aims at monitoring and evaluating the existing curriculum in which the tracer studies are necessary. Tracer study is an assessment tool for defining effective or ineffective program components which are impact on the target groups (ILO, 2005). The study is important to faculty by its structural information (professional career and education program) which is benefit for curriculum improvement and Professional career is focusing on land management, land administration, survey and geographic information system. The study has three objective are

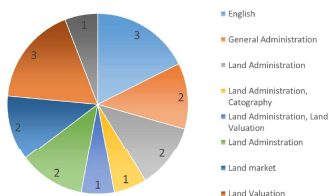
1. Understanding current situation of the graduated students related career
2. Characterizing a relationship between the job experience and curriculum
3. Evaluating and monitoring the existing curriculum for improvement

Methodology

Mainly, the study uses quantitative research method to achieve its objectives. There are 161 samples were selected from FLMLA students who graduated from FLMLA between 2003 and 2019 by using stratified random sampling. Interviewees are former students (1st – 14th Batch) Questionnaires was designed by using ODK platform (Open Data Kit) and the in-situ information are stored in Google Cloud Drive;

Objective (1): Understanding current situation of the graduated students related their career,

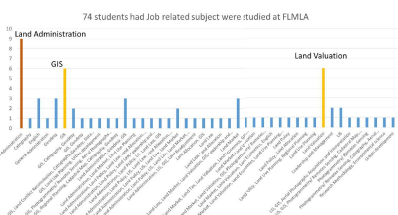
Student Status Before Enrolled FLMLA



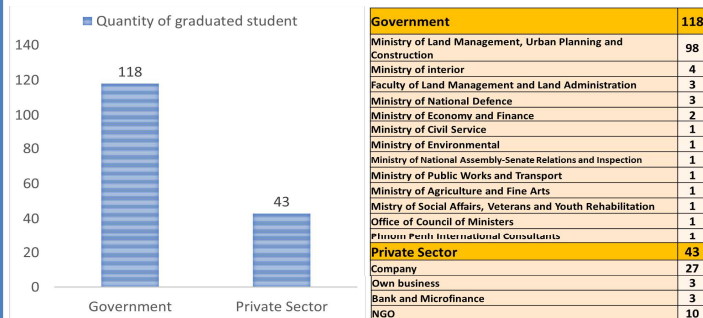
Before enrolled to FLMLA, there are 29 students of 161 students have job. There are only 17 students of 29 students working related to the Cambodian land sector. This presents that 132 students are the high school students. They have different perspectives about FLMLA.

Student Status During Study at FLMLA

During study at FLMLA, there are 87 students of 161 students have job. There are 74 students of 87 students working related to the Cambodian land sector such as Land Administration, Geodesy and Land Use planning.



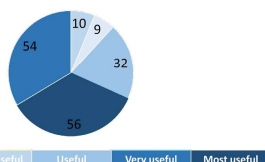
Current Status of Graduated Student at FLMLA



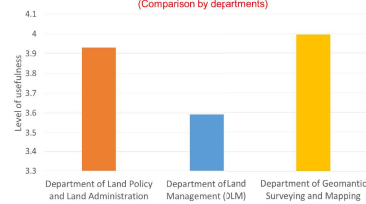
Government	118
Ministry of Land Management, Urban Planning and Construction	98
Ministry of Interior	4
Faculty of Land Management and Land Administration	3
Ministry of National Defence	3
Ministry of Economy and Finance	2
Ministry of Civil Service	1
Ministry of Environmental	1
Ministry of National Assembly-Senate Relations and Inspection	1
Ministry of Public Works and Transport	1
Ministry of Agriculture and Fine Arts	1
Ministry of Social Affairs, Veterans and Youth Rehabilitation	1
Office of Council of Ministers	1
Phnom Penh International Consultants	1
Private Sector	43
Company	27
Own Business	3
Bank and Microfinance	3
NGO	10

Objective (2): Characterizing a relationship between their job and curriculum. In this object, we are planning to explore how the student using their expertise which they got from FLMLA in their career.

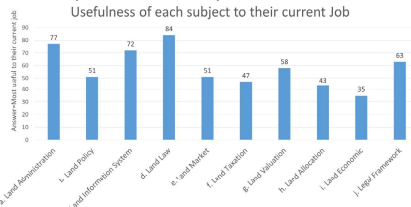
Level of usefulness of the subject done at LMLA for current Job



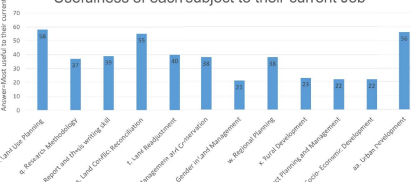
The Usefulness of the Subjects studied at FLMA to their current job (Comparison by departments)



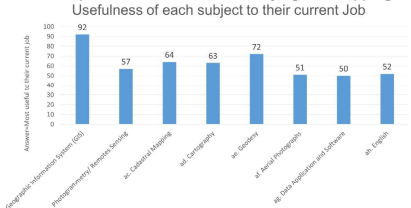
1. Department of Land Policy and Land Administration



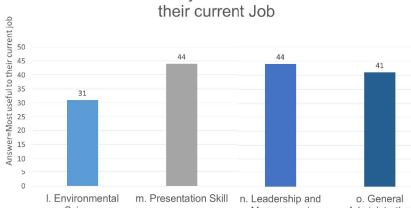
2. Department of Land Management



3. Department of Geomatic Surveying and Mapping



Usefulness of subjects in Elective course to their current Job



Objective (3): Evaluating and monitoring the existing curriculum for improvement is necessary to understand the efficiency of the current curriculum. So, we will deeply evaluate and monitor every subject which is existing in our curriculum.

Table 1: Percentages comments from graduates on important subject that should included

N°	Description	Percentage
1	No Comment	33%
2	Enough	24%
3	Land Conservation	19%
4	AutoCAD	8%
5	Environment Science	16%
6	Rural Development	16%
7	Others	7%
Total		100%

Table 2: Percentages comments from graduates on less significant subject that should deducted

N0	Description	Percentage
1	No Comment	20%
2	Enough	17%
3	Gender in Land Management	12%
4	Soil Management and Conservation	16%
5	Environment Science	15%
6	Rural Development	13%
7	Others	7%
Total		100%

Conclusion

Since the beginning of FLMLA journey, the student of FLMLA had a many opportunity to work in a wide range of public and private field . In this study 118 respondents work for Government while 43 respondents work for private sector Student decided to study at FLMLA because of three main factors: Family/Relative 55 respondent , Preference 45 respondent and Social needs 17 respondent. 60 % of respondent answered that the courses done at LMLA very useful for their current career while 40% said that the courses are useful or little bit useful Three subjects for each department that are most useful: Department 1 : Land Administration, Land Information System, Land Law Department 2 : Land Use planning, Land Conflict Reconciliation, Urban Development Department 3 : Geographic Information System, Cadastral Mapping, Geodesy Identifying the subjects that are very significant and insignificant for the market need and the academic inputs which are needed to equip the students with the right skill and competencies is important.



This poster is undisclosed



Carbon Stock Estimation and Landscape Pattern Analysis of Silang-Santa Rosa Sub watershed, Philippines



Jan Joseph V. Dida ¹, Cristino L. Tiburan Jr. ¹, Narumasa Tsutsumida ² and Izuru Saizen ²

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² Graduate School of Global Environmental Studies, Kyoto University

Introduction

- Forests approximately comprise a significant percentage of the terrestrial carbon storage
- Carbon sequestration is also one of the most important forest ecosystem functions
- Development of spatial models offers potential benefits in forest conservation (Reddy, et al., 2017)
- Since forests have the highest carbon sink compared to other land cover types, it is important to monitor the landscape patterns



Figure 1. Google Earth Street views of Silang (Top) and Santa Rosa (Bottom) area of the Sub watershed.

Objectives

The study aims to:

1. Estimate the carbon stocks; and
2. Quantify the landscape patterns of the watershed

Methodology

Silang-Santa Rosa Sub watershed is located at the western portion of the Laguna Lake Basin.

It has a total area of 12,030.36 hectares covering mostly the City of Santa Rosa in Laguna Province and Municipality of Silang in Cavite Province. Areas in the upstream (Silang) are mostly agricultural while areas in the downstream (Santa Rosa) are industrial and residential built-up.

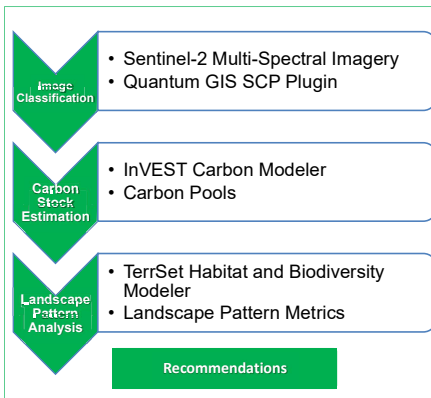


Figure 2. Flowchart of Activities

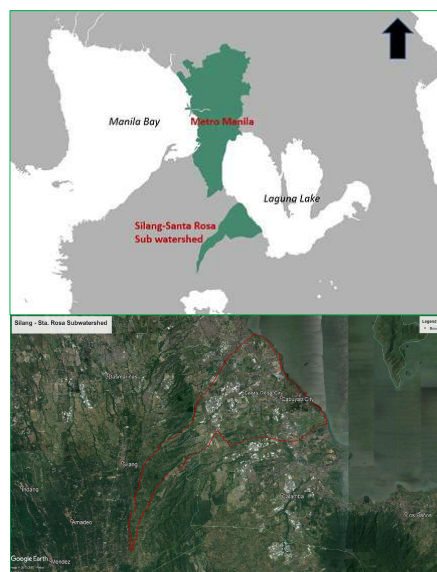


Figure 3. Location of the study area relative to Metro Manila, Philippines.

Results and Discussion

Agriculture is the largest land use class in terms of total area followed by Forest which accounts for the largest estimated carbon stock in the area.

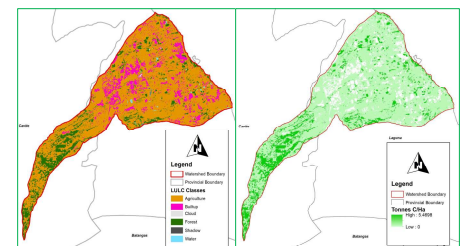


Figure 4. Classified Land Use (L) and Estimated Carbon Stock (R) of the area

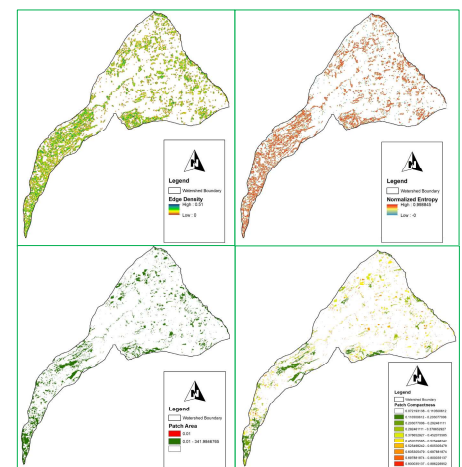


Figure 5. Landscape Pattern Metrics of the area

Conclusion

Forested areas, despite having large carbon stock values, are the locations of possible land use conversion based on the landscape pattern metrics.

Acknowledgements

This study was supported by the Graduate School of Global Environmental Studies (GSGES), Kyoto University through the GSGES seeds research funding program 2018.



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

Water Environment Management utilizing Monitoring Data and GIS Data – the change in the Lake Biwa-Yodo River basin

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** Nikken Sekkei Civil Engineering LTD., *** Research Center for Sustainability and Environment, Shiga University

INTRODUCTION

1. Lake Biwa – Yodo River Basin

- The Lake Biwa-Yodo River basin, covering 8,240 km² with a channel length extending 75.1 km, is a representative basin of Japan.
- Lake Biwa, Japan's largest fresh-water lake, is one of the world's leading ancient lakes.
- Its water from Lake Biwa serves as the source of drinking water for 14.5 million people, which includes people outside of the basin (Kyoto, Nara, Osaka etc.).
- The water of the basin is reused from upstream to downstream.

3. Useful as Analytical Tools

- The water management requires not only the water quality data but also various data (geography, climate, weather, temperature, etc.) to grasp the conditions of the entire basin.
- The objective of this study is to create maps as analysis tools to consider water quality improvement, measures for future water conservation, and water environment management.
- These integrate local data including water quality and related data, and it can see conditions of the entire basin from a bird's eye view.
- Converting collections of data from individual research into visual information by GIS is an approach to analysis for the entire basin and helps to compare and contrast problems.

2. Water Quality Mapping

- It is important to see the entire basin and understand changes in water quality and factors related to water quality in order to properly manage water from rivers, etc.
- In history, rapid changes in society had deteriorated the water quality of the basin. An increase in sewerage plants coverage area, and effluent regulations had contributed to reduce causes of water pollution and improved the water quality.
- However, changes in water quality have occurred due to changes in social structure, such as population growth and varieties of land use, as well as a global climate change.

MATERIALS & METHODS

1) Data Items

Classification	Data Items	Number of monitoring sites, etc.
Social Structure	Population, Land use, Population density Densely-inhabited district etc.	
Weather items	Annual mean temperature Highest temperature in summer Highest temperature in winter Annual precipitation Snowfall etc.	Precipitation: 49 stations according to the Japan Meteorological Agency (JMA), 34 stations by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). Temperature: 36 stations (JMA)
Water quality items	Annual average water temperature, Mean average highest/Lowest water temperature in summer/winter, Annual average pH, DO, SS, BOD, COD, T-N, T-P etc.	1990: 272 monitoring sites 2000: 284 monitoring sites 2009: 292 monitoring sites
Water quality relates facility	Coverage rate by sewerage systems Wastewater treatment plants etc.	Wastewater treatment plant: 70 locations

2) Targeted period

Data compiled for the preparation of the distribution map are shown as 4 categories.

- 1st period of average of three years, 1988-1990
- 2nd period of average of three years, 1998-2000
- 3rd period of average of three years, 2007-2009
- Variation Map (change in data over 20 years).

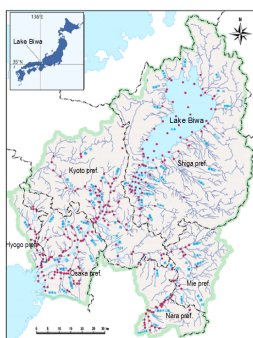


Figure 1 – Survey location in the basin

3) Water quality data and defining section

- Water quality data is a collection of public data from administrative organs, National Institute for Environmental Studies "Environment GIS", MLIT, prefectures, and Japan Water Agency.
- Annual mean value was calculated based on observation data.
- While water quality of each survey location is shown as point information (Figure 1), it is created as the water quality representing a specific section of the river as shown in Figure 2.

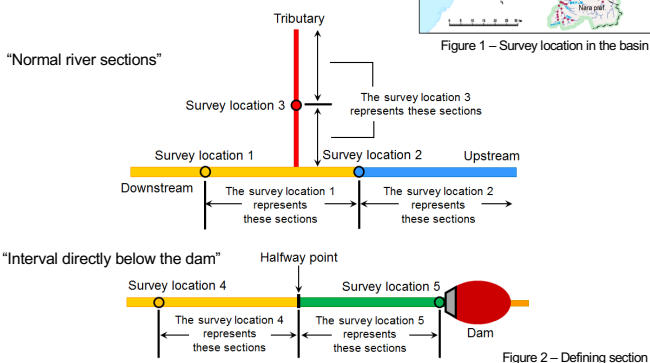


Figure 2 – Defining section

[Data Source] Population: Bureau of Statistics, Ministry of Internal Affairs and Communications.
Land Use: Land utilization segmented mesh data, National Land Information Service, MLIT, Japan.
Wastewater Treatment: Sewage Works Statistics by Japan Sewage Works Association.

RESULTS & DISCUSSION

- Population in the Lake Biwa–Yodo River basin increased by approx. 3% over past 20 years, especially, in South basin of Lake Biwa, Ina & Kizu River basin, and Osaka city (Figure 3).
- The coverage rate of sewerage systems in the entire basin increased by approx. 20%, and in 2009, the rate reached over 90%.
- In particular, the coverage rate of sewerage systems increased by more than 40% on the east shore of Lake Biwa, and the upstream basin at Ina River (Figure 4).
- Usually population increase causes the deterioration of water quality due to domestic wastewater. In that case, the BOD concentration in rivers should be higher. However, the result of BOD concentration was different from the expected result (Figure 5).
- It means that the distributions of the water quality measurements such as sewerage systems and the regulations successfully reduced the pollutants discharged into water.

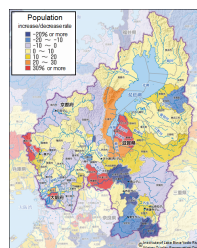


Figure 3 – Population Distribution (Change in data over 20 years)

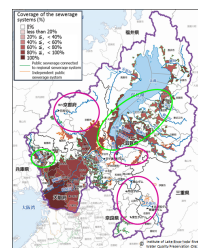


Figure 4 – Percentage of Sewerage Systems (2009FY)

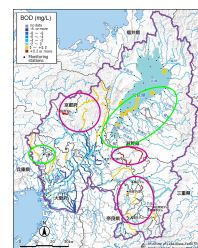
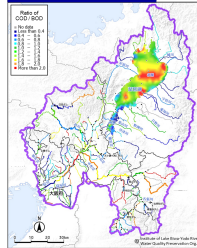


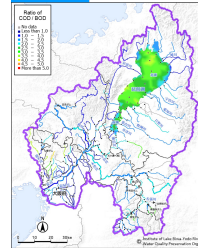
Figure 5 – BOD concentrations (Change in data over 20 years)

Appendix: Ratio of COD to BOD (COD conc. / BOD conc.)

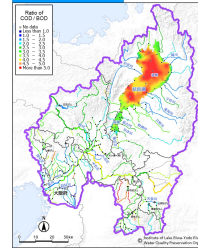
Change over the past 20 years



1990



2009 (20 years after)



CONCLUSIONS

- Long-term continuously-monitored data for river, lake and sea is important for forecasting as well as for making prospective assessment of management challenges. Pollutants travel quite a distance as water circulates when they are discharged into water. In that case, it is difficult to trace the pollutants to their sources.
- Analyzed the reciprocity of population, sewerage distribution and each water quality. They also help to compare and contrast between locations based on their conditions such as long-term changes in water temperatures, land use, etc. within the entire basin.
- To address complex environmental problems, don't focus only on their parts, but also on their entirety. For dealing with dramatically changing and increasingly complex environmental management issues, it is indispensable that we collectively perform more efficient and effective monitoring programs. The accumulated data should also be widely shared as a common property for the present and future generations.

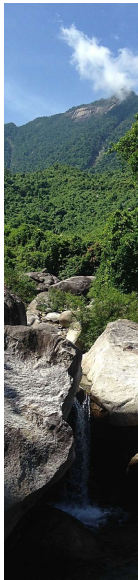
Kyoto University International Symposium on Education and Research in Global Environmental Studies in Asia

Action Plan to Develop Eco-tourism through Community-based Approach for Ethnic Minority People in Upstream Areas of Bo River, Thua Thien Hue Province

Authors: Le Thai HUNG*, Ngo Tung Duc*, Le Van An* and Hitoshi Shinjo**

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



Introduction

- Community-based ecotourism is a kind of ecotourism in case of local communities have real power and participation in the development process and management of ecotourism, particularly benefits almost belong to them.
- Sustainable ecotourism was developed based on four perspectives: economic, ecological, cultural and community
- Forest resources, water resources, the advantage of topography, local knowledge, cultural identity, characterized the life and living are the potential and strengths can be exploited to develop ecotourism;
- To develop rural tourism effectively, it is very necessary to make very clear planning strategies, objective - base investments and built a well-prepared tourism network
- Local cultural events and traditional manners and customs should be considered and covered in the tourism development strategies
- It is noted that there are many sorts of rural tourism. Therefore, tourism model selectivity should be based on local conditions and natural factors



Parlê waterfall



Homestay in community house



Traditional foods

Objectives

- To develop and plan integrated eco-tourism activities sustainably in relation to conservation of traditional cultures for local communities.
- To propose potential solutions in order to improve livelihoods through community-based eco-tourism activities for local people participated directly and indirectly in eco-tourism activities.

Contents and Research Methods

Contents:

- Identify the local status and potential resources in terms of natural and social conditions related to development of ecotourism.
- Identify potential kinds of community-based ecotourism activities that can be developed towards improvement of livelihoods in relation to conservation of traditional culture.
- Select priority kinds of community-based ecotourism activities and make detailed plan of development.

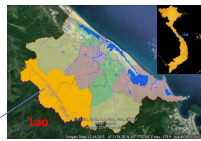
Methods:

- Organized meetings to do focus group discussion with farmers and local officers
- Field survey and interview with tourists



Study sites

The map of study site for research



★ Hong Ha commune

Research Results

1. Potentials and advantages of developing community-based ecotourism in Hong Ha commune

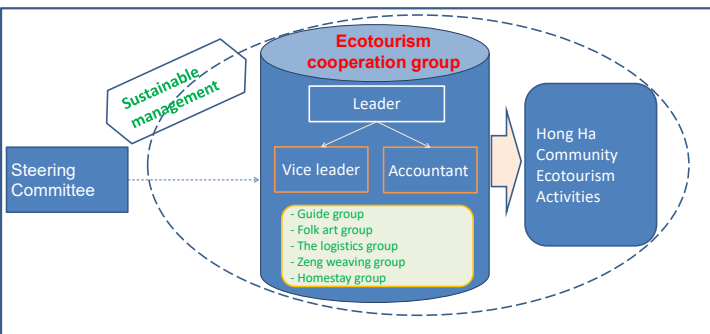
1.1. Potentials and advantages of natural conditions

- Geographical location: a mountainous commune, the area of the Bo river system
- Topography and land: Total land is about 14,047.56 ha of which agricultural land occupies only 96.27 ha (0.68%), forestry land is 11,026.5 ha (78,2%) and other land types
- Hydrological: These are the two main river systems associated with many other streams that have created the watershed of the Bo River and flow into the East Sea

1.2. Potentials and advantages of social conditions

- Ethnic composition and population: Hong Ha Commune has a total population of 1,632 people, with 416 households, of which 123 poor households (29.6%) and 28 poor near-poor households (6.7%); This is the residence of the ethnic groups of Katu, Ta Oi, Pahy, Paco, Bru-Van Kieu and Kinh
- Organizational system of the community
 - Form of traditional management
 - Form of state management

2. Organizing the management and development of community eco-tourism



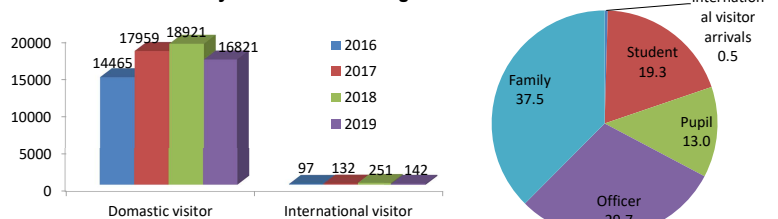
5. Results of community ecotourism business activities in Hong Ha

No.	Expense	(Unit: VND)
A	Total revenue	240.838.000
A.I.	Parlê stream	228.898.000
1.	Tents	92.684.000
2.	Bathing life jackets	10.159.000
3.	Foods, Drinking waters	54.415.000
4.	Entrance tickets	71.640.000
A.II.	Homestay	11.940.000
B	Total expenditure	232.460.700
B.I.	Parlê stream	218.147.700
1.	Equipment procurement	8.195.500
2.	Salaries for members	130.419.360
3.	Daily allowance for employees	32.604.840
4.	Foods and Drinking waters	46.928.000
B.II.	Homestay	10.013.000
B.III.	To remit the commune budget	4.300.000
C	Profits	8.377.300

3. An integrated assessment of the ecotourism potential of Hong Ha

No	Criteria	1	2	3	4	5	6	7	8	9	10	Total
	Tourist spots	3	3	3	1	2	1	1	2	2	1	
1	Visiting and experiencing the Parlê stream	12	12	9	4	8	4	4	8	8	3	72
2	Homestay Hong Ha	12	12	12	2	8	4	4	6	8	4	68
3	Discover the sacred stone column A Doi	12	9	9	3	4	2	2	8	8	3	60
4	Visiting the new village of Cu Muc - Kan Hoa	6	12	9	4	6	3	4	6	8	4	62
5	Organizing sports exchanges, folk games, cooking dishes at Guol House	3	12	9	6	6	4	4	6	8	4	62
6	Walking to discover the A Rum stream and Pi Reng waterfall.	12	3	6	2	2	1	2	8	6	3	45

4. Status of community ecotourism in Hong Ha Commune



Conclusions

Ecotourism in Hong Ha has introduced models of tourism activities exploring the Parlê stream and homestay has received the support of local ranks and communities, contributing to improving the livelihoods of people associated with the preservation of identity the culture of the ethnic minority community

STYDY ON ASSESSING THE SALINITY INTRUSION IN THE DOWNSTREAM OF VU GIA – THU BON RIVER

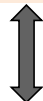
Authors: Nguyen Duong Quang Chanh*, Le Hung*

* Faculty of Environment, Danang University of Science and Technology, The University of Danang

Introduction

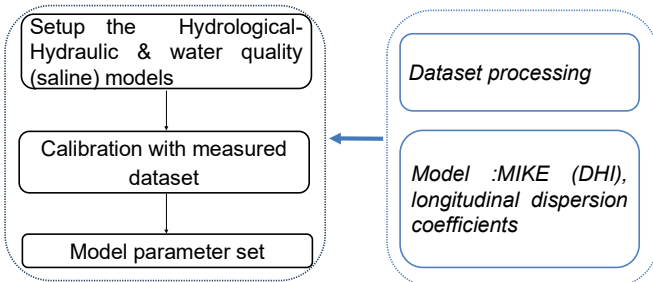


Downstream at Vu Gia - Thu Bon (VGTB)-Han river in Danang city: salinity intrusion usually occur in dry season.



- Devastated, the depletion of fresh water resources
- From 2009 to present, A Vuong, Song Tranh 2, DacMi 4, Song Bung hydropower reservoirs in the upstream
- Climate change and sea level rise

Materials and methods

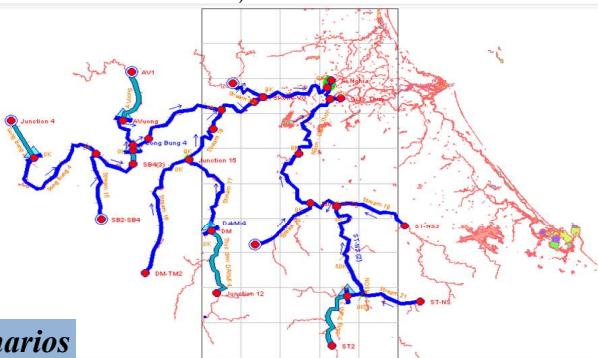


Process of salinity intrusion study

Hydrological-Hydraulic models

Upstream: Nong Son, Thanh My, Bung River, A Vuong (Flow – calculated from MIKE NAM)

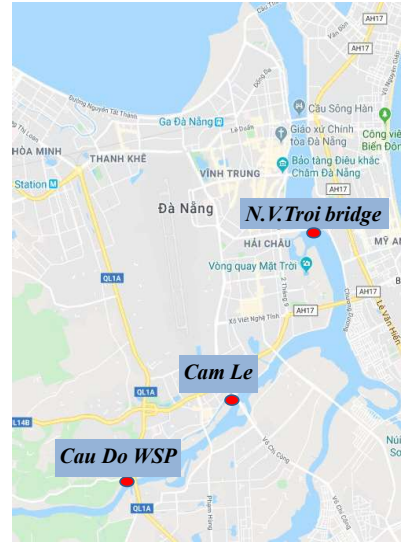
Downstream: Cua Han, Cua Dai (water level)



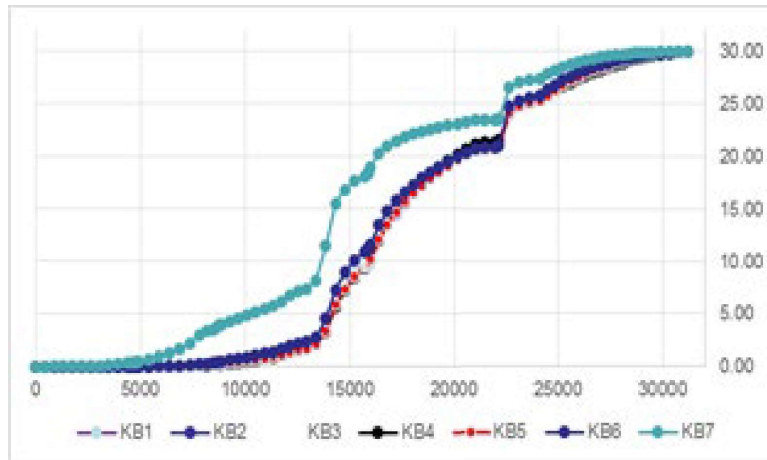
Scenarios

Scenarios	Rainfall (upstream areas)	Sea level
KB 1	2005	2005
KB 2	2005+ B2 (2030)	2005+ B1 (2030)
KB 3	2005 + B2 (2030)	2005+ A1F1 (2030)
KB 4	2005 + B2 (2030)	2005 + A1F1 (2100)
KB 5	2005 + B2 (2050)	2005 + A1F1 (2030)
KB 6	2005 + B2 (2050)	2005 + A1F1 (2050)
KB 7	2005 + B2 (2050)	2005 + A1F1 (2100)

Results



	N/V Troi bridge	Cam Le station	Cau Do (water supply plant)
KB1	28.72	11.44	6.78
KB2	28.85	11.01	6.4
KB3	28.87	11.03	6.42
KB4	28.7	11.73	7.1
KB5	28.86	10.89	6.29
KB6	29.09	11.12	6.54
KB7	29.65	14.08	8.9



The largest salinity intrusion (‰) on the Vu Gia-Han in the climate change scenarios

Conclusions

The influence of climate change and sea level rise to salinity intrusion: *rather high*; the salinity in Cau Do is greater than 3% for 2050 CC scenario and SWL 2100.

The saline concentration would effect much on water supply of Danang city

Further research

- Verification study of model parameter with 2019 dataset
- Conduct the simulation with other components (organic matter, SS,..)

STUDY ON THE IMPACTS OF INVASIVE ALIEN SPECIES IN BA NA - NUI CHUA NATURE RESERVE, DA NANG CITY, VIETNAM

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 ** Silviculture Research Institute, Vietnamese Academy of Forest Sciences, Ha Noi, Vietnam
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Introduction

The status of invasive alien species in Ba Na - Nui Chua

Ba Na - Nui Chua Nature Reserve is centred on Mount Ba Na, a 1,487 metre-high mountain on the border between Da Nang city and Quang Nam province, has a total area of 26,751.3ha. The flora includes 793 species, belonging to 487 genera and 134 families, 19 species are listed in the Red book of Vietnam (Nguyen N.T., 2003).

Problem invasives plants in Da Nang, Vietnam

- Thousands of hectares of forest in Da Nang City have been reported to be overwhelmed by invasive species
- Forests loss and degradation
- Rapid development of construction such as hotels, resorts, traffic roads in Ba Na - Nui Chua has created "favorable conditions" for invasive plants to thrive.



This study

- The status of invasive alien species in Ba Na - Nui Chua
- Invasive Species Assessment
- Build a database of invasive plants in Ba Na - Nui Chua Nature Reserve

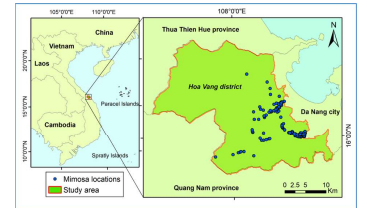


Figure 1. Locations of the study area and detected mimosas occurrences

Materials and Methods

Transect-Method and Quadrat Sampling

- 14 transects (3 to 18 km in length), crossing over different habitats: planted forests, nature forests, forest sides, alongside stream, roadsides, cropland, grasslands, orchards, vacant lands and swamp

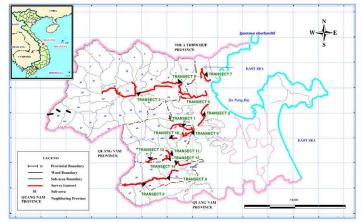


Figure 2: The location of 14 surveys transects in Ba Na - Nui Chua nature reserve

- The line-intercept transect-method (Brower et al., 1998) with quadrat of (5x5m) and (1x1m) was used in the survey transects. Quadrat size depends on the type of species (tree, vine or herb...). and the total number of individuals of each was recorded.

Methods

Invasive Species Assessment Protocol

- The methodology for surveillance of invasive alien plant species was based on an Invasive Species Assessment Protocol: Evaluating Non-Native Plants for their Impact on Biodiversity, Version 1, (Morse et al., 2004).

Making the invasive species distribution map by using drone image and image analysis software

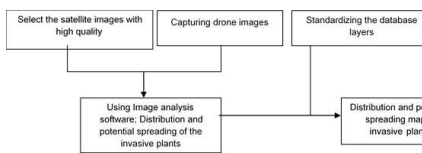
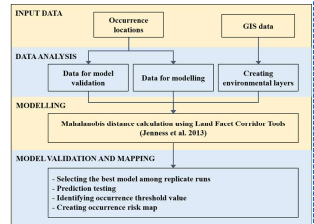


Figure 3: The modelling procedure for occurrence risk mapping

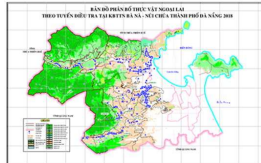


Results

The status of invasive alien species in Ba Na - Nui Chua



Fig1. Invasive plants distribution in Ba Na - Nui Chua nature reserve



Invasive Species Assessment

Rank	Species	Impact Rank (I-Rank)
1	<i>Merremia boissiana</i>	0.6541 ± 0.065
2	<i>Ipomoea eberhardtii</i>	0.1176 ± 0.011
3	<i>Mimosa pigra</i>	0.0101 ± 0.001



Fig. 2. The Invasive Species Impact Rank (I-Rank) in Ba Na - Nui Chua nature reserve



Fig. 3. (a) *Merremia boissiana* covers the nature forest and (b) planted forest canopy

No.	Species names	Area of origin	Year of introduction	Year of first discovery	Area of distribution
1	<i>Azadirachta indica</i>	India	1950s	1950s	Widespread
2	<i>Albizia chinensis</i>	China	1950s	1950s	Widespread
3	<i>Albizia julibrissin</i>	China	1950s	1950s	Widespread
4	<i>Albizia leonensis</i>	China	1950s	1950s	Widespread
5	<i>Albizia odorata</i>	China	1950s	1950s	Widespread
6	<i>Albizia saman</i>	China	1950s	1950s	Widespread
7	<i>Albizia tonkinensis</i>	China	1950s	1950s	Widespread
8	<i>Albizia waterhouseana</i>	China	1950s	1950s	Widespread
9	<i>Albizia zeyheri</i>	China	1950s	1950s	Widespread
10	<i>Albizia adonifolia</i>	China	1950s	1950s	Widespread
11	<i>Albizia chinensis</i>	China	1950s	1950s	Widespread
12	<i>Albizia chinensis</i>	China	1950s	1950s	Widespread
13	<i>Albizia chinensis</i>	China	1950s	1950s	Widespread
14	<i>Albizia chinensis</i>	China	1950s	1950s	Widespread
15	<i>Albizia chinensis</i>	China	1950s	1950s	Widespread

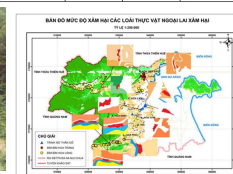


Fig. 4. Mapping the extent of the invasive plant species

Build a database of invasive plants

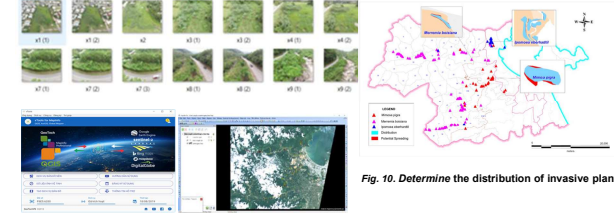
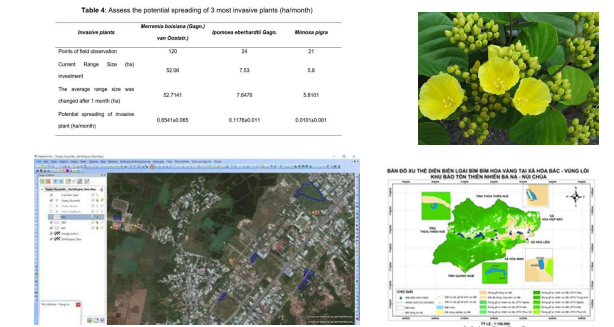


Fig. 10. Determine the distribution of invasive plants

Assess the potential spreading of 3 most invasive plants



Conclusions

- 13 most invasive plants were identified, with 11 species listed as invasive species in Southeast Asia and five of them in the 100 world's invasive species by IUCN. Three species were identified as the species with high ranked impacts on biodiversity and ecosystem, including *Merremia boissiana*, *Ipomoea eberhardtii* and *Mimosa pigra*. *Merremia boissiana* shows the highest spreading rate at 0.6541 ± 0.065 ha/month, followed by *Ipomoea eberhardtii* and *Mimosa pigra* at 0.1176 ± 0.011 ha/month and 0.0101 ± 0.001 ha/month, respectively.
- Fresh biomass of *Ipomoea eberhardtii* Gagn and *Merremia boissiana* in Ba Na - Nui Chua nature reserve are 15.67 and 14.9 ton/ha.
- The database of invasive plants distribution and potential spreading will be used for monitor strategies and invasive weeds managements in Ba Na - Nui Chua Nature Reserve.

References

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A Feasibility Study on Chemically Exfoliated Graphene Oxide Production

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ABSTRACT: Chemical exfoliated graphene oxide (GO) is one promising advanced material with such high potential for mass production. It was subjected to partially replace carbon black as reinforcing material, conductive electrode in battery, conductive resin, and surface coating, etc. In this research work, we studied possibility of establishing a chemically exfoliated graphene production plant in Thailand, with maximum graphene production capacity of 1.2 tons per year (100 kg/month). The capital cost, raw material cost and operating cost were determined to be 463,332, 78,984 and 451,268 USD/month, respectively. Based on GO sale value of 1,289,338 USD per month, (128.9 USD/g), investment return can be realized within the very first month of operation, or as soon as the first batch of GO product was purchased. The production capacity led to return on investment (ROI) of 2,029.8 percent/ year, internal rate of return (IRR) of 2,097 percent/year and net present value (NPV) of 7,236,508.5 USD/year. According to key financial analysis (ROI, IRR and NPV), GO production plant has such strength in generating profits with positive market driving force, and could soon be the new black gold in the business.

INTRODUCTION: Graphene is an emerging material that has generated research explosion worldwide since its discovery back in the year of 2000 with its outstanding characteristics, such as high chemical resistance, high electrical charge transfer ability and high mechanical strength. Graphene is considered a black gold with such potentials for a wide spectrum of applications, such as electronic devices, chemical sensors, reinforced materials and energy storages. To cope with growing demands on graphene, various approaches have been demonstrated and developed, naming mechanical exfoliation, solvothermal, chemical vapor deposition (CVD), and chemical exfoliation. Chemical exfoliation approach is the productive most, because of its simplicity and scalability, and good graphene quality. The method relies on chemical oxidation between graphite flakes and oxidizing agent, yielding carbon-hydrogen-oxygen functional groups, such as carboxyl, carbonyl and epoxy, on graphite structure, leading to disintegration of C-C and C=C bonds on graphene sheets. Good amount of chemically exfoliated graphene can be realized in the form of graphene oxide (GO) with promising chances in scalability [1].

RESULTS AND DISCUSSION (1): To chemically exfoliate graphite to GO[1], highly crystalline graphite flakes was in contact with potassium permanganate in concentrated acid solution. The yellow-brown GO powder was filtered from the mixture and was rinsed thoroughly with hydrochloric acid solution. The procedures were transformed to PFD design of a graphene production plant (Fig.1). Based on the PFD design, key financial analysis tools were applied for the feasibility study of chemically exfoliated graphene plant. Firstly, the cost assessment concerns capital cost, raw material cost (Table 1) and overhead cost of the operation. Capital cost was evaluated from statistic data available from "Process Engineering Economics" (J.R. Couper [2]), by projecting the equipment cost in 2003 to present time. Capital cost values were determined as corresponded to plant's GO production capacity using cost index formula (RSMMeans Construction Cost Indexes, Data base collected by Public organization in USA and Canada [2]), and power sizing model (Fig.2). Market prices of the GO products varied from 128.9 to 3,844.8 USD/g, depending on number of layers on graphene sheets and how the GO products were sold (Table 2).

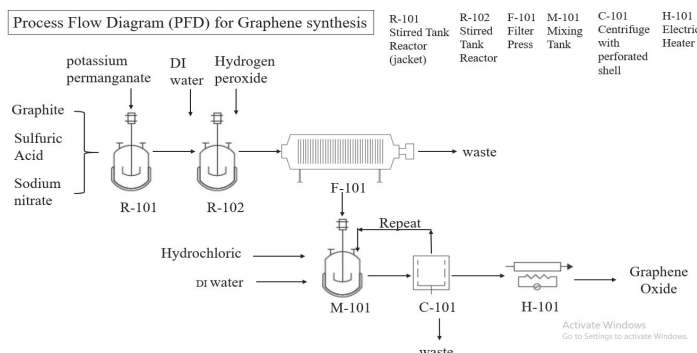


Fig.1 Process flow diagram (PDF) of the graphene production.

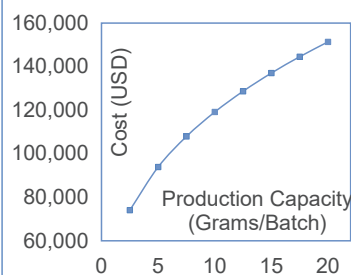
According to the textbook (J.R. Couper [2]), maximum volume capacity of a vessel reactor is roughly 44 m³ and can be estimated to yield GO production capacity of 4.4 tons per month. However, our analysis on payback period values revealed the payback period of 3 years 1 month, 1 years 11 months, and 1 year 6 months, as corresponded to production capacity of 25, 50, and 75 grams per month.

RESULTS AND DISCUSSION (2):

Table 1 Prices of chemical input **Table 2** Market prices of graphene product

Raw material	Market price
Graphite flake (99.9%, 10 mesh size)	56.9 USD/kg
Sulfuric acid (98%)	138.7 USD/2.5 L
Hydrochloric acid	152.2 USD/2.5 L
Sodium nitrate	138.7 USD/kg
Potassium permanganate	426.2 USD/2.5 kg
Hydrogen peroxide	2,790.4 USD /53.8 L

GO (2 mg/mL) in water	25 mL	192.2 USD	3,844.8 USD/g
	100 mL	439.3 USD	2,196.5 USD/g
GO (4 mg/mL) in water	50 mL	357.5 USD	1,787.3 USD/g
	200 mL	714.9 USD	893.6 USD/g
GO (1 mg/mL) in water, 15-20 layers/sheet, 4-10% Edge-oxidized	50 mL	132.0 USD	2,640.4 USD/g
	200 mL	363.6 USD	1,818.2 USD/g
GO powder, 15-20 layers/sheet, 4-10% Edge-oxidized	1 g	128.9 USD	128.9 USD/g



Then, with GO production capacity of 100 kg/month, capital cost was determined as 463,332 USD; raw material cost was 78,984 USD; operating

cost was 451,268 USD. The profit was determined as 295,754 USD, which returned the investment during the very first month of operation or very soon after the first batch of GO product was purchased. Feasibility of the industry can also be evaluated using key financial analysis (Table 3).

Table 3 Key financial analysis factors

Key Financial Analysis Factors	Net Present Value (NPV)	Internal Rate of Return (IRR)	Return of Investment (ROI)
Value	7,236,508.5 USD	2,097% per year	2,029.8% per year

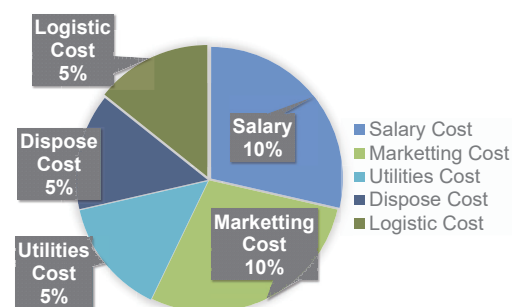


Fig.3 Pie chart showing portions of overhead cost of operation.

NOTE: Graphene is the uprising advanced material that would soon be one target commodity. Although the key financial analysis showed great opportunity in starting the business, risks from other graphene distributors were hardly considered here. The key players from all over the world, China in particular, possesses graphene production technologies and only wait for the market demands. Since graphene has geared toward becoming an affordable ingredient for industrial products, it would attract more industrial customers. The demand would eventually be realized.

1. Jiali Zhang, Haijun Yang, Guangxia Shen, Ping Cheng, Jingyan Zhang and Shouwu Guo, Reduction of graphene oxide via L-ascorbic acid, ChemComm, 2010, 46, 1112-1114
2. COUPER, J.R., Process Engineering Economics (Chemical Industries). 1st ed. CRC Press, 2003.

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IoT Based Fecal Sludge Management:

A proposal to formalize the informal fecal sludge emptying businesses

Authors: Wutyi NAING*, Hidenori HARADA*, and Shigeo FUJII*

* Graduate School of Global Environmental Studies, Kyoto University

Background and Objectives

- Developing countries substantially rely on onsite sanitation that needs to be emptied fecal sludge periodically.
- Informal emptying businesses that mostly practiced open dumping were widely used in developing countries.
- To reduce and to formalize the informal emptying business are big challenges in developing countries.

Objectives

- To find out the **reasons why informal businesses were chosen** and challenges of formal providers,
- To design the **IoT based fecal sludge management (FSM)** to reduce **open dumping, informal emptying businesses and the pollution threat from overflow.**

Study Area

Mandalay city, Myanmar



- 5 urban townships
- 1.2 million population
- Area 108 km²
- Urban townships
- Rural townships

Methodology

400 households
5% SE, 95% CI



A. Demographic Info.

- Income
- Education

B. Toilet facilities

- Type of toilet facilities
- Age of toilet facilities

C. Emptying management

- Emptying experience
- Choice of service
- Fee and waiting time

D. Perception and Willingness to pay

- Prefer service types
- Willingness to pay for prefer type
- Knowledge on the type of service

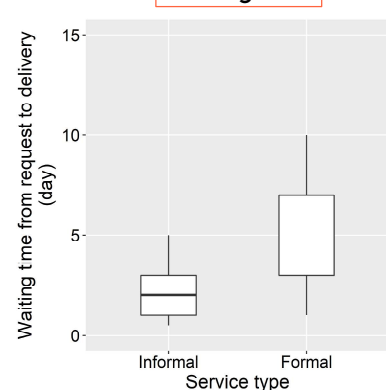
Result and Discussion

Findings (Current situation and challenges)

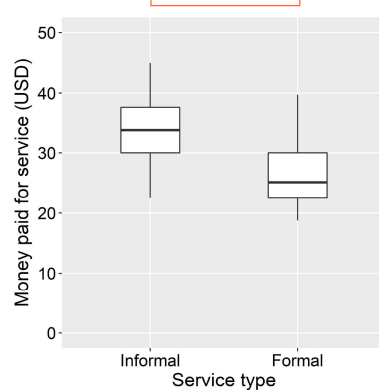
Present: **Passive (waiting)** emptying service, based on sudden request

- Emergency need** – requested only when onsite facilities overflowed or blocked
- Not enough truck** to provide immediate service by formal provider
- Demand creating** of informal business by **shorter waiting time** and **convenient contact** service with more expensive fee

Waiting time



Service fee



Contacted way



Choice of Service

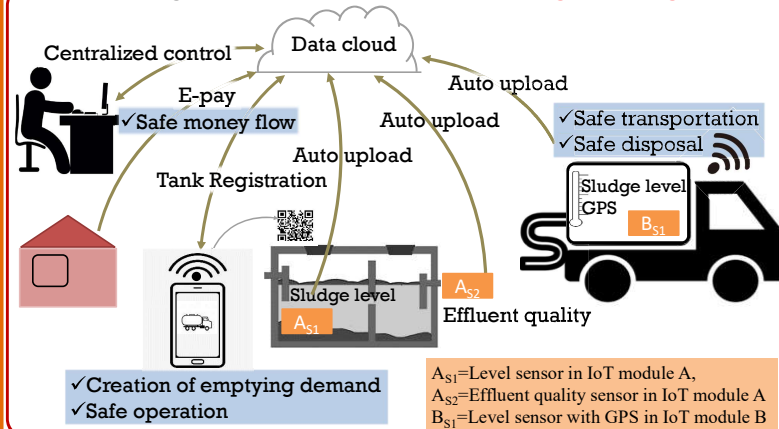


67% chose informal business

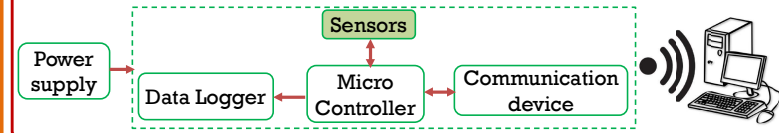
A proposal to transform and improve

Future: **Active (creating)** emptying service, centrally monitored septic tanks

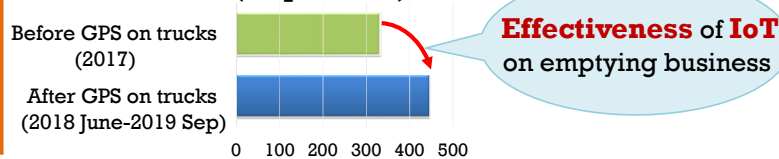
System diagram for IoT based fecal sludge management



IoT Module



Average reported trip of formal provider (Trip/month)



Conclusion

- Majority of people **chose informal businesses** because of **bureaucratic system** and they **need immediate service.**
- Most of the developing countries have the similar problems with FSM.
- IoT based FSM with **demand creation, safe operation, safe emptying, transportation and disposal** would be **feasible proposal.**
- IoT based FSM would be **foremost footstep** for more advanced onsite sanitation system in developing countries in near future.

This study was supported by:



November 26–28, 2019, Kyoto, Japan



This poster is undisclosed

Entomophthorales: the Guards of Agricultural Ecosystems

Authors: Ruly Anwar*

* Department of Plant Protection, Faculty of Agriculture – IPB University

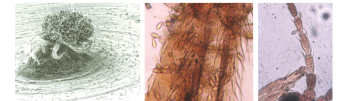
ABSTRACT

Entomophthoralean fungi (Zygomycotina) are the one of the natural enemy agents have been used to control insect pests and mites on various crops. These fungi were founded for the first time in Indonesia in 2008, when the papaya mealy bug, *Paracoccus marginatus* invading the papaya plantation at Bogor area. Among the papaya mealy bug, there were the fungus infect the insect. During ten years after that, we have observed that some insects and acari were infected by the fungus. *Phenacoccus manihoti* on cassava, *Thrips parvispinus*, *Frankliniella intonsa* on rose, cucumber aphid, green onion aphid, red mites on cassava, psyllid citrus and brown planthopper were confirmed to infect by the Entomophthoralean fungi. Epizootics of these fungi usually occurred at crowded insect population with less human intervention, especially pesticide.

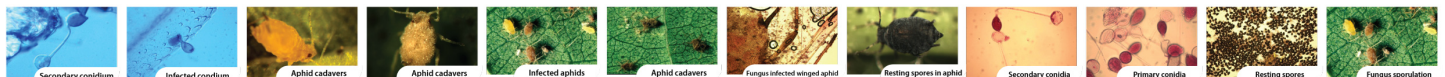
Key words: Entomophthoralean fungi, insect, mites, pests, natural enemy

ENTOMOPHTHORALES

- A group of biologically interesting fungi best known as the name implies, as insect fungi.
- Do not form multi-spored sporangia.
- 3000 conidia/cadaver and $\pm 75\%$ of these are discharged into the air and $\pm 25\%$ directly hitting the leaf adjacent to the host (Steinkraus et al. 1995).
- Spores: primary conidia and capilliconidia.
- Survival stage: resting spores.
- Natural epizootics occur in the field in Midsouth and Southeast of USA.
- Members of this order are distinguished from all other members of the Zygomycota by having forcibly discharged spores.
- In fact, most Entomophthoralean fungi multiply vegetatively as protoplasts and/or hyphal bodies after having invaded the host.
- Thick-walled resting spores are formed, usually inside (but sometimes outside) the host.



Neozygites fresenii



THE PAPAYA MEALY BUG

- The insect is polyphagous insects that destroyed papaya at Mexico, Belize, Costa Rica, dan Guatemala in 1992 (Miller et al. 1999).
- *Paracoccus marginatus* originated from Neotropical (Mexico and other Middle America) (Miller & Miller 2002).
- Since 1994, *P. marginatus* have been reported founded in 14 Caribbean countries, and 1998, it founded at di Florida, USA, on *Hibiscus* sp. (Muniapan et al. 2008).
- Guam island in 2002 (Walker et al. 2003) and di Republic of Palau in 2003 (Muniappan et al. 2006). On May 2004, *P. marginatus* founded at Hawaii, USA on papaya, Plumeria, Hibiscus and *Jatropha* spp. (Heu et al. 2007).

HISTORY

- The insect were reported to distribute by wind, seed or plants, human, or other insects.
- In Indonesia, *P. marginatus* were reported at papaya in Bogor Botanical Garden- West Java on May 2008 and July 2008. Also have been reported at Coimbatore, India (Muniapan et al. 2008). Tangerang and Jakarta.



NEW RECORD OF ENTOMOPHTHORALEAN FUNGI

No.	Host	Year Founded
1	Papaya mealy bug, <i>Paracoccus marginatus</i>	2008
2	<i>Thrips parvispinus</i> and <i>F. Intonsa</i> on Rose	2011
3	Trips and aphid on Chrysanthemum and rose	2012
4	Cassava mealy bug, <i>Phenacoccus manihoti</i>	2012
5	Cassava red mites, <i>Tetranychus kanzawai</i>	2014
6	Aphids: <i>Semiaphis dauci</i> (carrot), <i>Neotoxoptera formosana</i> (onion), <i>Aphis gossypii</i> on cucumber	2014
7	The citrus psyllid (<i>Diaphorina citri</i>) and Leucaena psyllid (<i>Heteropsylla cubana</i>)	2015
8	Brown planthopper, <i>Nilaparvata lugens</i>	2016
9	<i>P. Jackbeardsleyi</i> , <i>F. virgata</i> , on Cassava, <i>P. Minor</i> on guava, dan <i>P. Illacinus</i> on eggplant	2018



IN FACT

- Most of entomophthorean fungi are obligate.
- Epizootics occur in the field.
- The best way for these fungus is Conservation, instead of inoculation or inundation.

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Inland Aquaculture-based Helmholtz Resonator for Precise Fish Volume Measurement

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¹Graduate School of Agriculture, Kyoto University

²Faculty of Applied Biological Sciences, Gifu University *JSPS International Research Fellow

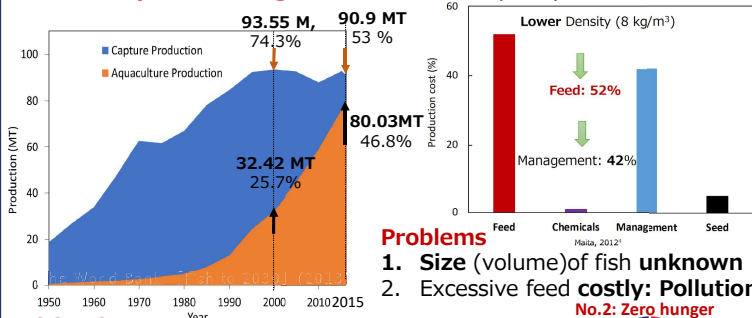
³Department of Ocean Mechanical Engineering, National Fisheries University



Background

Precision Aquaculture

- Rearing of fish, crustaceans, sea weed: in cages, ponds...
- **Precisely monitoring:** fish size, water quality, feed



Problems

1. Size (volume) of fish unknown
2. Excessive feed **costly: Pollution**

No.2: Zero hunger

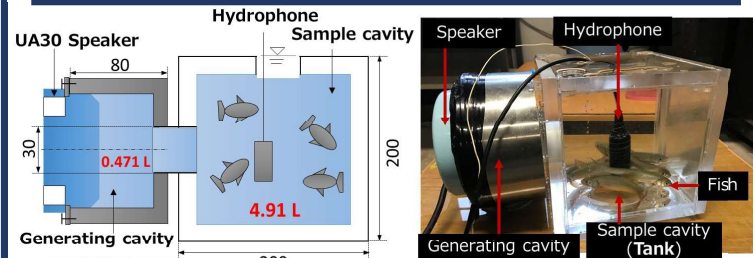
Objective:

Develop resonator for inland tank for precise non-destructive fish volume measurement

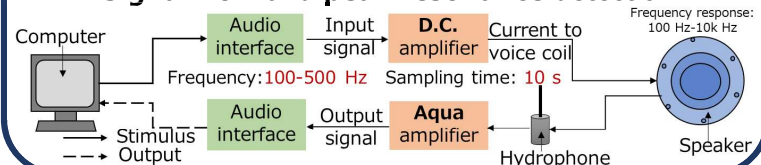


Materials and Devices

Double cavity based resonator placed on land

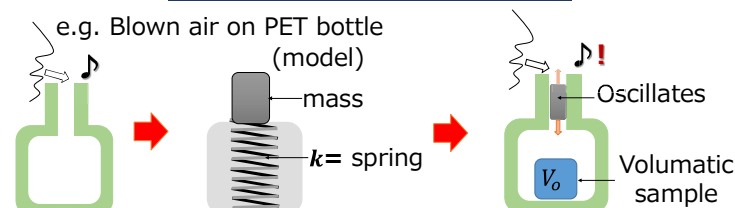


Signal flow and peak resonance detection

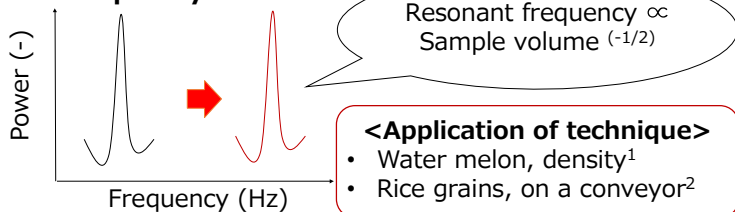


Helmholtz Resonance Theory

Air Helmholtz Resonance



Frequency shifts !!



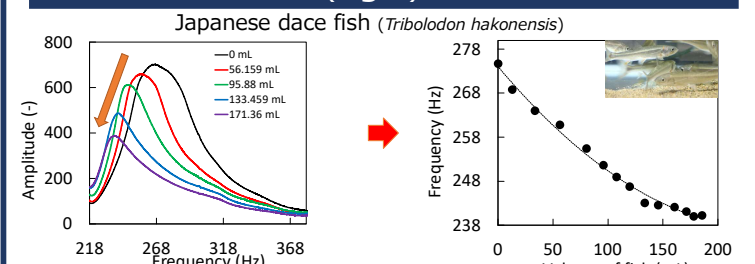
<Application of technique>

- Water melon, density¹
- Rice grains, on a conveyor²

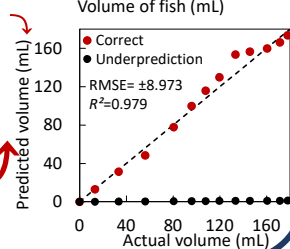
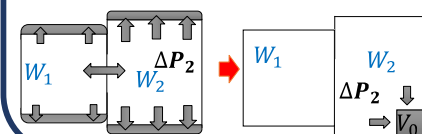
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2) Nishizu et al., "Automatic, continuous food volume measurement with a Helmholtz resonator" 2001. CIGR Vol III FP 01 004

Results & Discussion

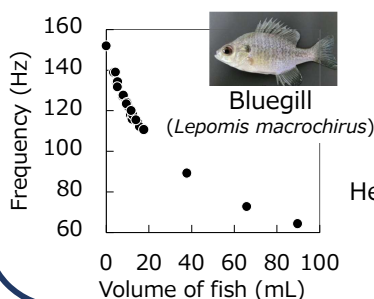
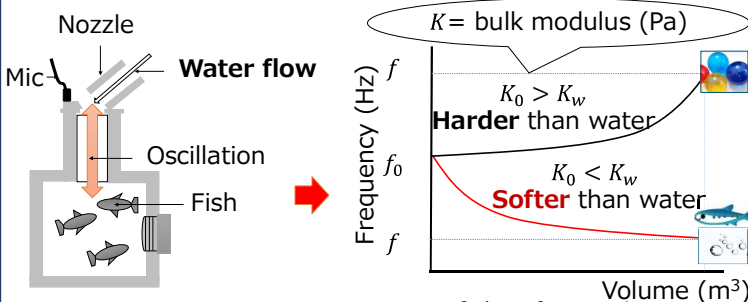
Precise total Fish (Ugui) volume estimation



- As volume ↑ resonance frequency
- $K_{fish} < K_{water}$ (swim bladder in fish)
- Need to account for deflection



Underwater Helmholtz Resonance



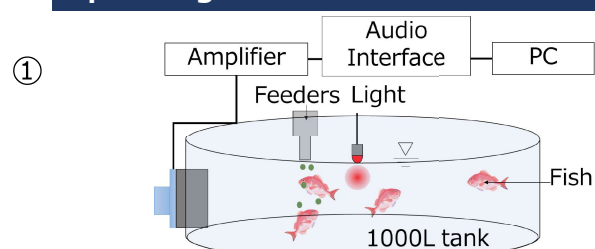
- As fish volume ↑ resonance frequency ↓
- $K_{fish} < K_{water}$ (swim bladder in fish)

Helmholtz resonance is available for fish volume estimation³

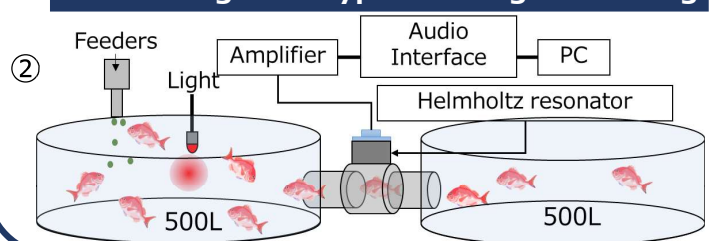
³ Njane et al., "Improved Underwater Helmholtz resonator with an open cavity for sample volume estimation" COMPAG, 147, 18-26 2018

Future Plans & Application

Upscaling for total volume measurement



Connecting duct-type: Sorting and Sizing



This research is funded by: GAP ファンドプログラム, Kyoto University

Poster Presentation (Doctoral Students)

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D-2	Foraging strategies of Japanese eels (<i>Anguilla japonica</i>) between fresh-and brackish waters Alisa Kutzer (Kyoto University)	...pp.2
D-3	Study on the Integration of Disaster Risk Reduction and Climate Change Adaptation for Regional Governance -Taking the risk of sloping land disaster as an example ChinYu He (National Taiwan University)	...pp.23
D-4	Fecal-oral transmission assessment in peri-urban Lusaka, Zambia Chua Min Li (Kyoto University)	...pp.24
D-5	The environmental education at MSW (Municipal Solid Waste) treatment facilities in Japan) Eiichi Suzuki (Kyoto University)	...pp.25
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D-7	Positioning System using Spread Spectrum Sound for Greenhouse Robots Huang Zichen (Kyoto University)	...pp.27
D-8	Greenhouse Gas Emissions from Blackwater Septic Tank in Tropical Climate Region: A Case Study of Hanoi, Vietnam Huynh Tan Loi (Kyoto University)	...pp.28
D-9	Perceptions of Gender In Disaster Risk Irene Petraroli (Kyoto University)	...pp.29
D-10	Evaluation of Forest Environmental Program for Elementary School Students in Japan: An Analysis from Perspective of ESD Junko Kondo (Kyoto University)	...pp.30
D-11	Characterization of tomato autofluorescence observed from surface Keiji Konagaya (Kyoto University)	...pp.31
D-12	SWMM-based Assessment of Low Impact Development Facilities at an Urban Catchment Scale in Japan Linying Zhang (Kyoto University)	...pp.32
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Satoru Yukioka (Kyoto University)
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- D-27** "Removal of diethyl phthalate, glyphosate and tetracycline by advanced oxidation technology" ...pp.46
Zhang Zhengfang (Tsinghua University)

URBAN ENVIRONMENTAL GOVERNANCE IN INDIA: ROLE OF INTERMEDIARIES IN ADDRESSING CHALLENGES

Authors: Abhishek Koduvayur Venkitaraman^{1*}, Akihisa Mori^{2*}

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* Graduate School of Global Environmental Studies, Kyoto University

INTRODUCTION

Environmental Governance in India has not been very structured and consistent. It has been an experimentation of policies and legislations involving a multitude of actors. Government in India plays an imperative role in devising policies that could foster a regime shift, but often this regime shift faces institutional and political barriers. There are numerous actors contributing to impacting the environmental governance of a country. This study aims to explore the role of particular actors known as intermediaries, for example, think tanks and NGOs, which are basically actors connecting other actors, and their role in the country's environmental governance. The investigation is aimed at identifying the institutional and political barriers in the environmental governance as viewed from the lens of intermediaries, and to suggest possible solutions to overcome the same.

1. BACKGROUND

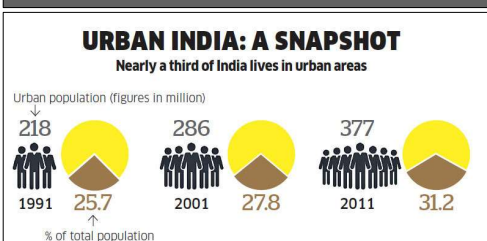
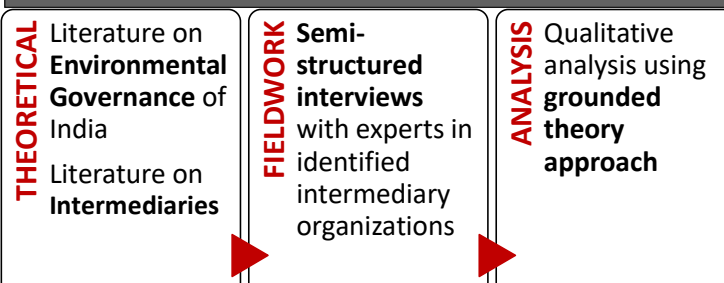


Figure 1 India's Urbanization
Source: The Economic Times, 2017

It is expected through these projections that Indian metropolitan cities will suffer from severe environmental degradation and unhealthy living conditions. Therefore, the Environmental Governance needs to be reviewed.

2. METHODOLOGY



2.2 Significance of the research

While the previous literature focuses exclusively on case studies from European contexts, this study aims to identify the intermediaries in a developing country, India. Since the Institutional setup in the federal structure of India is much more complex, it is challenging and intriguing to identify intermediary actors in India's environmental Governance.

2.1 Intermediaries ?

Actors connecting other actors in the institutional framework of environmental governance

Hard Intermediaries: Research & Technology Organizations, which engage in technology & knowledge transfer

Soft Intermediaries: Chambers of commerce or innovation centers, which are oriented to intermediating skills.

PREVIOUS LITERATURE

3. RESULTS & DISCUSSION

3.1 The main challenge: Complexity of Governance

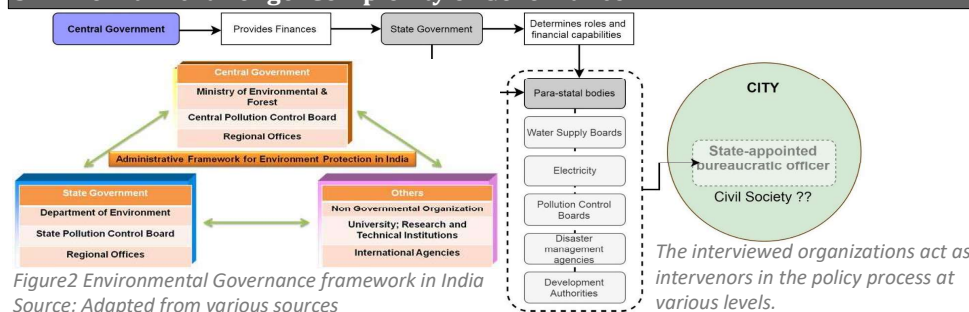


Figure 2 Environmental Governance framework in India
Source: Adapted from various sources

3.2 Overview of the Intermediary organizations.

NAME OF ORGANIZATION	TYPE
TERI (The Energy Resource Institute) & TERI University	Research Institute & Think-tank, University
IHS (Indian Institute of Human Settlements)	Research Institute & University
CPR (Centre for Policy Research)	Think-tank
CEEW (Council for Energy, Environment and Water)	NPO, Think-tank
ICLEI (International Council for local Environmental Initiatives)	International Network
NIUA (National Institute of Urban Affairs)	Research & Training
JNU (Jawaharlal Nehru University)	University

3.3 Role of Intermediaries

- Focus areas:** Low carbon pathways, climate change, urbanization, energy, resource mobilization, sustainable development, climate resilience
- Engagement with Stakeholders:** State Government, Local Government, Planners, Architects, Consultants, Civil Society & more
- Identifying Power relationships:** Power asymmetries, dominance of State or Central Government over City Government, Conflict between Centre & State
- Intermediation in Environmental Governance: Act as advisor** in Multi levels of governance.

3.4 Split Governance structure

- Governance in Indian cities involves a complex arrangement of laws, involving municipal and non-municipal institutions with "tangled" jurisdictions.
- Multiple, overlapping and poorly coordinated plans across sectors.
- Urban services provision at the central and state levels, with limited control for urban local bodies outside of implementation.
- lack of clarity and the power struggle between the state government and the local government.
- Extremely complicated mix of differently accountable governance in different levels

3.5 Solutions ?

- Identifying institutional imbalances and need for an Institutional reform.**
- The ULBs (Urban Local Bodies)** need to be strengthened in terms of requisite manpower, technology and funds to deliver.
- Better co-ordination between various levels of government.**
- As per the interviewed experts, **civil society** need to be given a more deliberative space.

Main References:

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Foraging strategies of Japanese eels (*Anguilla japonica*) between fresh- and brackish waters

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¹Graduate School of Global Environmental Studies, Kyoto University

²Field Science Education and Research Center, Kyoto University



1. Background

The classical paradigm of eel catadromy has been replaced in recent years by migration patterns of high plasticity¹²³.

The analysis of carbon and nitrogen stable isotopes can be used to track animal migration. The $\delta^{13}\text{C}$ of fresh water organisms is depleted compared to individuals in marine and brackish water but changes only very little between trophic levels⁴. Stable isotope ratios display the recent feeding history of consumers⁵.

Aim of this study was to investigate the use of foraging habitat of Japanese eels during their growth phase in continental waters via stable isotope analysis (SIA).

2. Methods and Materials

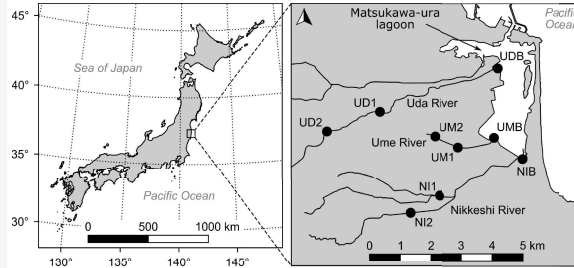


Fig. 1: Study area Matsukawa-ura lagoon, Uda (UD), Ume (UM) and Nikkeshi (NI) Rivers. Sampling locations in freshwater (1,2) and brackish water (B).

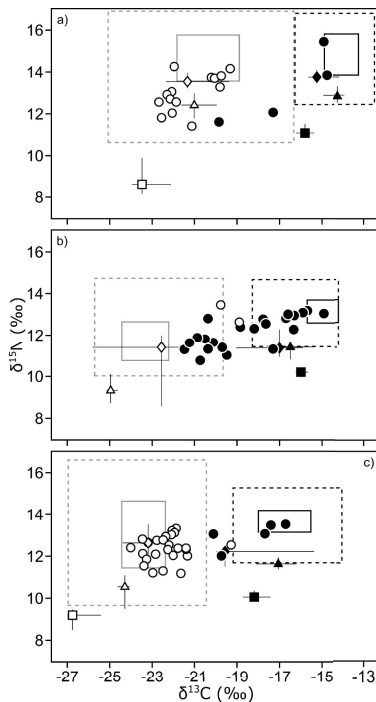
Sample collection: Eels and possible food sources were collected by electric shocker, set net and hand net in May, June, August, October 2017.

SIA analysis: Muscle tissue of eel, prey fish, crustaceans and bivalves and full body samples of aquatic insects were analyzed.

Study site: Matsukawa-ura lagoon in Fukushima prefecture, Japan and three tributary rivers: Nikkeshi, Uda, Ume (**Fig. 1**).

Sampling stations were located in brackish water (BW, salinity: 0.5 – 30‰) and fresh water (FW, salinity < 0.5‰) of each river.

3. Results



- 73 eels were analyzed (range of $\delta^{13}\text{C}$: -25.1 – -14.4 ‰ and $\delta^{15}\text{N}$ 10.8 – 15.4 ‰).
- FW food sources were significantly depleted in $\delta^{13}\text{C}$ compared to BW in all three rivers ($p \leq 0.01$, Kruskal-Wallis test).
- Eels could be classified into three groups by their use of foraging habitat: brackish water foraging, freshwater foraging, and multiple-habitat foraging (**Fig. 2**)

Fig 2: Isoplots for Uda (a), Ume (b) and Nikkeshi (c) Rivers. Isotopic signatures of food sources are shown as median values plus interquartile range (IQR). Estimated positions of feeding eels are calculated by adding the enrichment factor to the respective food source.

- $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of eels significantly correlated to the total length (**Fig. 3**, $p \leq 0.001$, rho: 0.54 and 0.41 respectively, Spearman-rank correlation for all eels combined).

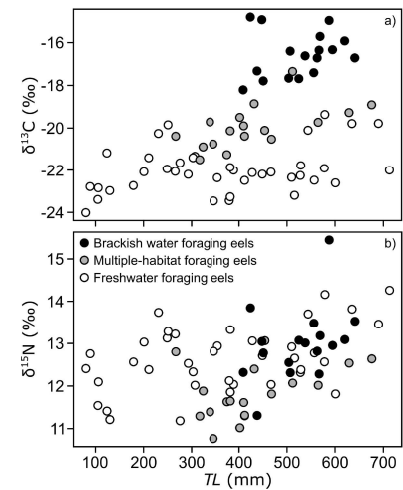
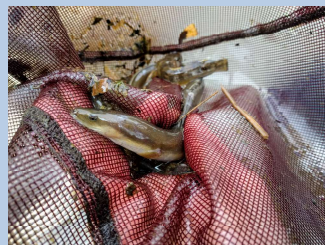


Fig. 3 Relationship of total length (TL in mm) of eels and $\delta^{13}\text{C}$ (a) and $\delta^{15}\text{N}$ (b) of eels classified as brackish water foraging, freshwater foraging, and multiple-habitat foraging

4. Conclusion

SIA revealed that some eels forage using a broad range of habitat and crossing salinity zones while others show higher fidelity to one salinity zone. The study shows high plasticity in recent movement patterns of eels in the Matsukawa-ura lagoon and the three study rivers. The study points out the importance for habitat connectivity between FW reaches of rivers, the river mouth and coastal areas for the productivity of Japanese eel and should be considered for future management and conservation efforts.



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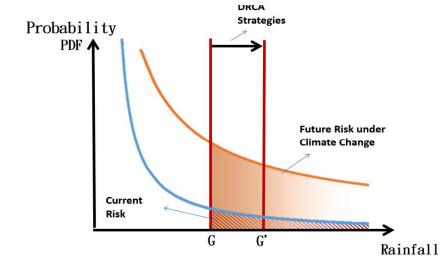
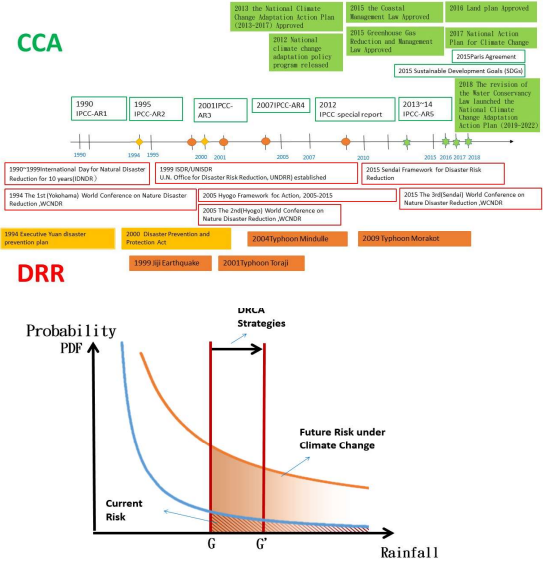
Study on the Integration of Disaster Risk Reduction and Climate Change Adaptation for Regional Governance -Taking the risk of slope land disaster as an example

Authors: Chin-Yu He 1*, Ching-Pin Tung 2*, Wan-Ya Wang 3*

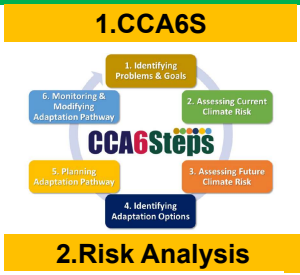
* Department of bioenvironmental system engineering, National Taiwan University

Background

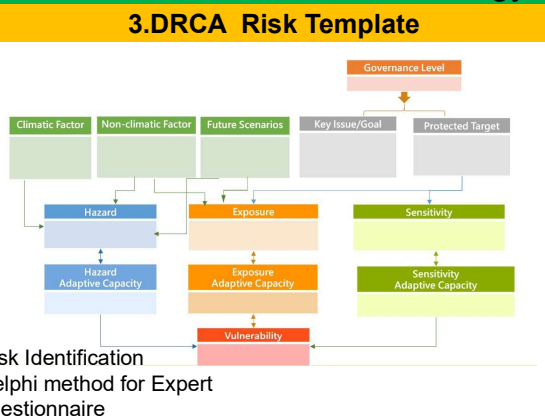
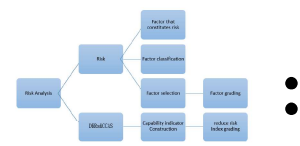
As the result of climate change, the occurrence of natural disasters has increased in recent years. "There is evidence that indicates climate change adaptation (CCA) is associated with disaster risk reduction (DRR). In 2015, the Sendai Disaster Reduction Program revealed that the goals and the strategies of CCA and DRR might be overlapping. Many related international research studies use some integration or fusion of CCA and DRR to solve this problem nowadays, but most countries have stated they faced significant difficulties in fusion. The main reason for this situation is that DRR and CCA are separately promoted by two different administrative structures. At a local regional level of governance, more and more instances of overlapping strategies and multi-level governance between the two domains have been found which might not only affect joint management strategies, but also cause a waste of administrative resources. To respond to this problem, this study is based on their common point "risk analysis" and is focused on fusion at the level of regional governance. Although both of these two fields have to do with risk, they define differently what risk means. In order to reach the fusion goal, the present study analyzed the relevant literature with respect to the definitions of risk and their respective factors, it examined a method to reduce risk factors through the use of expert questionnaires. The study developed the DRR & CCA (DRCA) risk template which assesses risks by taking into account the theory and practice at the same time. In the study, slope land disasters are taken as an example. First, a risk template analysis was performed which takes into account the interrelationship between risk factors and multi-level governance. Second, the risk factors and the corresponding capacity index were established. Third, with respect to future risks, the current risk and climate impact coefficient C were comprehensively assessed. Lastly, I have tried to propose a suitable fusion model for regional level of governance.



Methodology



2. Risk Analysis



4. DRCA Risk Evaluation

R=Hazard×Exposure× Sensitivity
 $R = F(H, E, S)$, S: Sensitivity (ISO14091,2019)
 $FR = F(C, R)$
 FR: Future Risk ; C: climate change impact factor
 $R = F(H - A_H, E - A_E, S - A_S)$
 A_H, A_E, A_S : Adaptation strategies for hazards, exposures, and sensitivities
 $R = F[(C \times H' - A_H), (E - A_E), (S - A_S)]$
 According to the statistics in the pass, August rain change values was taken as influence coefficient C, and the value in the interval 2022-1040 is 1.47, then C is 1.47.

In this case study

$$C = \Delta R = \text{Ratio } p_{\mu, m}$$

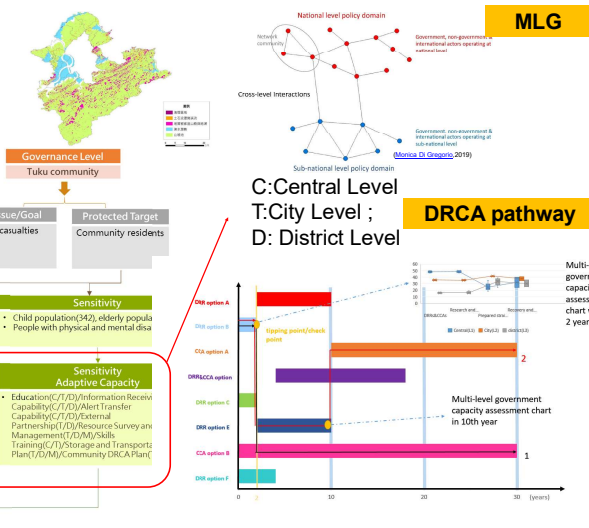
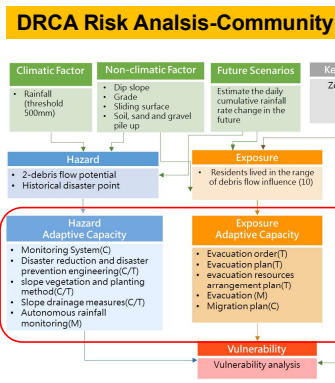
$$= \frac{\mu_{p, \text{future}, m}}{\mu_{p, \text{baseline}, m}}$$

CCSG (在研)	過去期間(過去)						未来期間(未来)					
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	
Task EMB-00	5.6	2.45	12.6	1.51	8.8	3.2	7.6	3.52				
Task EMB-01	8.5	1.11	1.8	1.38	7.6	2.54	4.8	2.36				
CSDBS-M&E-01	10.5	1.55	4.8	1.25	8.8	2	1.8	1.93				
CS244	8.5	1.17	8.8	1.89	8.8	1.98	8.8	3.35				
locasat-100	11.0	1.54	7-11.8	1.47	7.6	1.4	11.0	3.36				

- Risk Identification
- Delphi method for Expert questionnaire

Results & Discussion

By using DRCA risk template analysis, hazards, exposures, sensitivities and corresponding adaptation options can be identified during the discussion between relevant stakeholders. The choice of risk calculation indicators is related to key issues/goals and protected targets. The case study is about slope land disasters. The key issue or goal is to achieve zero casualties. The protected target is the community resident. Therefore, the representative indicators recommended here for representative risk factors are selected through relevant debris flow and landslide hazard reference studies and by use of expert questionnaires and key interviews. However, the quantitative calculation of indicators and the use of representative data will require further study in the future. The proposed adaptation options provide a reference for the corresponding pathway, which can reduce conflicting viewpoints between users. It provides an easier way to build DRCA fusion adaptation pathways, an assessment of DRRs or CCAs over time, and the effectiveness of these strategies at checkpoints or tipping points. The study provides a decision-making approach that would facilitate communication between local communities and other levels of governance.



Fecal-oral transmission assessment in peri-urban Lusaka, Zambia

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1. Background

Zambian peri-urban community

- Frequent *cholera* outbreak
- 1.4 million population
- *Diarrhea* in top 10 causes of death

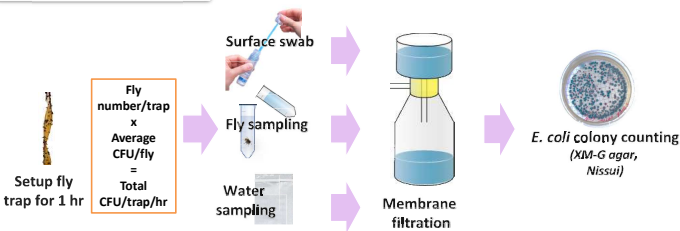


Urgent need to evaluate sanitary conditions in living environment.



How do fecal microbes transmit from one medium to another before ingested by a person?

2. Methods

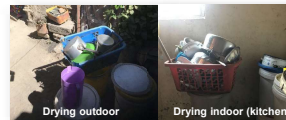


Study site: Chawama and Kanyama compound in Lusaka, Zambia
Target samples: Environment water, surfaces, flies in living environment (n: 12~36; 15 sample groups)
Survey date: June – July, 2019 (dry season)

3. Results: On-site investigation

For 24 houses visited (9 repeated in different days),

- 63% unroofed toilets
- 92% pit latrine, 8% septic tank

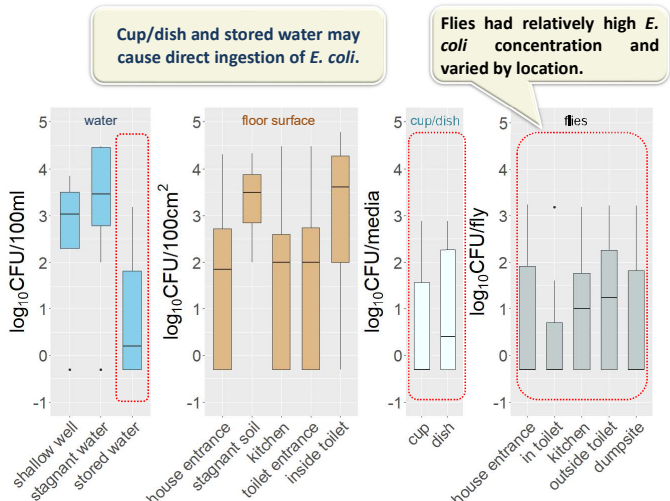


- 75% HHs washed dish/cup dried outdoor by sunlight

- In Kanyama (20 houses), 80% shallow well used for dish/cup washing
- In Chawama (4 houses), 100% tap water for all uses



4. Results: E. coli contamination level



	shallow well	stagnant water	stored water	house entrance	slagmanti soil	kitchen	toilet entrance	inside toilet	cup	dish	house entrance	in toilet	kitchen	outside toilet	dumpsite
+	10	14	12	13	15	16	15	18	21	12	12	5	8	14	19
n	12	15	24	24	15	25	22	22	36	23	32	16	15	32	41

Figure 1 E. coli contamination levels of various environmental samples

(+ shows positive E. coli sample numbers; n shows total sample numbers; all NDs (not-detected) were set to half of detection limit)

Future work:

- Host-specific source tracking in fecal transmission assessment
- Seasonal changes in transmission pathways
- Effect of distance of each fly-trap locations vs contamination level

We would like to express our gratitude towards all participants and local supporters in Chawama and Kanyama compounds

Funded by: KAKENHI 19H02274

5. Results: Potential transmission pathways in dry season

1) Dumpsite flies → Cup/dish → Stored water → Drinking

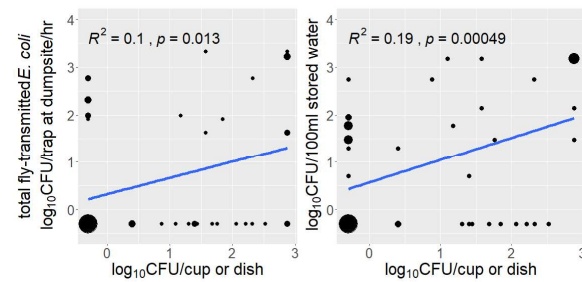
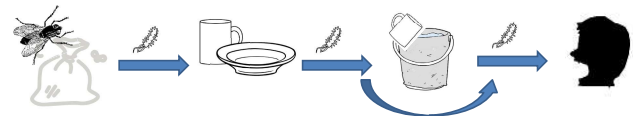


Figure 2 Correlation and significance between two media contamination levels: dumpsite flies vs cup/dish and stored water vs cup/dish (All NDS were set to half of detection limit)



2) Outside-toilet flies → House-entrance flies → Kitchen flies → Food/drink

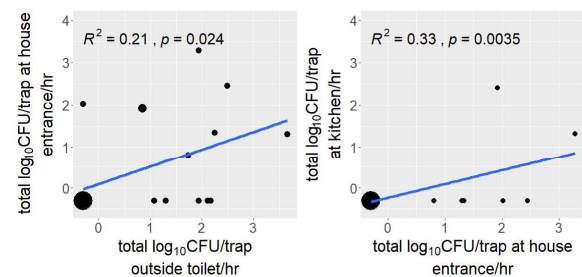


Figure 3 Correlation and significance between two media contamination levels: outside-toilet flies vs house-entrance flies and house-entrance flies vs kitchen flies (All NDS were set to half of detection limit)



The environmental education at MSW (Municipal Solid Waste) treatment facilities in Japan

Eiichi SUZUKI^{1,2}, Misuzu ASARI²

¹ The Environmental Education of KUNISAKI CLEAN CENTER

² Graduate School of Global Environmental Studies, Kyoto University

1. Background According to the MSW treatment in Japan, incineration is the most common method. The facilities are used for not only environmental learning, but also other community benefits, such as sports and spa by using the waste heat. However, there is no legal provision regarding the definition and operation of the environmental learning functions.

2. Purpose Clarify the environmental learning function as it is in an immature condition. Grasp the possibility of facility functions in the region and how to create a new base model. I would like to improve environmental learning at MSW treatment facilities in Japan.

3. Research method

• **Compare category classification:** I compared the category classification of the precedent research of environmental learning facilities in Japan.

• **Compare with social education facilities:** I compared the environmental learning facilities including MSW treatment with the social educational ones.

• **MSW treatment facility during the construction plan:** Focusing on the facility installation stage and comparative study on the environmental learning function in the recent basic construction plan.

4. Results and consideration

In **table 1**, the waste type and the natural type, these are important positions.

In **table 2**, the establishment of the social educational facilities is enacted by law. On the other hand, there are many environmental learning facilities nationwide, but there is still no legal basis for facility installation and operation.

table 2: Comparison table : Legislation on the establishment

	Public hall	Youth house (Youth exchange house, Youth nature house)	Environmental facilities		
			Environmental learning base facilities and NPO support base facilities in local governments	Bases for environmental conservation activities	Environmental learning facility at MSW treatment plants
Number of domestic facilities	14,841	28	100	160	1,600
Domestic regulations in installation	In the Social Education Act (1949), the necessary standards for establishing and operating public halls	At the Ministry of Education Establishment Act (1949), "The National Central Youth House will be an institution to train sound young people through group accommodation training"	Environmental Education Promotion Law, Environmental Education Support Organization Designation System	Establishment of a system that functions as a base for Promotion of environmental education promotion law etc., Global Warming Prevention Activity Promotion Center in the Act on Promotion of Global Warming	Describe the environmental education function in the waste disposal facility development plan (2018) (There is mention in the waste disposal law concerning the establishment of persons promoting waste reduction, etc. / no mention of facilities)
Domestic conference (research organization)	The Japan Society for the study of Kominkan	{Japan Outdoor Education Society }	{The Japanese Society of Environmental Education, Japanese Society of ESD, etc.}	{The Japanese Society of Environmental Education, Japanese Society of ESD, etc.}	The Japan Society of Material Cycles and Waste Management, Environmental Education Facility Research Group (2016), Living environment net C & C (2012), Environmental learning facility network LCNNet (2006), EIC (2005)
Association etc. (National organization)	National Kominkan Association	National Institution For Youth Education	Council for Promotion of Environmental Education, ESD Resource Center, etc.	Global Warming Prevention Activity Promotion Center	Environmental Education Facility Research Group is building a network nationwide
Expertise (qualification etc.)	Social education supervisors, Community center managerial qualification	Nature Experience Activity Leader, School Teacher's License, etc.	Registration system for human resource certification business of Environmental Education Promotion Law	Climate change action officers of Promotion of environmental education promotion law	{There is mention of the establishment of promoters such as the Waste Disposal Law etc. / No mention of facilities}
Public training, etc.	Course organized by Ministry of Education, Culture, Sports, Science and Technology etc.	Training course by the National Institution For Youth Education and Ministry of Education, Culture, Sports, Science and Technology etc.	Experience occasion certification system, other related ministries' environmental education training of Environmental Education Promotion Law	{Local governments, including prefectures, conducts training etc. as necessary}	{Research organizations and others voluntarily implement}

table 1: Category of precedence researches

Precedence Research	Category				
	Waste type	Natural type	Museum type	Learning type	Others
Kazuoki Ohara (2000)	Recycle plaza type	Nature observation center type	Museum type	Learning center type	In-laboratory type
Hiroki Ogawa, Masuro Urayama (2004)	Recycle plaza type	Nature observation center type	Museum	Environmental learning and Information facilities	Public hall/ Lifelong learning facility
Environmental Learning Centers' Network (2007)	Recycle plaza type, and preservation facilities	Understanding of nature preservation center	Other facilities (including Museums)		
HOKKAIDO ENVIRONMENT FOUNDATION (2016)	Waste related facilities	Natural facility	Science Museum / Museum		Accommodation training facilities, Zoo, Aquarium, etc.

Important position!!

The social education facilities have legislation on the establishment and operation of the facilities.

The environmental learning facilities have just started activities by research organizations related to the facilities and operations.

The environmental learning facilities have no qualification or personnel training related to facility operation.



The specific gravity of environmental learning in the overall facility management.

Necessity of operational plan and its hardware design

Management method for utilize facility characteristic, and regional evaluation

Specification (Plan)

Design (Completed)

Operation and HR development (Performance)

Figure 1: From the facility design stage

However, there is an increasing awareness of the environmental education function. Social education facilities have well established academic societies and organizations, but environmental learning ones have only just started their activities. **From the facility design stage (Fig. 1)**, in view of these results, I will conduct the comprehensive management research from legal maintenance of the facility up to its management and human resource development. And, I will need a new system design of the facility for the development of local research methods from the design stage to the operational evaluation. For example, there is an interpreter evaluation equation that was first found and used in the US National Park Service.

5. Conclusion Environmental learning function in the MSW treatment facilities is indispensable. The facilities should consider not only the environmental learning function but also the standard guidelines and the way of operation toward the utilization of facilities as regional bases.

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Identification of Organic Compounds in Air Fresheners

Authors: Hayley Furnell, Niall O'Sullivan, John Wenger

Centre for Research into Atmospheric Chemistry,
School of Chemistry,
University College Cork



Background

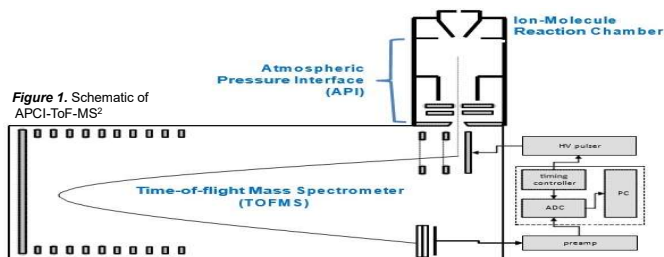
The impact indoor air quality has on human health is an area of growing concern, considering we spend up to 90% of our lives indoors. The indoor environment acts as a trap for pollutants, often resulting in the indoor pollution level exceeding that of the outdoor environment¹. Organic compounds are an important group of indoor air pollutants, which are composed mainly of carbon, hydrogen and oxygen. Air fresheners are a major source of organic compounds. They emit a multitude of organic compounds, however, usually less than 10% of them are listed as ingredients. Many are toxic and pose a health threat². In this project the emissions of an Air Wick Essential Oils Muddled Wine Air Freshener were analysed using an APCI-ToF-MS, with FIGAERO for sampling.

Instrumentation

APCI - ToF - MS

Atmospheric Pressure Chemical Ionisation Time-of-Flight Mass Spectrometer

- Methyl iodide is ionised to produce reagent ion I^+ .
- Organic aerosol undergoes chemical ionisation with I^+ at atmospheric pressure in the IMR.
- Deprotonated ions and ion-iodide clusters are produced.
- Ions are separated according to m/z based on time of flight.



FIGAERO

Filter Inlet for Gas and AEROsols

- FIGAERO allows sampling of both the gas and particle phases.

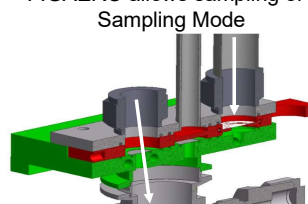


Figure 2. FIGAERO in sampling mode³

- Gases pass through the gas phase sampling port.
- Particles are collected on a PTFE filter in the particle phase sampling port⁴.

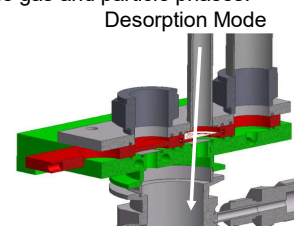


Figure 3. FIGAERO in desorption mode⁵

- The tray is repositioned to close the sampling ports.
- The PTFE filter is moved to the desorption chamber, where the particles are thermally desorbed.

Experimental Set - up

- The FIGAERO was connected to the APCI-ToF-MS.
- A tube was positioned above the air freshener to allow the emissions to flow directly to the FIGAERO sampling port.

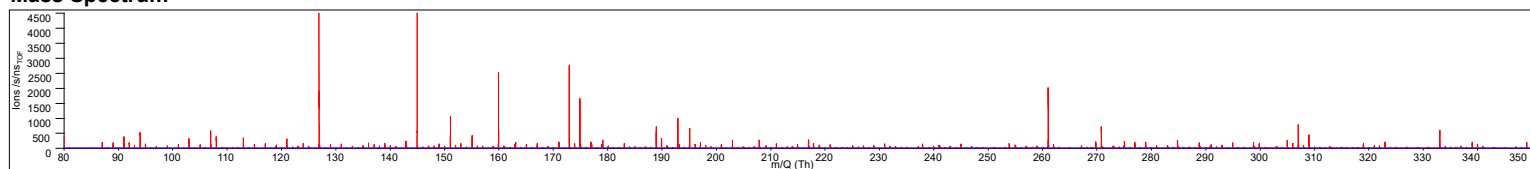


Methodology

- Background air was sampled for 10 minutes. The air freshener was plugged in and the air was monitored for 42 minutes.
- Monitoring was continued until the concentrations of organic compounds returned to their initial levels.

Results

Mass Spectrum



Graph 1. Mass Spectrum of gas phase sampling with air freshener on.

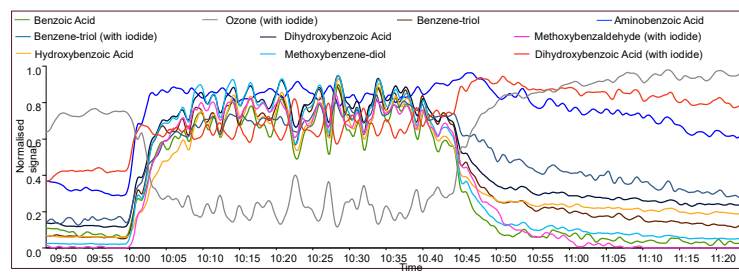
Benzoic Family

All of the compounds in the benzoic family contain the structure of benzene.



Benzoic Family	Molecular Formula	Ion	Iodide-ion Cluster
Benzoic Acid	$C_6H_6O_2$	Gas	
Benzene-triol	$C_6H_6O_3$	Gas	Gas & Particle
Aminobenzoic Acid	$C_6H_7NO_2$	Gas	
Hydroxybenzoic Acid	$C_6H_6O_3$	Gas	
Methoxybenzoic Acid	$C_8H_8O_4$	Gas	Gas & Particle
Di-hydroxybenzoic Acid	$C_6H_6O_4$	Gas	Gas & Particle
Methoxybenzaldehyde	$C_8H_8O_2$	Gas	

Table 1. Benzoic Family ion detection form and phase.



Graph 2. Time Series plot of the benzoic family during sampling.

Conclusions

- Hundreds of organic compounds were detected by the APCI-ToF-MS, most of which were observed in the gas phase.
- The ions produced depended on the degree of oxygenation of the compound.
- The time series shows that some compounds were emitted directly from the air freshener and others were produced after it was turned on, these compounds all show a strong anti-correlation relationship with ozone.

Future Work

- Perform further analysis to allow identification of other compounds emitted by the air freshener in the gas and particle phases.
- Quantify the levels of the detected compounds with the use of standards.
- The use of air fresheners leads to the inhalation of small particles, which causes breathing difficulties and aggravates migraines, future work includes the determination of the health implications of further detected compounds.

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Positioning System using Spread Spectrum Sound for Greenhouse Robots

Authors: Zichen Huang*, Tsay Lok Wai Jacky*, Zhao Xunyu*, Kim JungBin*, Tomoo Shiigi**

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**Department of Ocean Mechanical Engineering, National Fisheries University

Abstract

This research proposes the method to measure the orientation and quadcopter of greenhouse robots by means of the Spread Spectrum sound-based (SSSound) positioning system. Position and orientation measurement method is crucial to control ground-based robots and quadcopter in agriculture field, and the positions of quadcopters can be measured by SSSound. The maximum horizontal accuracy is 20 mm in a 30 m square field (Widodo, EAEP, 2014). The objective of this research is building the positioning system with orientation and position estimation for multi-robots in greenhouse. This poster introduces the research topics of our group.

Background

- ✓ In recent years, many new agricultural robots have been developed.
- ✓ It is necessary for operation of all moving multi-robots with positioning system.
- ✓ There are many devices already used to measure orientation, such as magnetic azimuth meters and the GPS compass. Both are inadmissible indoors.
- ✓ SSSound can be used to measure position, and even orientation.

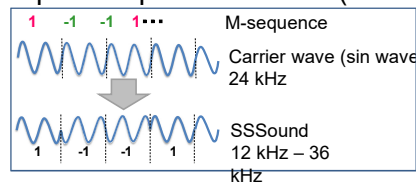


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<http://www.drone-air.com/wp-content/uploads/2015/10/agricultural-precision-farming-drone-air.jpg>

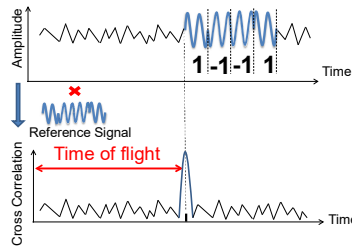
SSSound-based positioning system

1. Spread Spectrum Sound(SSSound)



2. Estimation of position

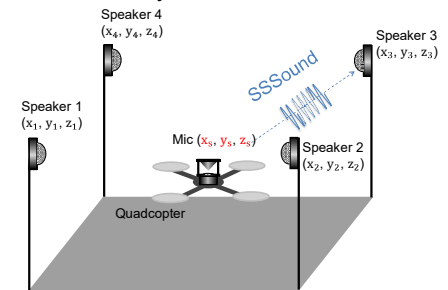
After microphones received signal, time of flight of SS sound from speaker to microphone is obtained by correlation calculation and detecting correlation peak.



Distance d between speaker and microphone is calculated as equation (1).

$$d = t \times v \quad (1)$$

Where, t is time of flight of SS sound between speaker and microphone, v is sound velocity.



The position of speaker (x_s, y_s, z_s) can be obtained by more than three distances between the speaker and each microphone as equation (2)

$$d_i = \sqrt{(x_s - x_i)^2 + (y_s - y_i)^2 + (z_s - z_i)^2} \quad (2)$$

Where, d_i : Distance between speaker and each mic

(x_i, y_i, z_i) : Each mic's coordinates

Positioning & Orientation estimation

There has the following two methods for the orientation

• Method 1

Orientation $(P_{m1}P_{m2})$ is calculated by the obtained coordinates.

$$P_{m1}P_{m2} = P_{m2}(x_{m2}, y_{m2}, z_{m2}) - P_{m1}(x_{m1}, y_{m1}, z_{m1})$$

• Method 2

$P_{m1}P_{m2}$ is calculated by the coordinates of Mic 1 and the difference between distances from each Mic to specific Speaker. Method 2 can improve accuracy by calculation as below.

$$P_{m1}P_{m2} = (p_{m1}p_{si}^T \cdot p_{m1}p_{si})^{-1} \cdot (p_{m1}p_{si}^T \cdot \vec{d}_i)$$

Temperature Compensation Method

- Temperature is used to estimate the sound velocity. Temperature compensation using the estimated sound velocity localization method.

$$(v)(t_i) = \sqrt{(x_s - x_i)^2 + (y_s - y_i)^2 + (z_s - z_i)^2}$$

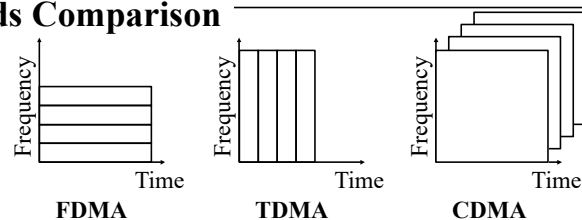
where: (x_s, y_s, z_s) are known speakers' coordinates, t_i is measured propagation time, (x_i, y_i, z_i) are the unknown target position (v) estimated sound velocity is also unknown.

This method assumes the evenly distributed temperature in greenhouse, so the sound velocity in four distance is same. The four distance from tweeters to microphone give four equations with four unknown values. The unknown value can be estimated by iteration.

Multi-Access Methods Comparison

In order to localize the multi robots in the greenhouse, the following multi-access methods need to be evaluated in order to decrease the interference with each speaker.

- TDMA (Time Division Multiple Access)
- FDMA (Frequency Division Multiple Access)
- CDMA (Code Division Multiple Access)



Greenhouse Gas Emissions from Blackwater Septic Tank in Tropical Climate Region: A Case Study of Hanoi, Vietnam

HUYNH Tan Loi*, Hidenori HARADA**, and Shigeo FUJII**

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1. INTRODUCTION

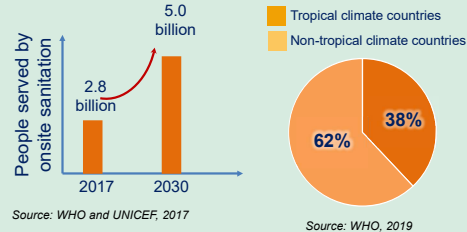


Fig 1 Onsite sanitation coverage

Fig 2 Basic sanitation coverage

- In 2006, IPCC proposed CH₄ emission factor (EF) of **septic systems** (IPCC, 2007);

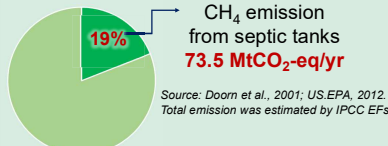


Fig 3 Global non-CO₂ emission of wastewater sector

- Only **2** studies focused on GHG emissions for septic systems which received **mixed black and greywater in USA** (Diaz-Valbuena et al., 2011; Truhlar et al., 2016)
- > Lack of information in **blackwater septic tank under tropical climate**
- Septic tanks in some tropical countries (Vietnam, Myanmar, India) receive only **blackwater** (Nguyen et al., 2007, Naing, 2019, Singh et al., 2015);

OBJECTIVE To monitor GHG emissions from blackwater septic tanks in tropical climate regions

2. MATERIALS AND METHOD

Table 1 Surveyed household information

ID	Household size	No. of toilet	Type of toilet	Volume per flush (L)	Year of construction	Years since septic tank emptied	No. of septic tank's compartment	Effective volume of septic tank (m ³)	Effective volume of septic tank of 1 st compartment (m ³)	Depth of water (m)	Depth of septicage (m)
HH1	5	2	Flush toilet	4.5/8.0	2000	3.9	3	2.6	1.82	0.472	0.397
HH2	5	3	Flush toilet	4.0/6.0/8.0	2005	10.0	3	1.57	0.96	0.211	0.489
HH3	4	2	Flush toilet	5.0/5.0	2005	14.0	3	2.16	0.99	0.036	0.664
HH4	4	3	Flush toilet	4.5/4.5/4.5	2012	7.0	3	3.24	2.28	0.235	0.705
HH5	3	2	Flush toilet	4.5/4.5	2001	18.0	3	2.45	1.65	0.394	0.696
HH6	4	1	Flush toilet	8.0	2000	4.0	2	1.84	1.07	0.055	0.785
HH7	3	3	Flush toilet	4.0/4.0/4.0	2010	9.0	3	3.01	2.14	0.38	0.8
HH8	6	3	Flush toilet	6.0/4.5/4.5	2000	19.0	3	1.98	1.32	0.051	0.829
HH9	5	2	Flush toilet	5.0/5.0	2005	14.0	3	3	2.26	0.5	0.5
HH10	6	3	Flush toilet	4.5/4.5/4.5	2010	4.0	3	1.44	0.82	0.7	0.3
Average	4.5	2.4				10.3	2.9	2.3	1.5	0.3	0.6
S.D.	1.08	0.7				5.7	0.3	0.7	0.6	0.2	0.2

Effluent quantity and quality were determined by a monitoring system installed in HH1 and HH2 (Fig 4). Septage was sampled by transparency cylinder (Fig 5).

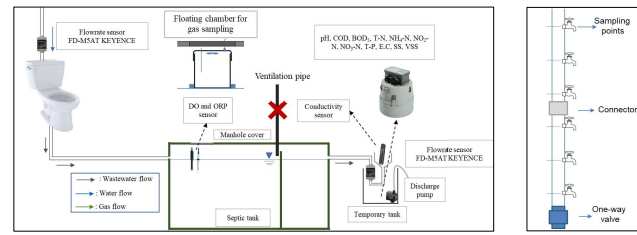


Fig 4 Experimental design

Fig 5 Transparency cylinder

GHG emission was measured by a floating chamber for 10 septic tanks (STs) in Hanoi. The floating chamber was inserted through inspection/emptying hole;

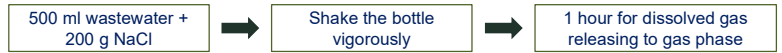


Gas mass emission rates were determined from the flux chamber measurements by plotting [X]_t (gas concentration (mg/m³)) against time. The slope from a linear fit to the data creates the mass emission rate.

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

Where:
E: the emission rate of 1st compartment (g/cap/day);
m: mass emission rate (g/m³/min);
n: household size (capita);
V_{FC}: the chamber volume (m³);
A_{comp}: Area of the 1st compartment (m²);
A_{FC}: area covered by floating chamber (m²).

Dissolved gas sampling – "Salting out Method" (Daelman et al., 2012)



The dissolved gas was analyzed for effluent WW of septic tank 1 and 2

3. RESULTS AND DISCUSSION

- The ratio of wastewater volume between influent and effluent of septic tank was **95 - 98%**. This gap could be explained by **urine and feces volume**.

- The water consumption, effluent quality, and septage composition (Table 2) were in the range of previous studies in Vietnam (Pham, 2014)

Table 2 Effluent wastewater loading of septic tank in HH1, HH2 and literature data

	COD ₅ loading (g/cap/d)	BOD ₅ loading (g/cap/d)	SS loading (g/cap/d)	VSS loading (g/cap/d)	T-N loading (g/cap/d)	NH ₄ -N loading (g/cap/d)	NO ₂ -N loading (g/cap/d)	NO ₃ -N loading (g/cap/d)	T-P loading (g/cap/d)
Mean	10.18	7.04	0.70	0.57	6.37	4.67	0.12	0.05	0.57
S.D.	3.16	2.25	0.26	0.19	1.83	1.33	0.04	0.02	0.15
Range	4.86-16.82	3.36-11.56	0.32-1.30	0.24-0.94	3.44-10.74	2.46-7.82	0.06-0.20	0.02-0.08	0.30-0.84
Mean	16.91	11.41	3.65	3.12	7.80	6.02	0.18	0.01	0.79
S.D.	7.25	4.80	1.61	1.39	3.41	2.60	0.07	0.01	0.43
Range	8.54-26.94	6.02-18.00	1.92-5.90	1.54-5.14	3.98-12.56	3.14-9.54	0.10-0.30	0.02	0.38-1.52
Pham, 2014 (Vietnam)	Mean	12	7	2	-	1.61 (TKN)	-	-	0.39

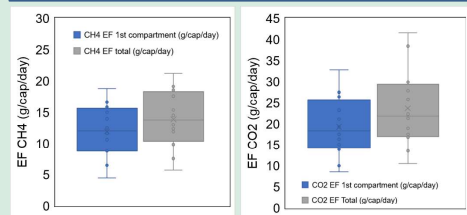


Fig 6 CH₄ and CO₂ emission rates from blackwater septic tank in Hanoi

Septic tanks in Leverenz's study:

- Received mixed black and greywater;
- Shorter HRT (10 days) while HRT in this study was longer (26 day);
- Lower liquid temperature: 14-26°C (compared to this study ~30°C);
- ORP values in their study was higher than this study.

Leverenz et al., (2010)

CH₄: 11 g/cap/day
CO₂: 33.3 g/cap/day

This study

CH₄: 13.01 g/cap/day
CO₂: 21.99 g/cap/day

IPCC & USEPA estimation EFs

CH₄: 26 g/cap/day

IPCC estimation based on:

- Biodegradation of mixed black and greywater under anaerobic process;
- 50% of influent BOD conversion to CH₄ while previous studies determined that BOD removal efficiency of septic tank was less than 50%.

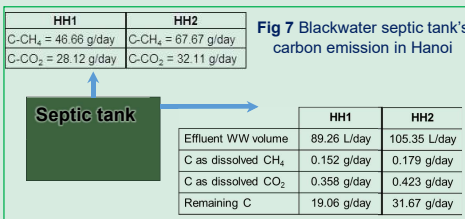


Fig 7 Blackwater septic tank's carbon emission in Hanoi

There is a correlation between CH₄, CO₂ and DO, ORP which was indicated by regression analysis and p-values < 1%.

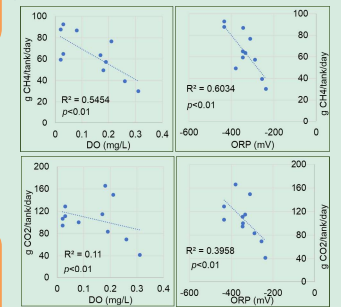


Fig 8 Comparison of the gas emission rates and the DO, ORP values

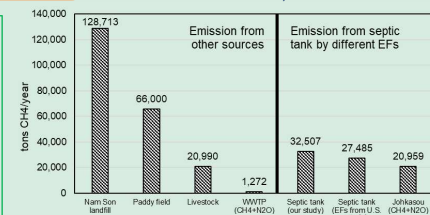


Fig 9 Methane emission from different sources in Hanoi

4. CONCLUSIONS

- This study was monitored GHG emissions from **blackwater septic tanks** in Hanoi, an example of **tropical climate regions**. The mean emission rates of CH₄ and CO₂ were **13.01 (σ = 1.49) and 21.99 (σ = 1.50) g/cap/day**, respectively;
- The **majority** of carbon emission from septic tank was under **gas form**; There is a **correlation** between DO, ORP and GHG emission rates;
- Methane emission from **septic tank** in Hanoi was **higher** than from **available WWTPs and livestock** in Hanoi.

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This poster is undisclosed

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

Evaluation of Forest Environmental Education Program for Elementary School Students in Japan: An Analysis from Perspective of ESD

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1. Introduction

Education for Sustainable Development (ESD) :Critical for Younger generation facing Climate change, Biodiversity loss, Economic inequality, Alienation from nature

Forest in Japan: 70% of Japan's total land

Field Trip including outdoor learning: 87.9% of elementary school implemented in 2013 (Ministry of Education, Culture, Sports, Science and Technology-Japan 2016)

Forest Education: Forest as familiar nature and a part of the culture

Issue including sustainability

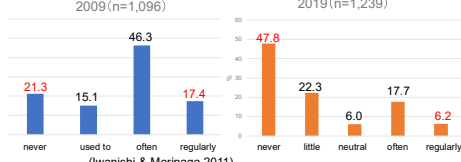
e.g. Value of the ecosystem of forests, Sustainable forest management

Familiarity as the learning subject:

promoting active involvement of learners

→Meet the content and interactive pedagogy of ESD (UNESCO, Forest Agency in the Ministry of Agriculture, Forestry and Fisheries n.d.)

Playing Experience in the forest



The rate of students playing regularly in the forest : illustrating 'Attachment to the forest'
Halved compared to a similar survey done 10 years ago
→ Forest Education is necessary for conservation effort

2. Case study

Shiga Prefecture mainly included within the Watershed of Lake Biwa

- 1970s: Pollution to conservation movement
- 1980s: Launched Environmental Education (EE) programs
- 2004 : The first local regulation for promoting EE

The educational program for case study:

Yamanoko (Children in the Mountain)

Where:

9 logging sites in Shiga

How long:

One day or Overnight

Who attend:

All fourth-grade elementary students (9-10 years old) in Shiga from both public and private schools

Program goal:

- Help students understand about forest
- Encourage their curiosity about forests
- Foster their communication skill



3. Research objective and research questions

Research Objective

Understand how students perceive local ecology and community through the program

Research Questions

RQ1: How does this program affect students' perception of the forest?

RQ2: Does this program provide opportunities to learn about the place including information about the local community or society?

RQ3: Which factors promote students' willingness to act for conservation?

4. Methodology

Pre- or Post-trip Questionnaire

[Pre-test 14 items, Post-test 16 items, in 10 min]

When: May to July, 2019

Who: Students (n=1,341) in 25 elementary schools

Items: 5 point Likert scale

—Program Goal, Local Place, Local Livelihood

Open ended response

—What they learned, Image of forest, Awareness of conservation

Software

•Statistical Analysis: IBM SPSS statistics version 25

Significance level: $p < 0.05$

•Text mining: KH coder

Leven-test → Homogeneity variance: t-test
Inhomogeneity variance: Welch-test

5. Results

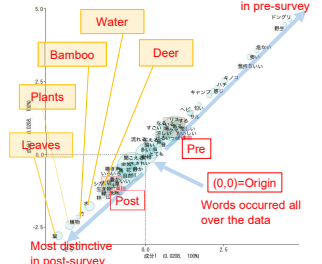
Response rate: Pre-trip survey n=1,239 (92.4%), Post-trip survey n= 1,227 (84.0%)

Reliability: Cronbach's alpha internal consistency reliability coefficients=0.84 (total scale)

RQ1: How does this program affect students' perception of the forest?

Difference of the image of forest between pre- and post-test

Figure: Correspondence analysis



Text mining for Q16 "Write your image of forests."

10,197 words used for analysis (Total 34,393 words)

The distinctive words in post-survey:
- "Leaves", "Plants", "Bamboo", "Water"
- "Deer"; the only animal

RQ2: Does this program provide opportunities to learn about the place including information about the local community or society?

Larger significant increase from Pre- to Post-survey

Q7 "I know/ learned the connection between Lake-Biwa and forest."

Mean: $2.35 \pm SD1.3 \rightarrow 4.18 \pm 1.2 (p=0)$

Q8 "I know/ learned the connection between forest and local livelihood."

Mean: $2.35 \pm 1.6 \rightarrow 4.35 \pm 1.0 (p=0)$

Place Attachment

Q10 "I like Shiga prefecture as the place I'm living."

=Watershed of Lake Biwa

Mean: $4.45 \pm 0.9 \rightarrow 4.53 \pm 0.9 (p=0.024)$

RQ3: Which factors promote students' willingness to act for conservation?

Stepwise multiple regression analysis

Q13 "I want to conserve the nature in Shiga." : Mean=4.63 SD±0.7

	Mean	Beta	t	VIF
Q14: I want to conserve the livelihood of local people.	4.59	.396	15.317	1.724
Q10: I like Shiga prefecture as the place I'm living.	4.53	.205	8.416	1.521
Q6: I want to visit the forest again.	4.37	.121	4.400	1.982
Q3: I understand forest functions to maintain our local livelihood.	4.62	.109	4.488	1.504
Q12: I became to like playing in the nature much more.	4.35	.106	3.842	1.972
Q5: I learned it is important to cooperate with peers.	4.59	.059	2.620	1.297

$p < 0.01$, Adjusted $R^2 = 0.562$

The predictors for the willingness to act for conservation:

- Interest for local livelihood
- Place attachment
- Enjoyable experience with peers

6. Key findings

RQ1: Students' perception of the forest :

More holistic understanding of forest and ecosystems

RQ2: Student perceptions of the local ecology and community:

The program successfully emphasized the connection between forests and local livelihoods

→Social science topics such as human geography and history should be integrated

RQ3: Factors promote students' willingness to act for conservation:

To increase students willingness to act for conservation, the forest education should include

- Learning about local livelihoods

- Enjoyable outdoor activities that involve interaction with peers

→Field trip should not focus only on the observation of the ecology of the forest connected with the subject of natural science

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Are **unmaintained** sensors useful to monitor wastewater treatment plants?

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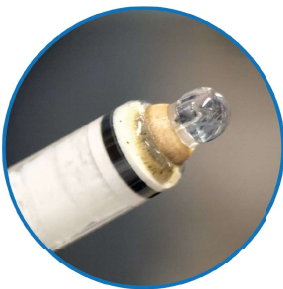
^{**} Eawag, Swiss Federal Institute of Aquatic Science and Technology



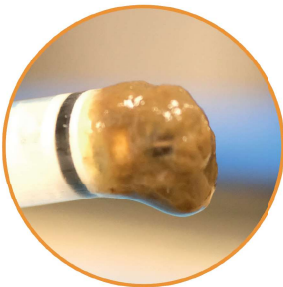
Motivation

- Monitoring can improve the treatment performance of wastewater treatment plants (i.e. low ammonium effluent).
- Especially for on-site wastewater treatment plants monitoring comes at high monetary costs.
- Unmaintained** sensors are an attractive solution.

maintained pH



VS

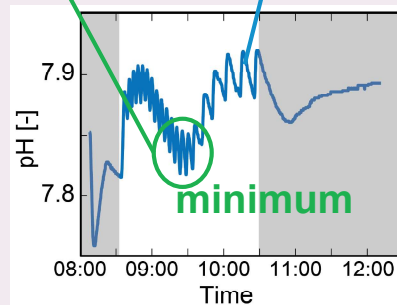


unmaintained, drifting pH

Analytical approach

A local **minimum** in the pH signal acts as a proxy for the ammonium effluent concentration. As a **minimum** in the pH occurs when the ammonium is fully oxidised.

pH signal during aeration



INPUT + MODEL = PREDICTION

automatic **minimum** detection per cycle:
minimum present?

yes

no

ammonium effluent $\leq 1 \text{ g}_N\text{m}^{-3}$

ammonium effluent $> 1 \text{ g}_N\text{m}^{-3}$

Experiment

- Sequencing batch reactor monitored for one year.
- One **maintained** and four **unmaintained** pH sensors.
- Ammonium effluent concentration measured for 107 cycles.

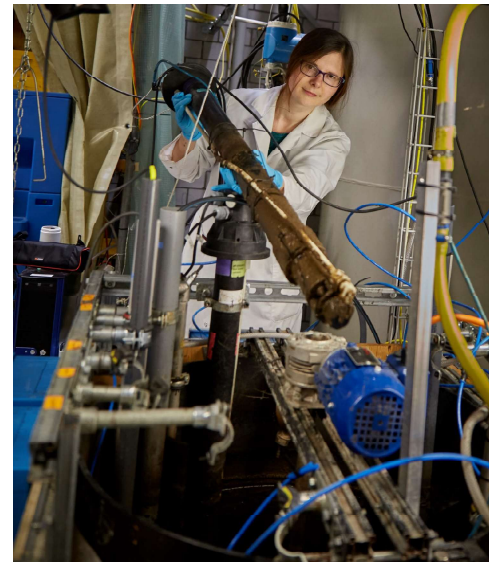


Figure: Experimental setup with unmaintained sensors.

The ammonium effluent measurements are used as a measure of success for the prediction.

Results

		measured ammonium effluent concentration									
		$\leq 1 \text{ g}_N\text{m}^{-3}$				$> 1 \text{ g}_N\text{m}^{-3}$					
maint. = maintained pH sensor unm. = unmaintained pH sensor	minimum observed?	maint.	unm. 1	unm. 2	unm. 3	unm. 4	maint.	unm. 1	unm. 2	unm. 3	unm. 4
		yes	41	40	41	39	39	1	1	1	1
	no	15	16	15	17	17	50	50	50	50	50

Conclusions

- Same prediction accuracy with **unmaintained** (despite a drift of about 0.5-1 pH/year) and **maintained** pH signal as input.
- High accuracy when detecting a **minimum**, lower accuracy when not detecting a **minimum**.
- A key step towards real-time, remote monitoring of on-site wastewater treatment plants.

This poster is undisclosed

Rate constant of the reaction of $\text{HO}_2 + \text{DO}_2$

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Introduction

The HO_2 radical is a key species in many chemical processes both in the gas and in the heterogeneous phase. Its responsibility in cycles of destruction of stratospheric O_3 as well as its ability to oxidize the main VOCs of the troposphere through its coupling with OH can be mentioned. Understanding the mechanisms involving HO_2 requires the development of tools capable of detecting and quantifying this radical in its environment.

The DO_2 radical does not play any role in atmospheric chemistry, but a selective detection is nevertheless highly desired in laboratory studies for carrying out mechanistic studies, especially involving hydrogen abstraction mechanisms.

The reactions of $\text{DO}_2 + \text{DO}_2$ and $\text{DO}_2 + \text{HO}_2$ have been studied by the simultaneous, selective and quantitative measurement of HO_2 and DO_2 by cw-CRDS in the near infrared, coupled to a radical generation by laser photolysis.

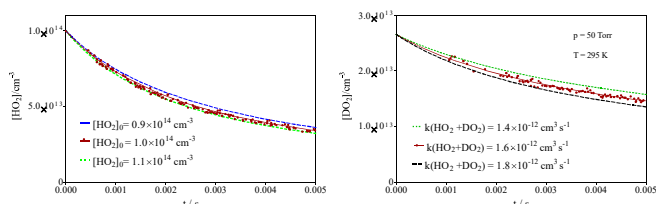
Objectives

- ① Determination of the absorption cross section of selected HO_2 (DO_2) lines
- ② Determination of the rate constants $\text{DO}_2 + \text{HO}_2$ reaction
- ③ Determine $k_{\text{HO}_2 + \text{DO}_2}$ as a function of pressure

Experimental results

HO_2 is formed through the photolysis of Cl_2 in presence of CH_3OH and O_2 :

Measurement of $\text{DO}_2 + \text{HO}_2$

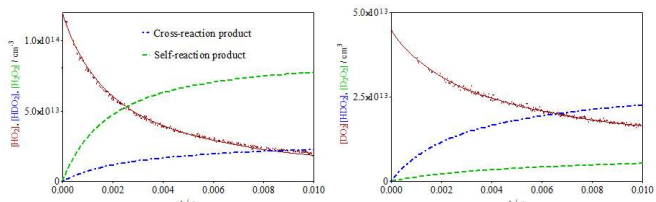


Left graph: $[\text{HO}_2]$ profile. Full line shows best fit using the rate constant from table (right) leading to $[\text{HO}_2]_0 = 1 \times 10^{14} \text{ cm}^{-3}$. Admitting uncertainty of 10% in the absorption cross section for HO_2 , the initial concentration of $[\text{HO}_2]$ has been varied between $9 \times 10^{13} \text{ cm}^{-3}$ (upper dotted line) and $1.1 \times 10^{14} \text{ cm}^{-3}$ (lower dashed line, both normalized for visibility)

→ HO_2 concentration can be very well determined by measuring decay.

Right graph: Corresponding $[\text{DO}_2]$ profile. Using $[\text{HO}_2]_0 = 1 \times 10^{14} \text{ cm}^{-3}$, the rate constant $k_{\text{HO}_2 + \text{DO}_2}$ has been varied between $1.8 \times 10^{-12} \text{ cm}^3 \text{ s}^{-1}$ (lower dashed line) and $1.4 \times 10^{-12} \text{ cm}^3 \text{ s}^{-1}$ (upper dotted line)

→ DO_2 profile is very sensitive to rate constant of $\text{HO}_2 + \text{DO}_2$ reaction.



A Product analysis for HO_2 (left graph) and DO_2 (right graph) shows that for HO_2 the main loss is **self-reaction**, whereas for DO_2 it is **cross-reaction**.

Reaction	Rate constant / $\text{cm}^3 \text{ s}^{-1}$	
$\text{HO}_2 + \text{HO}_2 \rightarrow \text{H}_2\text{O}_2 + \text{O}_2$	1.63×10^{-12}	[2]
$\text{HO}_2 + \text{DO}_2 \rightarrow \text{HDO}_2 + \text{O}_2$	1.63×10^{-12}	(This work)
$\text{DO}_2 + \text{DO}_2 \rightarrow \text{D}_2\text{O}_2 + \text{O}_2$	4×10^{-13}	[2]

Experimental technique

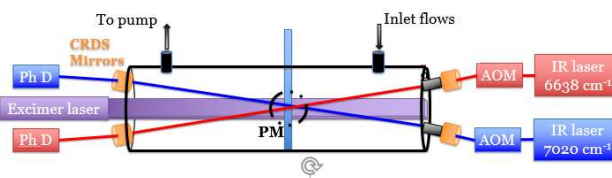
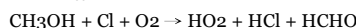
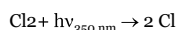


Fig.1: Schematic view of the photolysis cell coupled with two cw-CRDS and LIF techniques (PhD: Photodiode, AOM: Acousto-Optic Modulator, PM: Photomultiplier)

There are three main parts in our experiment:

- The photolysis cell with an excimer laser used at 351 nm.
- The two cw-CRDS for the simultaneous time-resolved detection of absolute HO_2 (at 6638.58 cm^{-1}) and DO_2 (at 7026.16 cm^{-1}). Possibility to measure other radical or molecular species [1].
- A high repetition rate laser induced fluorescence path for relative OH profiles, not used in this work.

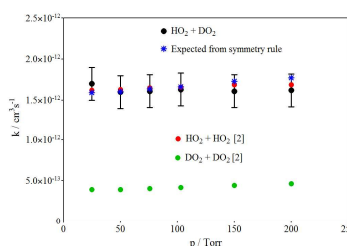


Low concentrations of DO_2 are formed simultaneously by adding some D_2O to the gas flow, leading through H/D exchange to:



Rate Constant of $\text{HO}_2 + \text{DO}_2$ at different pressures

The Rate Constant of $\text{HO}_2 + \text{DO}_2$ reaction was determined between 24.9-200 Torr Helium using the kinetic method, $k_{\text{HO}_2 + \text{HO}_2}$ and $k_{\text{DO}_2 + \text{DO}_2}$ for the different pressures has been taken from literature [2]:



p / Torr	$k_{\text{HO}_2 + \text{HO}_2} / \text{cm}^3 \text{ s}^{-1}$ [2]	$k_{\text{DO}_2 + \text{DO}_2} / \text{cm}^3 \text{ s}^{-1}$ [2]	$k_{\text{HO}_2 + \text{DO}_2} / \text{cm}^3 \text{ s}^{-1}$	$k_{\text{HO}_2 + \text{DO}_2} / \text{cm}^3 \text{ s}^{-1}$
25	1.62×10^{-12}	3.83×10^{-13}	1.7×10^{-12}	1.60×10^{-12}
50	1.63×10^{-12}	3.94×10^{-13}	1.6×10^{-12}	1.60×10^{-12}
76	1.65×10^{-12}	4.06×10^{-13}	1.61×10^{-12}	1.64×10^{-12}
103	1.66×10^{-12}	4.17×10^{-13}	1.65×10^{-12}	1.66×10^{-12}
151	1.69×10^{-12}	4.44×10^{-13}	1.61×10^{-12}	1.73×10^{-12}
200	1.69×10^{-12}	4.64×10^{-13}	1.62×10^{-12}	1.77×10^{-12}

The rate constant of $\text{HO}_2 + \text{DO}_2$ reaction is found independent of pressures within experimental error, in agreement with HO_2 and DO_2 self-reactions, and in excellent agreement with what is expected from the symmetry rule:

$$k_{A+B} = 2 \times \sqrt{k_{A+A} \times k_{B+B}}$$

Conclusion

- ① The absorption cross sections of HO_2 (DO_2) line at 6638.58 (7026.16) cm^{-1} was determined between 24.9 and 151 Torr and was used for selective detection of both species.
- ② The rate constant of $\text{HO}_2 + \text{DO}_2$ reaction, $k_{\text{DO}_2 + \text{HO}_2} = (1.63 \pm 0.2) \times 10^{-12} \text{ cm}^3 \text{ s}^{-1}$, at 50 Torr and 298 K were determined using a simple model.
- ③ The rate constant of $\text{HO}_2 + \text{DO}_2$ reaction is constant at the different pressures and in excellent agreement with values such as expected from applying the symmetry rule to literature values for HO_2 and DO_2 self-reaction.

References: [1] Assaf et al., JQSRT, 2018
[2] Kircher and Sander, JPC, 1984

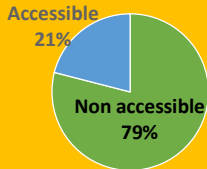
IoT Integrated Monitoring System for On-site Sanitation in Bangkok, Thailand

Moonkawin JAKPONG*, Hidenori HARADA*, and Shigeo FUJII*

* Graduate School of Global Environmental Studies, Kyoto University

Background

Sewer system availability in residential area in Bangkok, Thailand

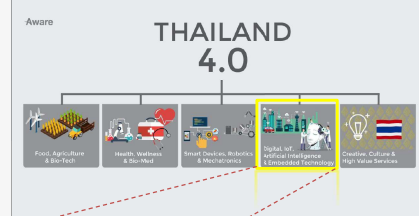


❖ On-site sanitation situation in Thailand

- 79% of residential area is not connected to sewer system (Boontanon and Buathong, 2013).
- Septic tanks or decentralised wastewater treatment system (DEWATS) currently plays a crucial role in urban area.
- Individual households have not been regulated and monitored for their septic tank operation including desludging period and effluent quality.

❖ SDGs 6 Clean water and sanitation

❖ Thailand 4.0: Smart cities and IoT development to achieve Digital Thailand



- SDG 6 states to improve sanitation, invest in management of sanitation facilities in developing countries.
- Thailand is currently under 12th National Economic and Social Development Plan (2017-2021). One of the key focuses is the Thailand 4.0 policy which targets to revolutionise industries through digital, IoT, AI and embedded technology.

On-site sanitation monitoring interrelated with IoT can potentially be an attractive tool using to promote on-site sanitation performance

Objectives

1. To introduce an IoT based accumulated sludge level measuring system of septic tanks to notify the time for desludging
2. To develop an IoT based effluent quality monitoring system for on-site sanitation system

Methodology

❖ Experimental Framework

Sensors Developing, Calibration and Validation (Laboratory)

- Sludge level measuring unit
- Effluent monitoring unit

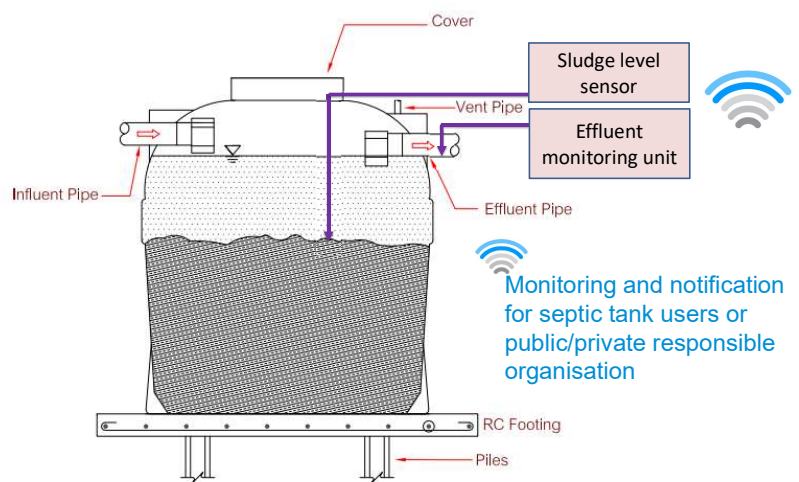
Developing of IoT Integration (Laboratory)

- Sludge level measuring unit
- Effluent monitoring unit

Data collection and Analysis (Field Application)

- Sludge level measuring unit
- Effluent monitoring unit

❖ Experimental Set up



Expected Outcomes

The anticipated results of this research including an initiative of promising IoT integrated monitoring system will be used to create the better change of on-site sanitation system, and promote proper operation of further advanced on-site sanitation which requires enough maintenance. The affordable digitalised monitoring system can be advantageous for septic tanks and DEWATS to aid the performance, control, and management resulting in environmental pollutants reduction which is corresponded with SDGs 6 and Thailand 4.0 policy.

The State of Mining Reclamation in East Kalimantan Forest Areas

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 ** Department of Forest Management, Faculty of Forestry, IPB University
 *** Department of Silviculture, Faculty of Forestry, IPB University

Background

Coal mining is essential to support national development. Its production from 2007 to 2017 annually increased 5.29% to 461 million tons in 2017. Forest Leasehold License (FLL) is granted by Minister of Environment and Forestry to accommodate non-forestry sector including mining. East Kalimantan plays important role in mining development since it has the largest area of FLL (Figure 1), the biggest coal producer province (Ditjen Minerba 2015) and 40.3% mining area from province area (SI 2018). Mining in forest area must disrupt and eliminate forest ecosystems (Syaprudin et al. 2014). Reclamation is obligated to be undertaken to restore disturbed forest (Gradinaru 2014). This study aimed to explore the state of mining reclamation in forest areas in East Kalimantan.

Methodology

This study applied a qualitative descriptive method to identify and analyze overall description from the data focusing on FLL reclamation in East Kalimantan (Sartika 2014). Primary data were obtained from interviews and field observations while secondary data were obtained by documents analysis.

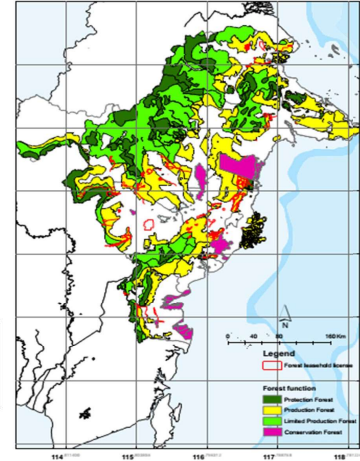


Figure 1 Map of study area

Result and Discussion

There are 28 regulations managing business process of FLL reclamation in East Kalimantan consisting of 4 Laws, 7 Government Decree, 8 Minister Decree, 2 Minister Verdict, 2 Provincial Decree, 3 Governor Decree, 2 Directorate General Decree. Those regulation are further analyzed resulting the flow of FLL business process (Figure 2).

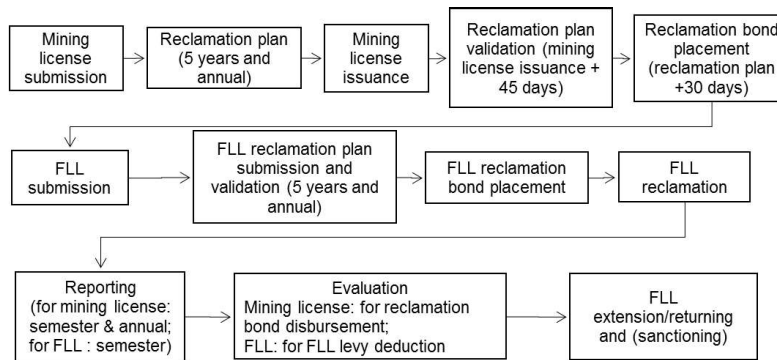


Figure 2 Reclamation business flow



Figure 3 Externalities of FLL

The impact of FLL is diminished forest biodiversity and function and created landscape change as well as caused soil compaction, erosion, sedimentation also water, soil and air pollution impacting local community (Figure 3). Community's economy is also disrupted due to loss of employment in agriculture and forestry and accessibility. The impact is actually not only to community. The opportunity cost by giving compensation is undertaken by FLL holder to community who claimed forest land is utilized by them before FLL granting. Reclamation consists soil, land and void management also revegetation. The effort in environmental management in the form of regulation as a command and control policy is still ineffective to control environmental risk caused by economic activities including mining (Gunarto et al. 2009). There are various technical and non-technical constraints in FLL reclamation including: 1) acid mine drainage problems and lack of soil supply; 2) limited capacity of reclamation operators; and 3) conflict between FLL holder and community. FLL holder must conduct reclamation to meet its successful criteria. It caused reclamation cost ranging from USD 5-14 thousand/ha (Figure 4). Regulations and characteristic of FLL areas influenced reclamation scheme, incentive, cost, challenge, behavior and finally defined the state of reclamation in East Kalimantan (Figure 5).



Figure 4 FLL Reclamation activity in East Kalimantan

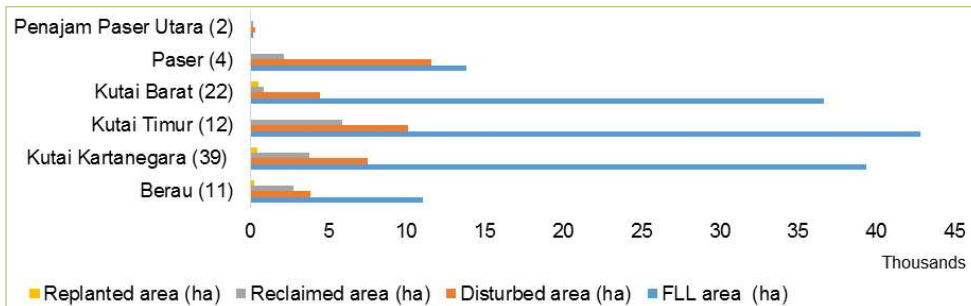


Figure 5 FLL Reclamation progress in East Kalimantan

Reference

[Ditjen Minerba] Direktorat Jenderal Mineral dan Batubara. 2015. Laporan Kinerja Ditjen Minerba KESDM Tahun 2015.
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Pesticide and Water Quality Modeling as Decision Support Tools for Water Quality Management: A Case Study on Paraquat in Chao Phraya Basin

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INTRODUCTION

Pesticides are recently concerned to human health and the environmental quality. The use of pesticides has offered significant economic benefits by enhancing the production and yields; their uses have adversely affected to human health and environment. Regarding the adverse effects on the environment, many of these effects depend on the toxicity of the pesticide used. Pesticides can make their ways into water sources, such as a river, lake, or pond and contamination in the environment and ecosystem. Especially paraquat, long-term exposure can cause serious incurable brain diseases such as Parkinson's disease, dementia, and has been connected to cancers.

OBJECTIVE

This study aims to investigate the situation of paraquat use in agricultural fields in Chao Phraya Basin, monitor the paraquat residuals in sub-watershed area and test applicability of the pesticide model under the perceived developments in the agricultural sector and impacts on water quality. The pesticide modeling as a decision support tools will help in making better decisions, for the management approach of pesticide uses in the Chao Phraya Basin, Thailand.

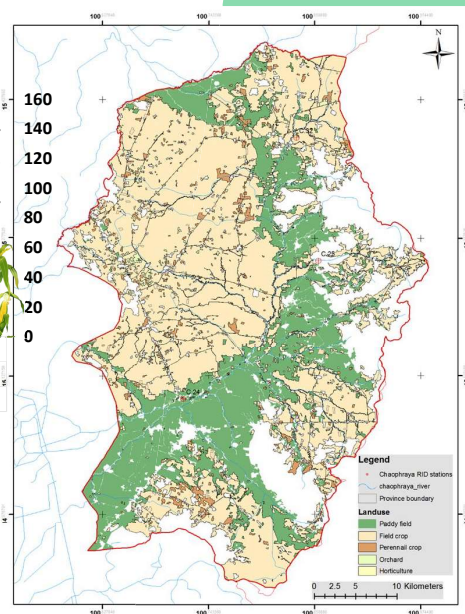
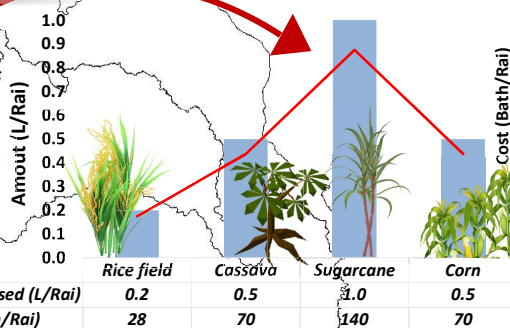
METHODOLOGY

Study area

The Chao Phraya Basin is the major river basin in Thailand and has a drainage area of 21,725 km² with the low alluvial plain forming the center of the country.

Chao Phraya Basin

Paraquat in agricultural uses



A represented watershed area

The used of paraquat in the agricultural area

Plant type	Date and time of use (week after planting)	Frequency of use/crop
Rice field	2-3, 5-6	1-2 times
Cassava	4-5	1 time
Sugarcane	1-2, 5-6, 48-49	1-3 times
Corn	2-3	1 time

Note: 1 Rai = 1,600 Sq. m., Paraquat 1 L = 140 Bath

The first part of this study is the use of paraquat based on application area and farming types, application rates and timing for the paraquat used as survey by questionnaires in a selected watershed area. The sample size of agricultural farmers calculated by Arkin and Colton (1963) equation, N = 380 from 39,091 farmers in represented a watershed area.

Questionnaire & survey (pesticide application data)

Behavior & attitude of pesticides use

Scenarios setting; Paraquat use; different rates and timing, and land cover changes

Monitoring of paraquat residue in water and sediment

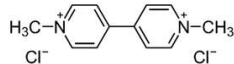
Concentration and loading

Paraquat fate and transport modeling

Knowledge support for pesticide management in the Chao Phraya Basin, Thailand (Guideline of pesticide use and agricultural practices)

Results analysis & Discussion & Recommendations

RESULTS



Paraquat is one of the most widely used herbicides in Thailand. Products that contain paraquat dichloride as an active ingredient may be known under many brand names, e.g. Paraquat, Paraquat dichloride, Gramoxone, Darazone.



The purpose of using the paraquat in the main planting area are sugarcane, cassava, corn, and paddy field.

DISCUSSION



- The situations of agricultural farming, labor is simply getting more expensive and lack, that make farmers choose to use agricultural chemicals.
- The farm size of the agricultural area is the reason that farmers used chemicals (more than 15 rai).
- The further study is Monitoring of paraquat residue in water and sediment to verify the modeling of paraquat fate that will be developed.

"The development of an integrated approach (questionnaire, monitoring, and modeling) to evaluate pesticide contamination in water environment more precisely is essential to be used as a tools for water quality management"

Reishi (灵芝) mushroom-mediated wastewater treatment for sustainable river management

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* Functional Omics-Bioprocess Development Laboratory and Biomass Energy Laboratory, Institute of Biological Sciences, Faculty of Science, University of Malaya, Kuala Lumpur 50603, Malaysia

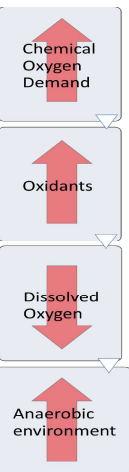
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*** Department of Chemical and Biological Engineering, The University of Sheffield, Sheffield, United Kingdom

Introduction

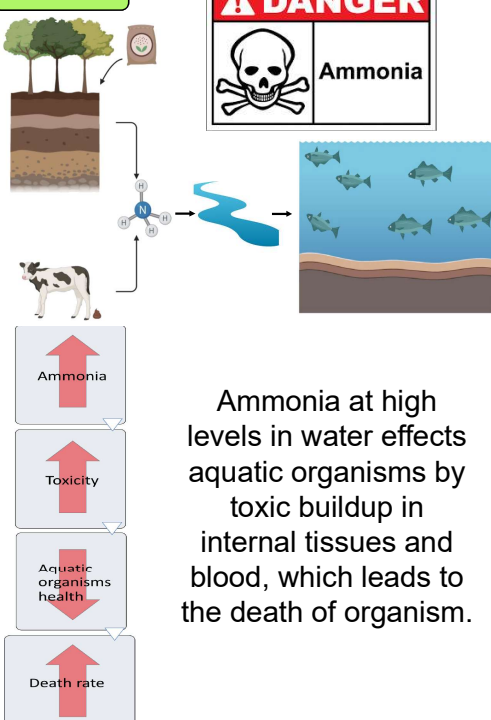
Pollutant in water from sewage is a big issue in modern era. The waste from big cities, agricultural waste and also fertilizers effects the water quality, which makes the water not safe to be used. Many approaches have been made to treat polluted water and one of it is using fungi. In this study, a medicinal mushroom, Reishi, was used to treat a synthetic sewage water and the results are as shown.

COD

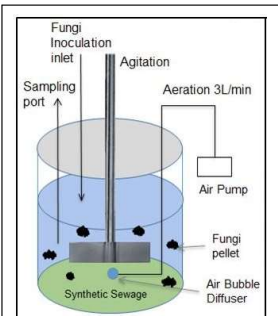


Chemical oxygen demand (COD) is a measure of oxygen required to oxidize the organic and inorganic compounds to a stable compound.

Ammonia

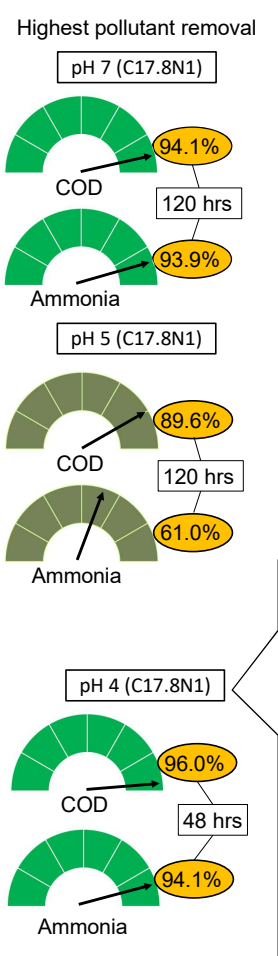


Experimental design

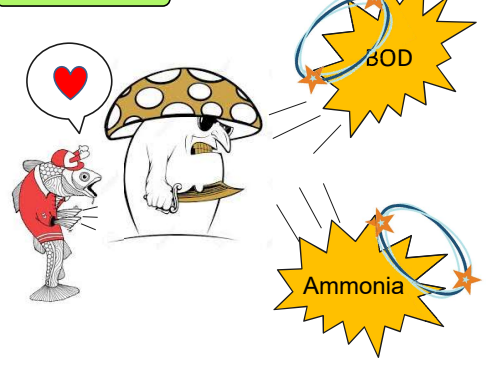


Schematic representation of the batch reactor for lab-scale experimental set-up

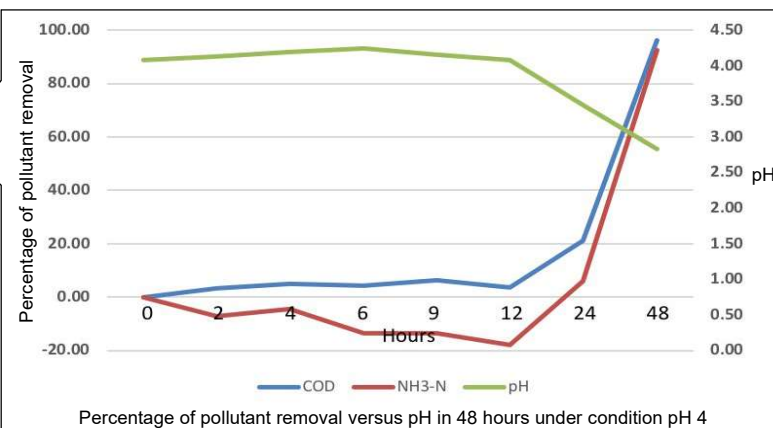
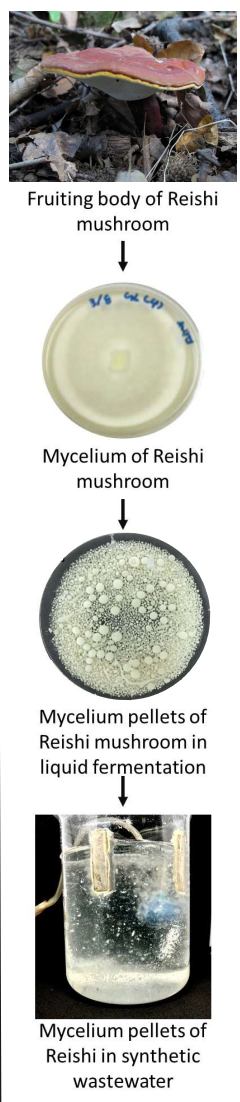
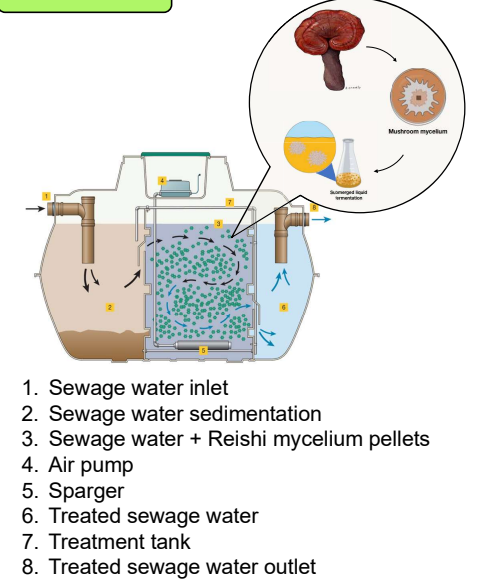
Results



Conclusion



Future work



Determination of life cycle GHG emission factor for paper products of Vietnam

Authors: Ta Thi Yen ^{1,2)}, Nguyen Thi Anh Tuyet ¹⁾

(1) Hanoi University of Science and Technology (HUST)

(2) Hanoi University of Natural Resources and Environment (HUNRE)

INTRODUCTION AND OBJECTIVES

Introduction

- Pulp and paper production is the fourth most energy-intensive industry in the world, occupies about 5% of total energy consumption and 2% of total CO₂ emissions of industrial sectors, respectively.
- The pulp and paper industry is an important economic but energy-intensive sector in Vietnam. Domestic output of the sector reached 3.674 million tons and average consumption per capita was 51 kg of paper in 2018.
- Most of the studies use cut-off method to determine material flows, therefore the environmental burdens from previous cycles of paper products have not been considered. There have been no studies on LCI and emission factors for paper products of Vietnam, except for some studies on material flow using cut-off methods.
- This study focuses on determining the GHG emission factor in the life cycles of three paper products of Vietnam (writing paper, tissue and carton box) in 2018 using ISO/TS 14067 method

Objectives

1. To determined GHG emission factor for paper products of Vietnam
2. To defined indirect GHG emission of paper products to other economic sector

RESULTS

Table 1. LCA GHG emissions of Vietnam paper products

Paper	r ₁	r ₂	Virgin material	Recycled material	Paper making	Transport	Total
			E _v	E _r	E _p		
Corrugated	1	0.2042	E _v 0	E _r 371.65	E _p 907.73	10.13	1289.51
Kraft-liner	0.8031	0.0877	E _v 44.8	E _r 294.06	E _p 943.16	9.47	1209.15
Carton box	0.9212	0.1576	60% E _v 17.92	40% E _r 340.62	60% E _p +40% E _r 1126.64	10.18	1456.95
Writing	0.1506	0.0871	E _v 217.57	E _r 58.06	E _p 926.34	9.98	1134.84
Tissue	0.2248	0.144	E _v 99.71	E _r 34.72	E _p 648.38	9.67	746.06

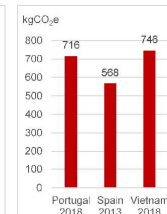
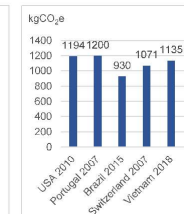
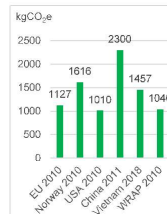


Fig. 4 Comparison LCA results for some countries. a) Carton box; b) Writing paper; c) Tissue paper

DATA AND RESEARCH METHODS

Research method diagram

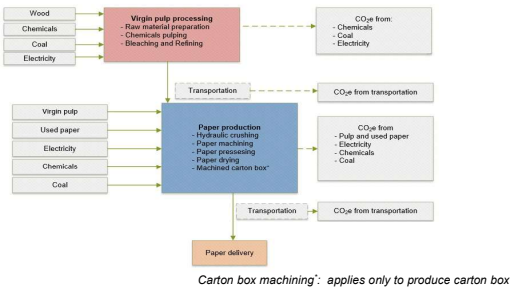


Fig. 1 Research method diagram

System boundary

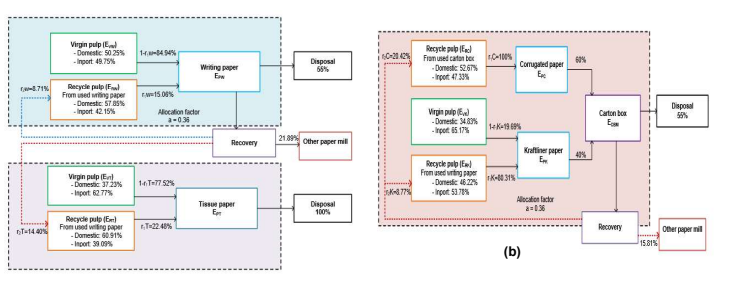


Fig. 2 System boundary and material flows for LCA GHG emission of papers (a) writing and tissue paper; (b) carton box.

Integration with the IO table

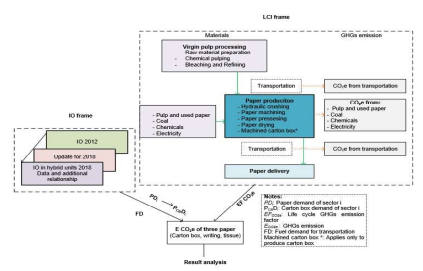


Fig. 3 Integrating with the IO table in method diagram

Data collection

- Primary data of was investigated at paper mills included: An Hoa paper factory for pulp production; 6 mills and production households in Phong Khe paper recycling village for carton box; 3 factories and households in the craft village for other papers.
- Secondary data of the study were collected from research publication and prestigious reports.

Table 2. Emission of virgin and recycle paper

Paper types	Emission of virgin paper	Emission of recycled paper
	Kg CO ₂ e /ton	Kg CO ₂ e /ton
Carton box	1496	1457
Writing paper	1295	1135
Tissue paper	896	746

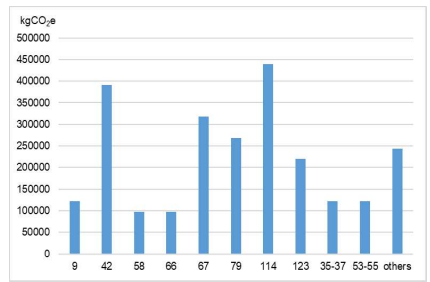
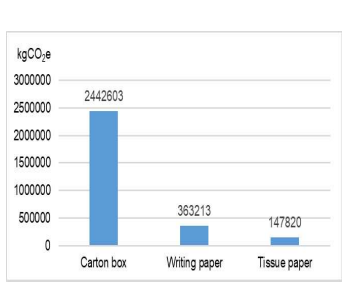


Fig. 6 GHG emissions from carton box, writing paper and tissue production in 2018

Fig. 7 Indirect GHG emissions, caused by demanding carton box in 2018. Sector 9 (Fruit products); 35-37 (Foods Processing); 42 (Confectionery production); 53-55 (Fashion); 58 (Printing and copying services); 66 (Chemicals); 67 (Chemistry and medicinal materials); 79 (Electrical and electronic equipment); 114 (Commercial); 123 (Warehousing and transport services)

CONCLUSIONS

- High energy intensity is identified as the main reason that causes high GHG emission factors.
- The emission factors may change if the input – output balance and/or the paper production technology changes.
- The emission factors also change if the LCI method and/or the system boundary changes. In addition, the method of integrating IO table is introduced as a support tool in cases of lacking investigated data.

Acknowledgements: This study is partly supported by B2017-BKA-42 scientific project. The authors would like to thank School of Environmental Science and Technology, Hanoi University of Science and Technology for the valuable academic supports



Influence of cement addition on barrier performance of soil-bentonite cut-off wall

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* Graduate School of Global Environmental Studies, Kyoto University

Introduction

Soil-bentonite (SB) cut-off wall is used for controlling contamination migration due to hydraulic conductivity and high homogeneity through trench deep mixing method (TRD) as shown in figure 1. Low strength and stiffness limits the application of SB walls. Cement addition used to improve the strength and stiffness of SB (Figure 2), but this method affects its barrier performance. Necessary to discuss effect of cement on barrier performance.

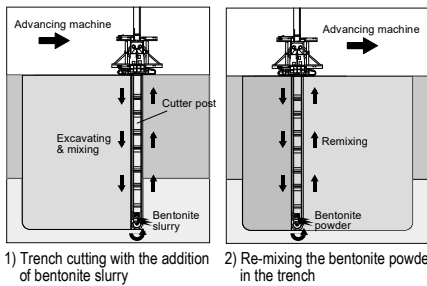


Figure 1. Typical construction procedures of SBM wall using TRD method



Figure 2. Samples failure plane of UCS test

Research object

Evaluate the influence of adding cement on hydraulic conductivity and sorption performance of SB cut-off wall against arsenic.

Method

Hydraulic conductivity of amended SB was studied by using flexible-wall permeameter with the falling head system with distilled water. The flexible-wall permeameter system is shown in figure 3, and the different content ratio shows in table 1.

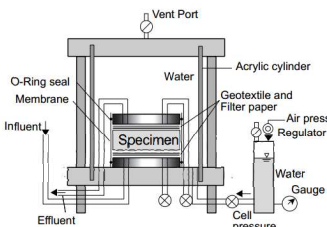


Figure 3. Schematic of flexible-wall permeameter

Table 1. Mixing ratio of SB in study

	Cement (g)	Bentonite slurry (ml)	Bentonite powder (g)	Soil (g)	Water (ml)
Group A	0	175	48.75	807.5	210
Group B	25	175	48.75	807.5	210
Group C	37.5	175	48.75	807.5	210
Group D	50	175	48.75	807.5	210
Group E	50	175	58.75	807.5	210

Sorption performance is evaluated by batch test. Samples were crushed to smaller than 2 mm, mixed with the NaAsO₂ solution with a liquid to solid (L/S) ratio of 10. Concentration of NaAsO₂ solution is 0.1, 0.5, 1, 5 and 10 mg/L. Horizontal shaking at 150 rpm for 24 hours, then centrifugation under 3,000 rpm for 10 mins and filtering using a 0.45 μm membrane filter

Results

It can be found figure 4 that the hydraulic conductivity of SB with cement is much higher. After 60 days, the hydraulic conductivity of group D and E (with 115 kg/m³ cement) decreased for 80%

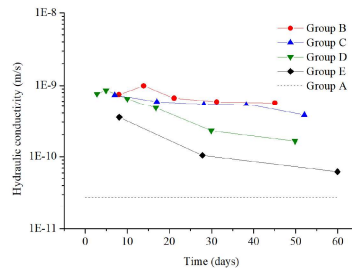


Figure 4. Hydraulic conductivity of SB along with time

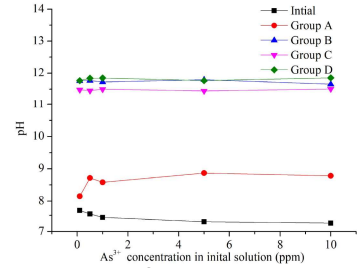


Figure 5. pH of the arsenic solution after mixing with SB

In figure 5, Initial pH ranges from 7 to 8, after mixing with SB with cement, it increase to around 11.5. Cation concentration is shown in figure 6, Fe and Ca concentration increased with amount of cement addition. Sorption isotherms in figure 7 reflects that SB without cement had the highest sorption performance. For the groups amended with cement, sorption amount increase with cement amount.

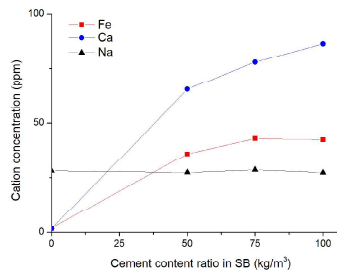


Figure 6. pH of the arsenic solution after mixing with SB

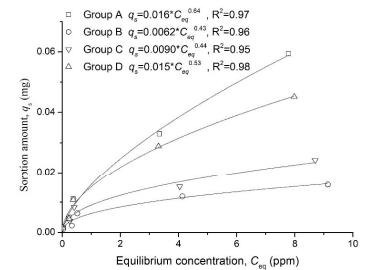


Figure 7. Sorption isotherms of samples with different content ratio

Conclusion

Few amount cement addition has significant negative influence on both hydraulic conductivity and barrier performance. It is recommended to use 100 kg/m³ cement and 135 kg/m³ bentonite to ensure the amended SBM has similar performance as SBM without cement.

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Features of the Reformed Environmental Impact Assessment System in China

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



Chinese Government Scholarship

Introduction

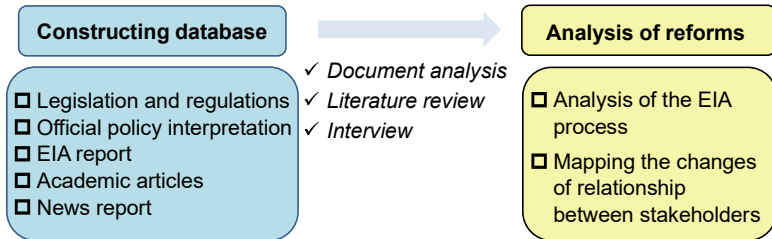
As one of the most important preventive environmental protection measures, Environmental Impact Assessment (EIA) has been developed in China for more than four decades. Although it has evolved into a fairly comprehensive and technically adequate system, there still exist many **problems** as to its **performance**.

Significantly, several forms of corruption in EIA system, such as developers implementing EIA before approval and EIA consultants get license through bribe, were pointed out by the central 3rd inspection team in 2015, which then opened up a severe “EIA reform storm”. To improve the effectiveness of EIA is seen as the core objective of EIA reform in the 13th five-year plan (2015-2020).

With the carrying out of these reforms, the **relationship** between various stakeholders are changing. To discuss these changes is helpful to clarify the responsibility of each stakeholder and further improve the performance of EIA.

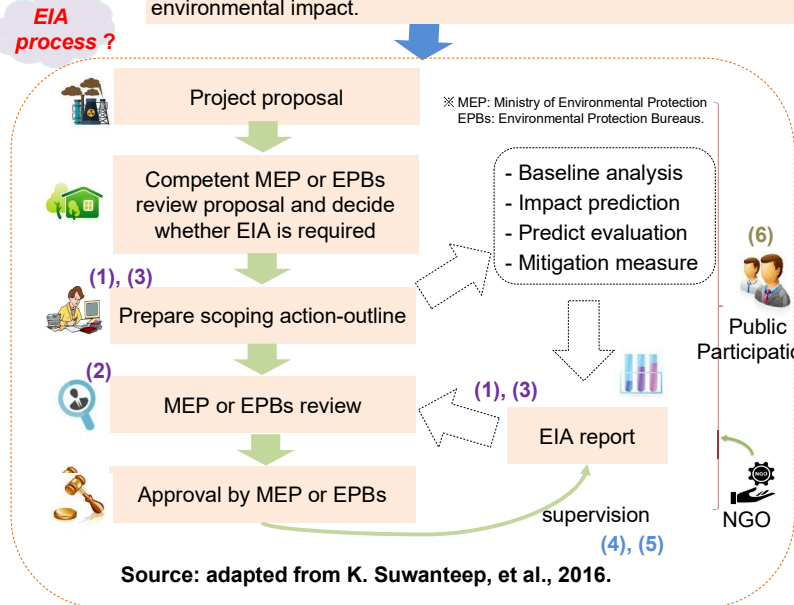
Keywords: EIA, reform, relationship between stakeholders

Methodology



Results

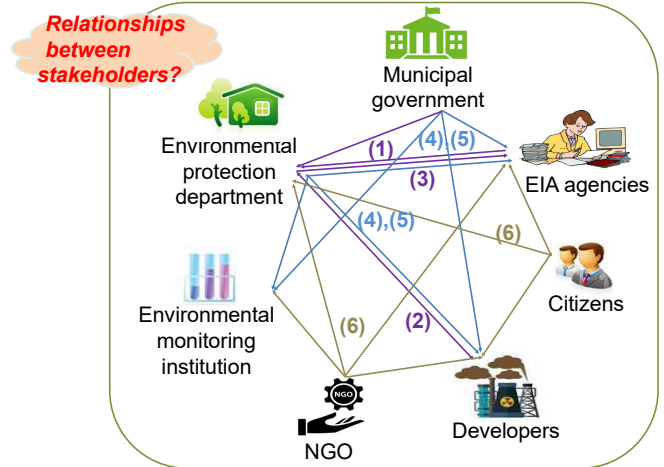
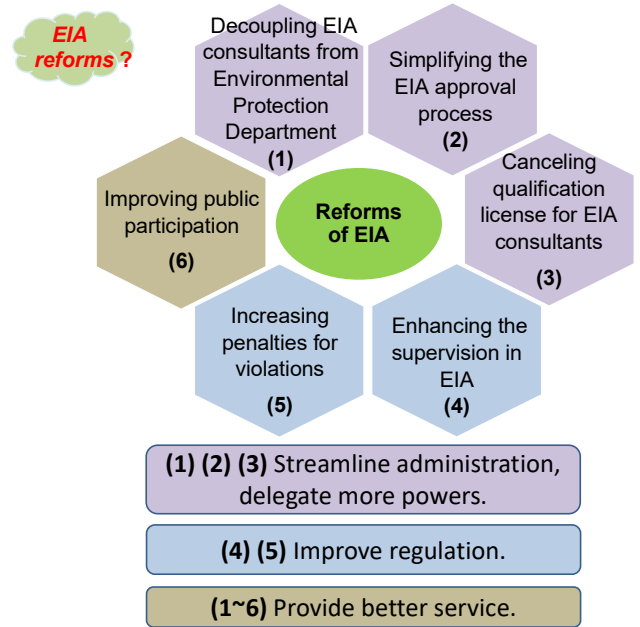
EIA ?
EIA: Environmental impact assessment (EIA) is a systematic approach to **analyzing, predicting** and **evaluating** the positive and negative impacts on components of the environment that may arise from the planning and construction projects, and then putting forward the **preventive measures** to mitigate the adverse environmental impact.



★ Arabic numerals are the number of reforms.
★ As is shown, the reforms **almost happens** in each EIA phase.

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Conclusion

The various stakeholders are related to each other. After reforming, their relationship have been changed as follows:

- The EIA agencies **become independent** from government, which can avoid the EIA reports compilers and reviewers being the same institution.
- The EIA agencies are **losing restrict** to developers. They get money from developers and help to prepare EIA reports, which may easily result in data forge.
- The review responsibility of the projects causing low level of environmental impacts are **delegated** and changed from national level to provincial level, or from provincial level to county level.
- The environmental protection department take **more responsibility** of supervision.
- The **liable institutions** are changed from EIA agencies to EIA developers.
- The public and NGOs are taking **more important role** in whole EIA process.

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Study of community-led housing provision for low-income households: Basic survey in Pan Thazin housing in Yangon

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INTRODUCTION

BACKGROUND Yangon city in Myanmar has been experiencing an urgent need of housing, particularly for the low-income households. Due to the industrial growth in the city and limited job opportunities, many rural dwellers have moved to the city, creating a great housing shortage. Recently, the authorities have launched the affordable and low-cost housing program. However, due to the financial difficulties and other factors, the low-cost housing strategy can be accessible only from upper low-income level but limited to grass root level, forcing them to live in informal settlements. Thus, the local NGO has started the community-led housing projects in the suburbs of Yangon in recent years through participatory approach, aiming to secure a house while enhancing wellbeing of the occupants.

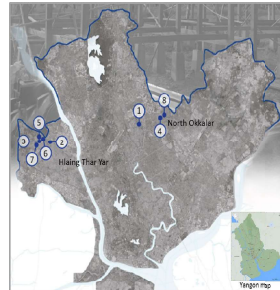


Fig 1. Location of complete community-led social housings

OBJECTIVE The main objective of the study is to develop the design solutions that is affordable to the low-income while reflecting to local context, culture and environment; while the objective of this study is to understand the social housing practice and the preliminary research of community-led housing conditions in Yangon for further research study.

METHODOLOGY In this study, the research is based on the field surveys conducted in one of the completed community-led housing projects, Pan Thazin housing in North Okkara Township in Yangon during the period of May, 2019 (① of Fig.1). The study included field observation, semi-structured interview with NGO and community heads and household questionnaires with the residents.

FINDINGS

PROCESS This community-led housing program applies the self-help approach where the residents themselves are the main players in implementation while NGO provides the technical support. Process for implementation of community-led housing program are as follows:

- 1) Surveyed and collected data on population and households of low-income
- 2) Mobilized saving group and housing co-operative
- 3) Housing co-operative started looking for the potential sites and decided the site together which match their needs and budget while also developing the operation and management plan along with NGO
- 4) Housing co-operative submitted the collective land lease grant along with the operation and management plan of housing to the government with the assistance from the NGO
- 5) Members worked together to develop the site plan and housing design while NGO provided the some technical assistances
- 6) Applied for the loan and then implemented the project construction activities once the government granted the land ownership and official living permit

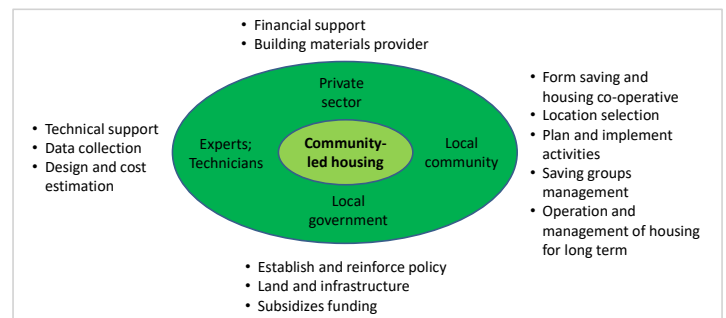


Fig 2. Coordination and roles of involved stakeholders in community-led social housing



Fig 3. Self-modification of housing condition and infrastructure in Pan Thazin housing

CASE STUDY Pan Thazin housing is one of the first community-led housing project established in 2011 and has the total of 30 households who are originally from different regions in Myanmar. The housing was established with the loan from the NGO; where the estimated cost for each unit was 1,200,000 Kyats (1,000 USD) including the land. With an average household size of 5 family members, each occupied a plot area of 39 sq.m and total floor area of 23.61 sq.m initially. Bamboo sheets were used for exterior wall and plywood for flooring where CGI sheets for roofing and timber structural column and concrete footing. The interior of the house was initially studio type, but later separated between living area and bedroom with room divider such as plywood, curtain, furniture, etc. It is found that living area is usually being used as multi-functional area for praying, dining as well as sleeping at night due to limited space and the allocated sleeping space is not large enough to accommodate all household members. Currently, nearly 60% of the households have done modifications to their houses after they managed to pay off the loan. Most common types of modifications were the renovation of toilet, extension of the house at both sides and/or at the front; the change of building materials from bamboo sheet to cement board, brick etc., and the addition of mezzanine or upper floor. Infrastructures such as passage way, water supply and electricity were also found improved.

CONCLUSIONS

DISCUSSION Through survey, it is found that there are some defects such as less ventilation and less space for a household in housing design due to limited budgets and technical knowledge but the project certainly could bring the positive impacts to the socio-economic conditions of the residents through securing the houses. Thus, if such issues could be addressed along with better financial management, the community-led social housing could be one of the potential solutions for the housing problems for the low-income residents in Yangon city.

FURTHER STUDY Further study will focus on the housing policy in Myanmar and the in-depth study of community-led social housing particularly on spatial arrangement, modification patterns and future plan to understand the local context and the defects in design; contributing to the optimal social housing design in terms of housing quality (land lot, public space, floor space, structure and material) and flexibility of its modification, management of financial planning and efficient process for implementation. And also the massive supply methods by the government support should be considered for huge amount of low-income people in Yangon city.

This poster is undisclosed

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Understanding Opinion Leaders Behavior on Sustainable Seafood Promotion through Blue Seafood Guide in Japan

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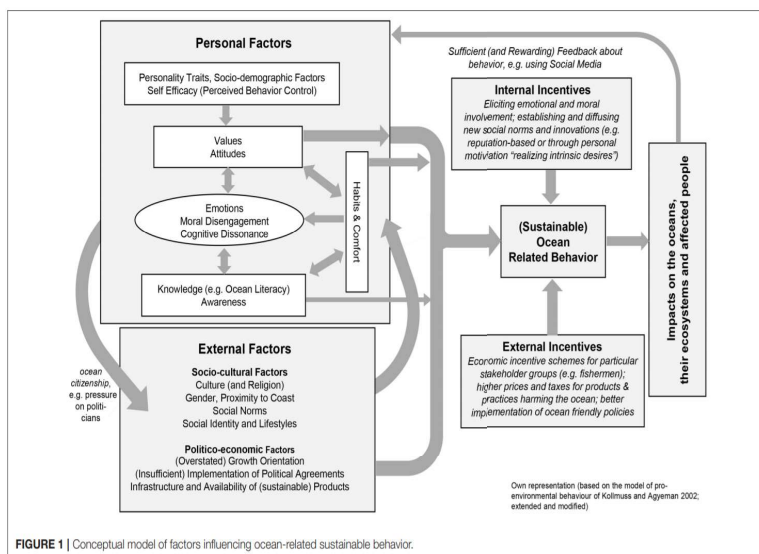
Background

- ❖ Japan-based ocean conservation NGO **Sailors for the Sea Japan** is holding an annual reception every November to gather charity and launch their newer version of **sustainable seafood recommendation (Blue Seafood Guide)**. These receptions are attended by about 300 **opinion leaders** ranging from politician such as Akie Abe (first lady of Japan), David Rockefeller Jr. (entrepreneur), to Sakana Kun (TV show artist), and many more.
- ❖ Through this opportunity, we have the chance to develop a special guidebook designed for encouraging people especially these influencers to promote more sustainable seafood activities and also **understand the behavior of these influencers & opinion leaders on promoting sustainable seafood**
- ❖ **The objective of this presentation is to show our current progress of our research**

Opinion Leaders & Behavior Change

- ❖ Definition: “**Influential members of a community, group, or society to whom others turn for advice, opinions, and views.**”
- ❖ It has been proven to be effective at accelerate the rate of diffusion (Valente & Davis, 1999)
 - ❖ Decreasing the rate of unsafe sexual practices (Kelly et al. 1991)
 - ❖ Decreasing the rate of cesarean births (Lomas et al. 1991)
 - ❖ Significant impact at accelerating ocean-friendly behavior (Stoll-Kleemann, 2019)

Conceptual model of factors influencing ocean-related sustainable behavior



- ❖ Questionnaire section 3 is based on the model from Stoll-Kleemann (2019).
- ❖ It consists of 21 questions measuring on a 4 point Likert scale with the following details [1 = Strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree]
- ❖ After the questionnaire, we will pick several opinion leaders to be interview in more depth to provide better understanding of the questionnaire

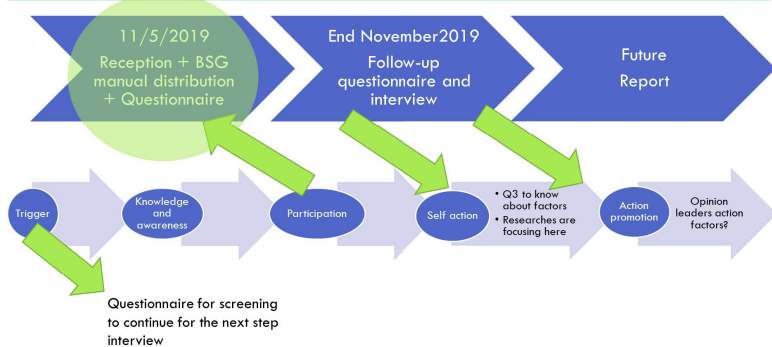
Expected Result

- ❖ Increased sustainable seafood promotion behavior from the opinion leaders in Japan
- ❖ In depth understanding of factors influencing opinion leaders in Japan in promoting sustainable seafood activities

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Schedule and Research Design



Questionnaire Methodology and Measurement

Online Questionnaire Survey – November 2019
Sample Size: 330 Opinion Leaders

- ❖ The questionnaire consists of 3 sections
 1. Personal information: name, age, gender, and type of opinion leader
 2. Current effort or project progress
 - a. BSG reception participation
 - b. Improving sustainable seafood lifestyle using BSG
 - c. Speaking up about BSG in public
 - d. Promoting BSG through personal event
 - e. Inviting BSG chef to personal event
 - f. Using BSG menu at personal event
 - g. Promoting BSG through social media
 - h. Other activities
 3. Factors influencing sustainable seafood promotion behavior

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

Sustainable Mangrove Ecosystem Management In Taneke Island, Takalar Regency, South Sulawesi Province, Indonesia

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Background

Mangrove ecosystem poses a very important role for life as it serves ecological, economic, social and cultural aspects. Majority of Indonesian coastal area is covered by mangrove ecosystem (3,112,989 ha) or 22.6% of mangrove ecosystem in the world (Giri et al. 2011), However, 30% mangrove covers in Indonesia is threaten by overexploitation (FAO 2007), even being the worst nation with mangrove ecosystem degradation events in the Brown 2015).

South Sulawesi is one of the world (Campbell and the provinces that being naturally covered by Mangrove ecosystems. According to Bakosurtanal (2009), mangrove area in South Sulawesi Province is 12,821,497 ha and being distributed along the coastline. One of which is found in Tanakeke Island.

Since 1990s, mangrove ecosystem on Tanakeke Island experienced massive losses more than half mangrove covering area (1300 ha) (Beys dasilva et al. 2014). The condition could affect to biodiversity, existence of exotic species inhabiting mangrove ecosystem, and some economical services provided by the ecosystem. Thus, sustainable management of mangrove ecosystem in Tanakeke Island is necessary.

Sustainable management of mangrove ecosystem could be achieved by appropriate policy designs that align to the sustainable development goals. The complex emerging issues by the mangrove management require an integrative-holistic approaches to the social-ecological system. The strategy in developing policy requires to concern facts to reproduce relevant plans in problem solving (Suharto 2010).

Objectives

- To assess the biophysical and socio-economic conditions of the Tanakeke Island community
- To determine the value of ecosystem services from the presence of mangroves on Tanakeke Island
- To formulate effective strategies for managing mangrove ecosystems in Tanakeke Island.

Methodology

- **Period of survey: December 2019 - February 2020**
- **Island's Area: 32.12 km²**
- **Island's Population: 7,702**
- **Mangrove area: 951,111 ha (Akbar 2014).**

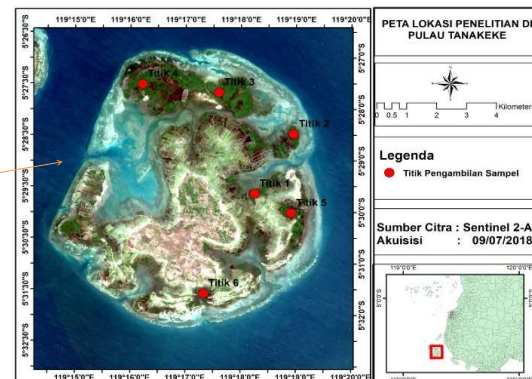
Data analysis

- Satellite and spatial imagery
- Ecosystems services
- Interpretive Structural Modeling (ISM)

Key informant interviews & FGD:

- Community leaders
- Experts (Academic)
- Head of management office
- NGOs
- Local government

Topic: management methods and community perception



Mangrove condition of Tanakeke Island



Activities of the surrounding community of mangrove ecosystem in Tanakeke Island:

1. Converting mangrove coverages for shrimp and milkfish farms
2. Cutting down trees for several purposes (charcoal, building materials, piles for seaweed cultivation)
3. Capturing mudcrabs, shellfish, and other fisheries commodities

Effects of mangrove ecosystem degradation on Tanakeke Island

1. reduced productivity of capture fisheries and aquaculture
2. high tide
3. Damage to the balance of the ecosystem

ASSESSMENT OF A BRIDGE STRUCTURE SUBJECTED TO FLOOD LOADINGS “CASE STUDY OF LICUNGO BRIDGE IN MOZAMBIQUE”

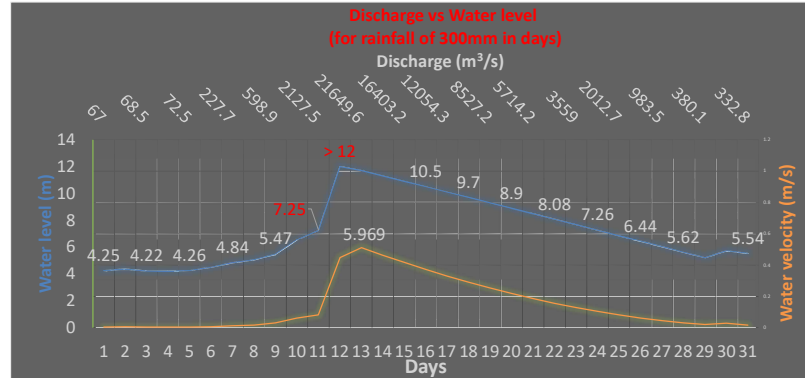
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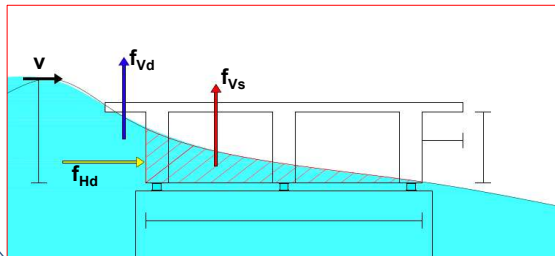
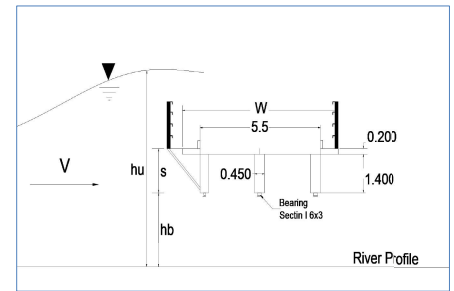
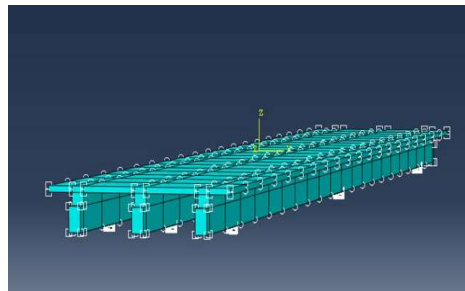
[Background]

The road network of Mozambican mostly have bridges that were designed based on the old Portuguese design code named RSA (1961), which only refer to hydrodynamics on piers. Recently, there have been registered an increment of flood frequency and raising of water level of rivers which is been linked with the effects of climate change, which implies the increasing of vulnerability to bridges failure due to combination of hydrodynamic and hydrostatic forces on the bridge. Therefore, this research aims to evaluate the condition of the structural condition of the bridge based on the past flood events and assuming that no water pressure was expected on the superstructure.



[Methodology]

- To identify flood loadings from past researches and design codes;
- To assess of the tendency of fall;
- To proceed simulations using OpenFOAM software and compare the results with actual capacity of the bridge;
- Propose prevention methods.

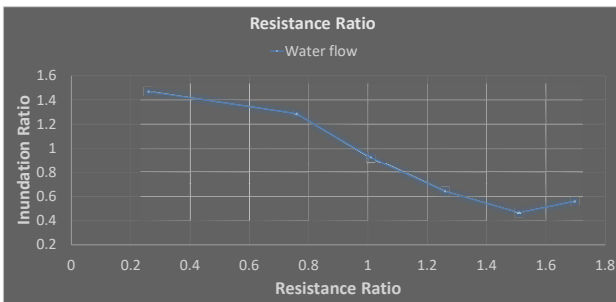


$$f_{Hd} = 0.5\rho V^2 h C_D C_{Hd}$$

$$f_{Vd} = 0.5\rho V^2 b' C_{Vd} C_L$$

$$f_{Vs} = \rho g h b C_{Vs}$$

[Results and Discussions]



Inundation Ratio	Flow Velocity (m/s)	Support Reactions		Bearings on the target girder	Bolts per Bearing	τ_0	Resistance ratio
		Horizontal	Vertical				
1.69725	5.23	342.316	627.579	9	6	351.53	0.56013609
1.50975	5.97	410.492	752.570	9	6	351.53	0.467105992
1.25975	5.39	298.420	547.103	9	6	351.53	0.642529078
1.00975	4.85	207.552	380.512	9	6	351.53	0.923832795
0.75975	4.33	149.058	273.273	9	6	351.53	1.286366291
0.25975	3.38	130.546	239.334	9	6	351.53	1.468778463

- According to the existing design, the lateral load due to water pressure on the superstructure contribute to the of almost 50% on resistance capacity on the supports when the water velocity is more than 5 m/s.
- In order to keep the bridge safe is important to improve the support condition, changing bolts for ones with high strength.
- For future works, some simulations on openFoam are planned, in order to confirm the results and provide an adequated solution.



Exploring sustainable livelihood of Kazakhs nomads - a residential survey in Karamay, China

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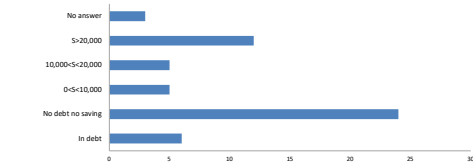
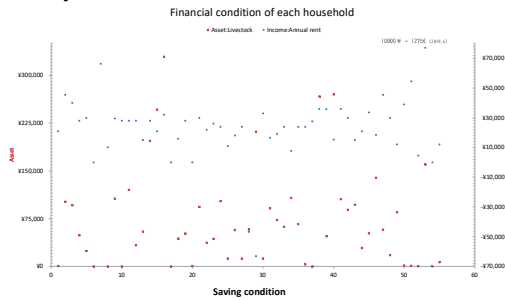
I. INTRODUCTION

This research focused on rural livelihood development of the Kazakhs nomads residential area in rural Karamay District, China. We investigated 55 households from 4 local village communities through semi-structured interviews.

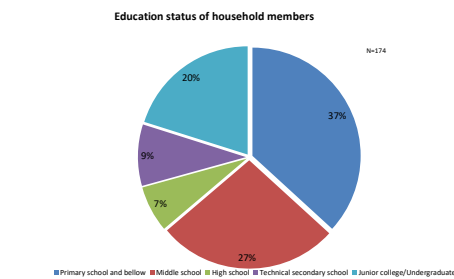
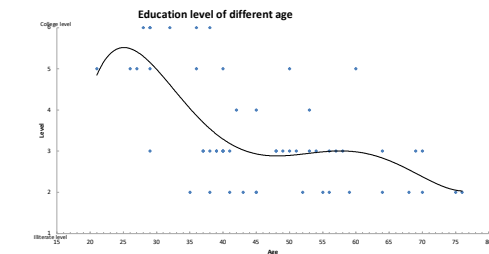
II. RESULTS & DISCUSSION

Livelihood conditions

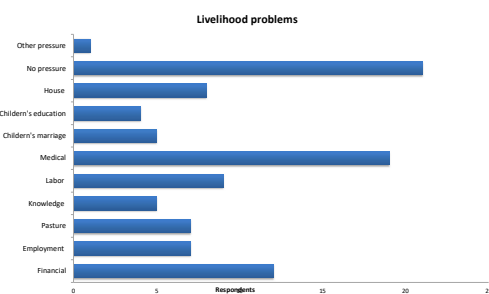
-Family financial condition-



-Education-



-Difficulties-



ABSTRACT :

As a part of the Urban-Rural Planning Project implemented to develop sustainable development strategies for Karamay District which faces a crisis of oil depletion, this research focused on rural livelihood development of the project area. The project took place in rural Karamay district, where main residents are Kazakhs nomads. The author investigated 55 households from 4 village communities through semi-structured interviews targeting randomly selected residents. The interview questions were designed based on previous unstructured interviews and literature review. Each interview took around 30~45 minutes.

In this research, we evaluated our interviewees' livelihood condition as well as their own perception of the current livelihood. Local government's role in local livelihood development was also explored. Implementation gap resulting from cross-cultural differences was observed in local governance.

Through the semi-structured interview, we obtained more information in a relatively more accurate manner compared to a questionnaire survey. However, the weakness is that due to our lack of in-depth knowledge in Kazakh nomadic culture, some of our findings couldn't be well explained. And this may be considered as the implication for future practice as well.

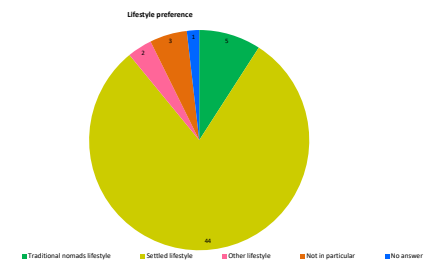
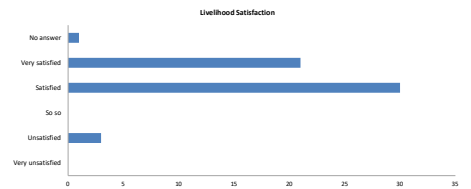
KEY WORDS:

Rural livelihood, rural sustainability, nomadic culture, cross-cultural differences, local governance

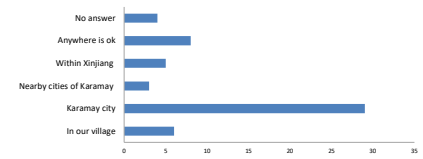
III. CONCLUSIONS

From this study, we noticed there were some cross-cultural differences resulted inconsistency in our findings. Despite the stable annual income guaranteed by the local government, the local residents seldom have savings. We found that regardless of the saving condition, most residents still claimed that they were satisfied with the current livelihood. Still, when it comes to the descendant's future settlement and career, most of our interviewees would prefer them settle in the local city and get a salaried job. As a result, gap in government's policy implementation was also observed. Despite government's efforts to increase local income such as encouraging agritourism development, the residents showed little motivation to cooperate because they were already satisfied with the current livelihood. The local government faced a challenge in sustaining rural development through community livelihood development.

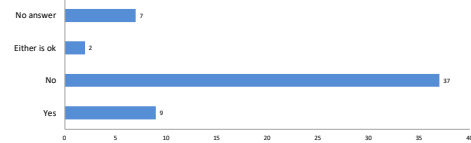
Residents' perception of the current livelihood



Where do you prefer best regarding your children's settlement?

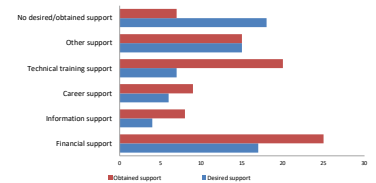


Do you hope your children have the same career as you did?

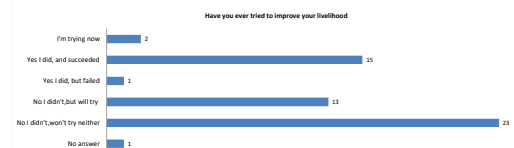


Government's role in livelihood development

Support from government



The gap



IV. REFERENCES

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Kreutzmann Pastoralism: Research, Policy and Practice 2013, 3:7, Dakhshkeiger, GF, 1978. Settlement and traditional social institutions of the formerly nomadic Kazakh people. In The nomadic alternative, ed. W Weisleder, 361-370. The Hague: Mouton.
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V. ACKNOWLEDGEMENT

The author gratefully acknowledges the supports provided by Prof. Degang Yang and Dr. Liang Hao from CAS, advices from Prof. Satoshi Hoshino and Assist. Prof. Kenichiro Onitsuka from Kyoto University.



This poster is undisclosed

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

Occurrences of Total Nitrogen & Total Phosphorus and Estimation of Main Pathways at an Urban Watershed in an Emerging Country in Southeast Asia

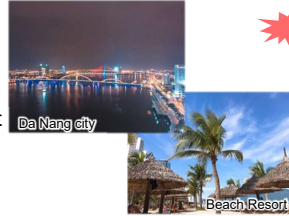
Daiki ARISUE*, Shuhei TANAKA*, Kazumasa WADA*, Shigeo FUJII*, Ngoc An Hoang**, Tran Van QUANG**

* Graduate School of Global Environmental Studies, Kyoto University
** Department of Environment, Da Nang University of Technology and Science

Background

Da Nang, Vietnam

- > The biggest city of central Vietnam
- > Popularity is rising as a sightseeing spot
- > Fishery is thriving



Concerned about impact on tourism and fisheries

However, There is little reports about Organic matter loading in Da Nang
(Vietnam Environment Administration, 2010, National Environmental Report)

⇒ To properly and efficiently improve,
it is necessary to calculation the source of pollution



Water infrastructure is insufficient

⇒ Water pollution caused by various pollution sources is serious
Ex) Industrial Wastewater, Grey Water, Sewage Treatment Water

Objective

Calculate the total nitrogen and total phosphorus concentration for each route and estimate the major load sources

Methodology

- Sampling & Analysis

- > Aug.- Nov. in 2018
- > Phu Loc River Basin

	n	
	Sunny	Rainy
Ground water	3	1
River	2	1
WWTP influent	2	1
WWTP effluent	2	1
IWTP	2	1
Khanh Son	2	
Tap water	5	
Septic tank	2	
Household	2	
Shop	5	
Road	5	
CSO	8	

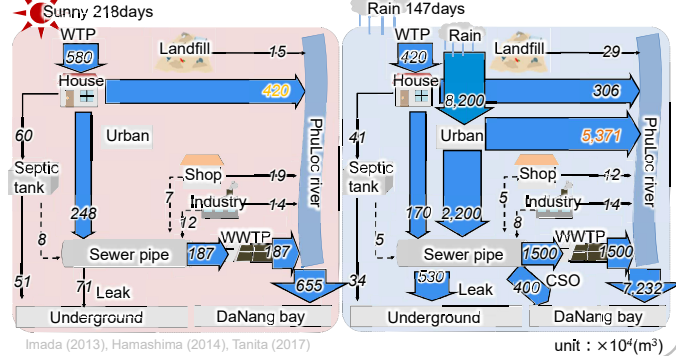
- Calculation Method

$$\text{Loadings} = \text{T-N, T-P Concentration} \times \text{Flow Rate}$$

- T-N, T-P Concentration :
 - Median of the result of T-N, T-P measurement
 - Sunny days and rainy days were separated
- Flow Rate :
 - Intake and discharge / Precipitation / Evaporation / River flow were calculated monthly

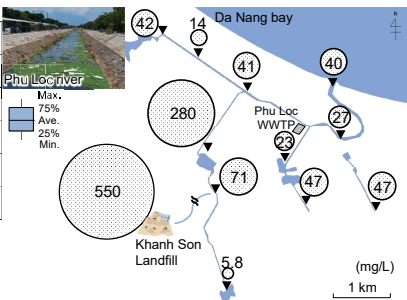
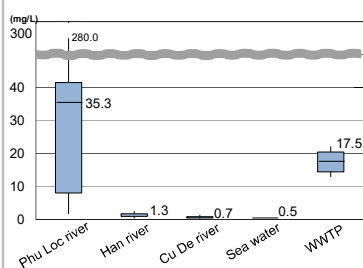


- Water Flow

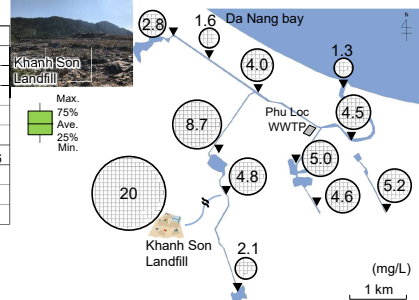
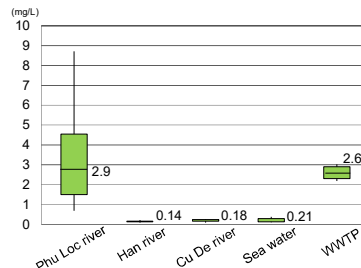


Results and Discussions

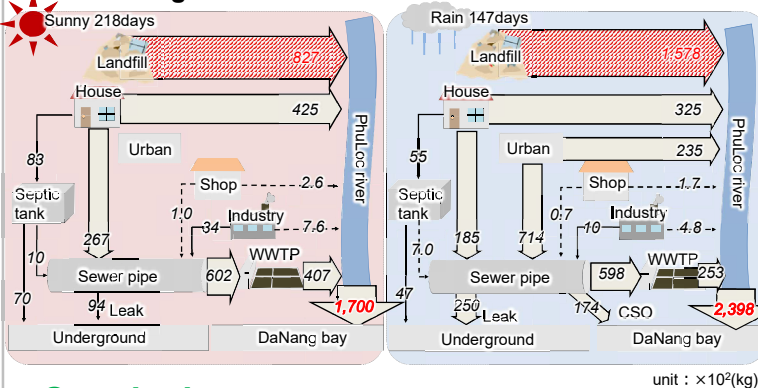
~ Concentraion of T-N ~



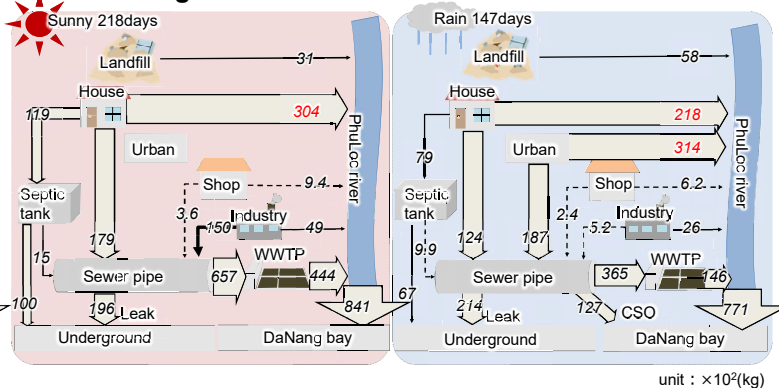
~ Concentraion of T-P ~



~ T-N Loading ~



~ T-P Loading ~



Conclusions

- > The highest concentration was the PhuLoc River for both T-N and T-P.
- > Landfill was the maximum amount of T-N loadings into Phu Loc river.
- > 66% of a load of T-N flowing into the PhuLoc river is from Landfill.
- > Road drainage from an urban area and household water was the highest amount of T-P Loadings into Phu Loc River.

This poster is undisclosed

Investigation of Functional Controls and Algae Species Treating High TDS Wastewater

Authors: Dongling Wang, Nawatch Surinkul

* Graduate School of Global Environmental Studies, Kyoto University
** Department of Civil and Environmental Engineering, Mahidol University

Background

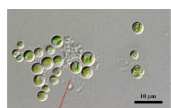
- Total dissolved solids (TDS) is one of the indirect measurements can determine salinity. Total dissolved solids cause toxicity through increases in salinity, changes in the ionic composition of the water and toxicity of individual ions.
- Current 4 physical methods (thermal method and membrane process)

Method	MED (multi-effect distillation)	MSF (multistage flash)	VC (vapor compression)	RO (reverse osmosis)
Cons.	High operating costs, Corrosion	Same as MED	Greater heat, High energy consumption	Small particle can pass, Slower process

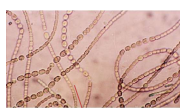
- Reverse osmosis (RO) is the mainly method for treating high TDS wastewater. However, regularly membrane cleaning cause more operation cost. Many researchers began to find another optional method, such as algal treatment.
- Several algae species provide possible TDS removal efficiency.



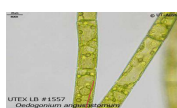
Scenedesmus
(97.7%)



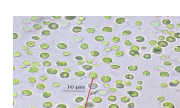
Chlorella minutissima
(97.57%)



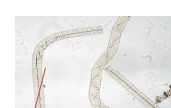
Anabaena variabilis
(38.84%)



Oedogonium
(54.12%)



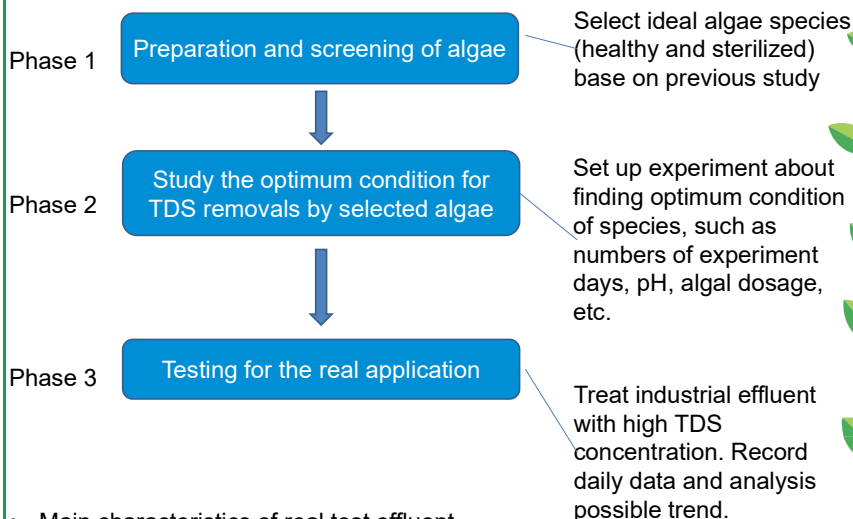
Chlorella vulgaris
(51%)



Oscillatoria quadripunctata
(32.6%)

Methodology

- Research framework

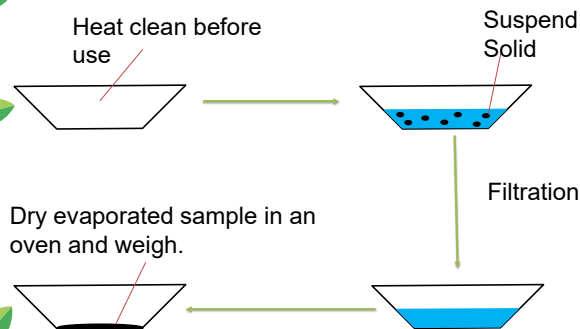


- Main characteristics of real test effluent

TDS (mg/L)	COD (mg/L)	BOD (mg/L)	TKN (mg/L)	NH ₄ -N (mg/L)	NO ₃ -N (mg/L)	TP (mg/L)	PO ₄ ⁻³ (mg/L)	SO ₄ ⁻² (mg/L)	Ca ²⁺ (mg/L)	Na ²⁺ (mg/L)
3200	112	43	4.1	0.07	4.63	6.012	-	651	59.4	1039
3150	62	15	3.6	Not Detecte	3.15	4.4	2.769	1964	70.4	952
3450	54	<2	2.2	0.16	3.67	3.4	2.869	1968	72.1	972

Analysis

- TDS determination



$$TDS, \left(\frac{mg}{L}\right) = \frac{(A - B)1000}{sample\ volume, (ml)}$$

Where: A = weight of dried residue + dish, mg
B = weight of dish, mg

- Daily record data, such as TDS, COD, pH, temperature, DO, etc.

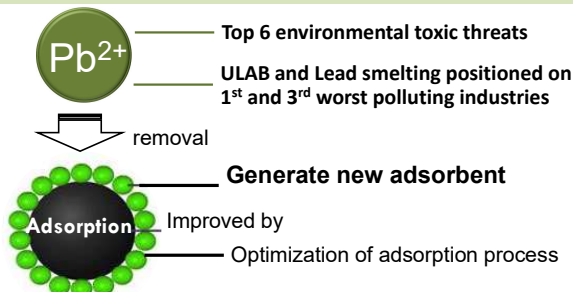
Alkaline-activated Indonesian pumice for the removal of lead in solution system

Faridlotul Hasanah*, Syaiful Anwar**, Arief Hartono** and Untung Sudadi**

* Soil Science, Graduate School of IPB University

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

Introduction



Lead maximum adsorption capacity of pumice

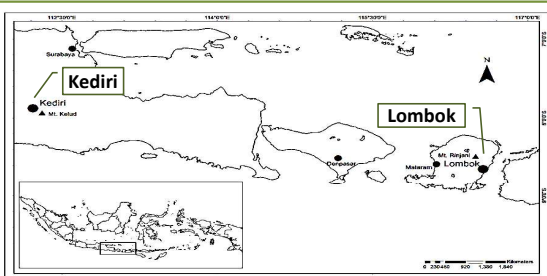
alkaline-modified pumice	28.09 mg/g
natural volcanic rock, Rwanda	9.52 mg/g
natural pumice, Turkey	7.46 mg/g
natural pumice, Iran	5.31 mg/g

2015 Pumice reserves reached 699 M ton
2015 Pumice Production volume 434 K m³

Objective: to assess the performances of adsorbent prepared from NaOH-activated Indonesian pumices for lead removal in solution system based on the maximum adsorption capacity using Langmuir model and removal efficiency parameters

Methods

Sampling sites



Pumice preparation

- 1 Pumices washed with running tap water and rinsed with distilled water
- 2 treated with 0.1 M HCl for 24 h
- 3 washed again with distilled water (until pH washing water= distilled water)
- 4 oven-dried at 60 °C for 24 h
- 5 milled and sieved to obtain pumice powder with particle size of 200 mesh (74 μm)

Pumice activation

- 1 5 g pumice powder were added each in 50 mL NaOH
- 2 Shaken using end-to-end shaker at 175 rpm for 24 h at room temperature
- 3 washed several times with distilled water until the pH of the washing water was equal to distilled water
- 4 oven-dried at 105 °C for 24 h

Tested adsorbents were combination of:
 Pumice sources Kediri (K) and Lombok (L)
 pumice activation 0, 0.5, 1 dan 2 M NaOH

Adsorption isotherm study

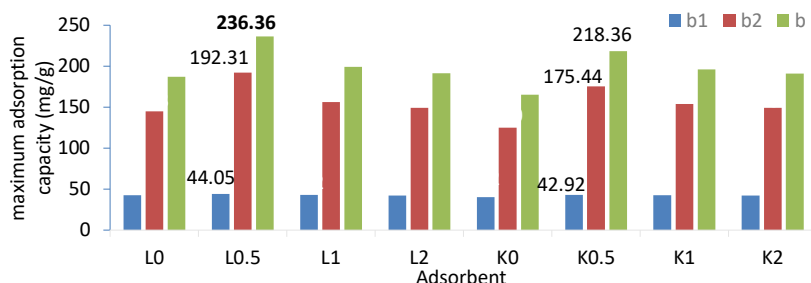
- » 0.12 g adsorbent+ 90 mL Pb(NO₃)₂ and 10 mL 0.01 M CaCl₂ as background electrolyte (at 30 °C)
- Initial Pb(NO₃)₂ concentration ranged from 0 to 260 mg/L (0, 5, 10, 15, 20, 30, 40, 50, 60, 100, 140, 180, 220, and 260 mg/L)
- » shaken at 150 rpm, for 100 min
- » the solutions were filtered, then Pb concentrations were determined using AAS

Two-sites Langmuir model

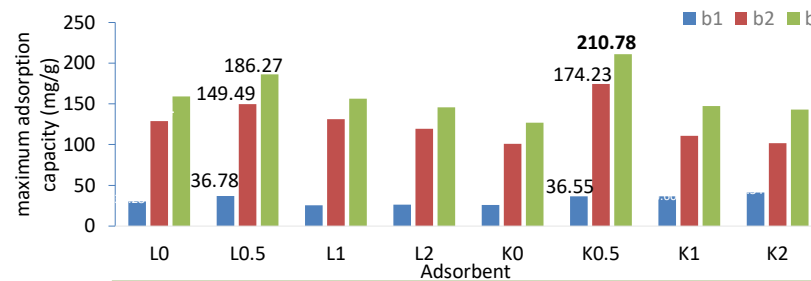
$$\frac{x}{m} = \frac{b_1 k_1 C}{1 + k_1 C} + \frac{b_2 k_2 C}{1 + k_2 C} \quad b = \text{maximum adsorption capacity (mg/g)}(b_1 + b_2)$$

$$\text{Removal efficiency (\%)} = \left(\frac{C_o - C_t}{C_o} \right) \times 100$$

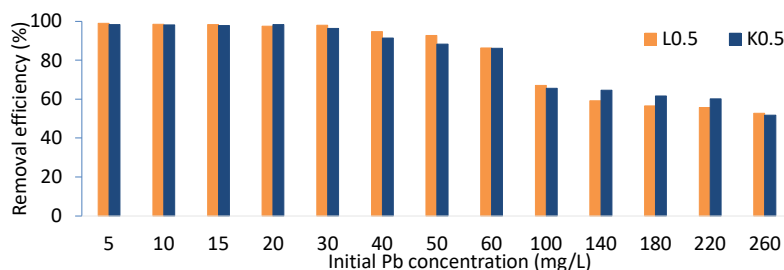
Results



Lead maximum adsorption capacity obtained from the two-sites conventional linearized Langmuir model



Lead maximum adsorption capacity obtained from the two-sites rearranged linearized Langmuir model



Lead removal efficiency of adsorbents prepared from Lombok (L) and Kediri (K) pumice powder with 0.5 M NaOH activation at initial lead concentrations of 0 to 260 mg/L

Conclusion

The most favorable NaOH activation based on lead maximum adsorption capacity for both pumices was 0.5 M. Both adsorbents yielded lead removal efficiency of > 80% at Pb initial concentration of < 60 mg/L and around 50-80% at about 100-260 mg/L. It is considered that both pumices are potential to be utilized as raw materials for preparing new natural cationic adsorbent in solution system with excellent performance.

Elucidation of Human resources for sustainable rural function by using System Dynamics model

Authors: Takuya Furusawa*, Kenichiro Onitsuka**

* Graduate School of Agriculture, Kyoto University

** Graduate School of Global Environmental Studies, Kyoto University

Introduction & research objective

1. The increase of marginal hamlets in Japan
 • Currently, the proportion of DIDs in the population of Japan is increasing and more marginal villages may be happened.

• It is important to maintain rural function for stopping marginal villages.

2. About rural function

Rural function is the Function to maintain rural area.

function	content
Resource management	The function to manage various types of regional resources (farm, river, etc.) by resident cooperation
Village promotion	The function to revitalize the regional community such as Green tourism, Sales of Agricultural products
Autonomy	The function to manage autonomies in villages by meetings in local resident.
Life supports	The function to support life of vulnerable people
Preserve value and culture	The function to preserve unique culture and value in villages by handing down tales or festivals
Disaster response	The function to confirm safety of resident and guide to safe area when natural disaster happens

3. In order to preserve rural functions

- Depopulation lower standards of rural functions.
- It is necessary to preserve human resources in villages
- Human resources supports in Japan are not suitable for sustainability of rural function

Judging the situation and sustainability of rural function from status of human resources in villages.

Quantitatively elucidating the conditions of human resources for maintaining rural function.

Research flow and Material

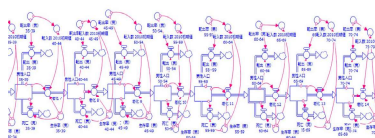
1. Research flow

The future of rural function are simulated by model.

- ① Generating simulation model of rural function
 - ② Implementation of simulation model
 - ③ Analyzing the conditions of sustainable rural function
- Target areas are marginal villages in Kyoto prefecture

2. Material

① Population forecasting data



Predicting the future population of each marginal villages
 Population forecasting assesses the future of rural function

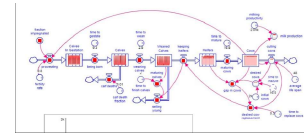
- ② Census of Agriculture and forestry in Japan
 There are various data items of Kyoto villages
- ③ Interview survey data
 Interview Survey at marginal village in Kyoto Prefecture

About System Dynamics

Simulation model is using System Dynamics

• Simulation model judges the conditions and the future of rural functions from human resources in villages

※ System Dynamics?



By combining stocks, converters, flows, System Dynamics becomes able to clarify the causal relationships in elements which are critical for complex social systems.

By viewing rural function as the whole system combined with population forecasting, we will observe how changes of rural function in marginal villages will occur along with demographic changes over time.

About Simulation model

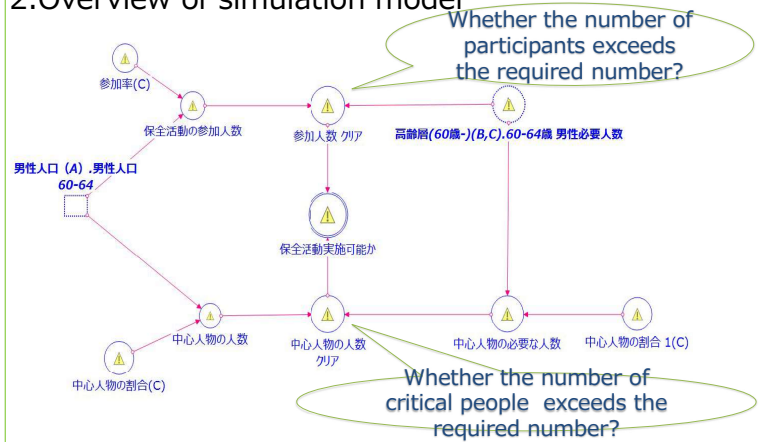
1. Simulation items

4 functions will be simulated

function	Standard items
Resource management	Can village do farmland conservation activities?
	Can village do pond conservation activities?
	Can village do river conservation activities?
	Can village do agricultural drainage channel conservation activities?
Autonomy	Can village hold meetings about autonomy there?
Life Supports	Is it possible to conduct a patrol for senior people?
Disaster response	Is there any group which response natural disaster?

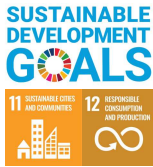
We will simulate when each item can be maintained

2. Overview of simulation model



- We will set the standards of each item in the number of participants and critical people for each age.
- When 2 standards are cleared for all ages each item are safe and each rural function are preserved

Waste Bank as an Integrated Approach Towards Sustainable Waste Management



Hikaru Shirai

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

Introduction

Human Development and Waste

With rapid population growth, economic development, and urbanization, the overconsumption of resources is creating a global crisis of **waste disposal**.

Today, current estimates show that the world generates **2.01 billion tonnes** of waste annually with an expected increase to 3.40 billion tons by 2050¹.

There are in need of fundamental change to circular-economy and resource management based on **3R(Reduce, Reuse, Recycle) and waste hierarchy**².

Limitation of Conventional Waste Management

In most cities and towns in developing countries, waste management is usually **municipal responsibility**;



Many of them are facing difficulties in providing proper waste management due to;

- increasing amount of MSW
- inability to cope with rapid expanded demands on system & costs.

Arise of Community-based Initiatives

- **local community-based initiatives** generally arise;³
- poorly served residents often form **community-based organizations**;⁴
- municipal authorities are taking more of a multi-actor approach.⁵

Waste Bank – Unique Community-based Waste Management in Indonesia

- Residents bring waste, can be reused/recycled, to waste bank **organized by communities** to exchange waste with money/goods/services
- Residents **separate waste voluntarily** thus it reduces waste going into final disposal site
- Popular recycling initiatives in Indonesia especially in the **low-mid income communities**
- **Promoted by country as a tool for community to implement 3R** – 7000 WB in Indonesia (2019)



PROS

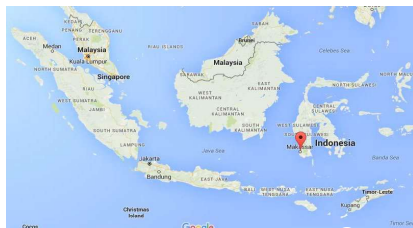
- ✓ Give new perspective/ change mindset, “Waste can be money/resource”
- ✓ Additional income for household
- ✓ Obtain skills of handcraft (not every time)
- ✓ Build the habit of separation
- ✓ Reduce the amount of waste going into the final landfill ⇒ Less littering ⇒ Achieve cleaner environment
- ✓ Strength community unit
- ✓ Educational / Innovative tool
- ✓ Economic benefit

CONS

- ✗ Not attractive enough: hassle, time consuming, space taking at house
- ✗ Lower price compared to informal recycling sector (tend to be)
- ✗ Limitation of voluntary action in the management : cost, human resource
- ✗ Insufficient support: Lack of fund (maintenance cost), no guideline ⇒ Difficulty in further development
- ✗ Less convenient compared to other services (mostly by informal sector)

Waste Bank Initiatives should integrate into MSW MANAGEMENT POLICY

Good Practice- Makassar City ~~COMMUNITY-BASED APPROACH~~ ✗ INTEGRATED SYSTEM



In Makassar City, Waste Banks were integrated into formal MSW management policy by introduction of “Central Waste Bank”

Municipal decree by Makassar Governor (2015~)

- Establishment of “Central Waste Bank” with **municipal budget**
- Target “1 community, 1 waste bank”
- Targeted recyclables increased from 4 to 51 categories
- Mandated the local government officers to bring 2.5 kg of waste to waste bank (otherwise, the officers won’t receive monthly salary)

CONCLUSIONS & DISCUSSIONS

Over the past few years, Waste Bank initiatives have been getting attention by practitioner and academic as its uniqueness, and rapidly increased number. On the other hand, some waste banks fail to manage their running due to difficulties such as stated above. Lesson learnt from Makassar city is that **integrating into formal MSW management policy seems to be one of the best solutions; especially in aspect of stability, reliability, and possibility for further growth. Therefore, Waste Bank has potential as an effective community-based approach toward sustainable waste management in the**

Factors improved after integration into MSW policy

- ✓ Data collection of recyclable volume collected – by gov.
- ✓ Selling price to recyclers – announce every 3 months
- ✓ Buying guarantee to residents – with fixed price
- ✓ Collection Schedule - reservation with central waste bank
- ✓ Categories of recyclables can be collected – more precisely

For future study, data collection and comparison with other waste bank initiatives, other community-based approach with analysis are necessary.

Reference: 1. World Bank (2018) 2.ADB and IGES (2007) . 3. Ali and Snel (1999). 4. Schübeler (1996). 5.Kubota et al., (2019)

Smart agriculture's influences on rural communities

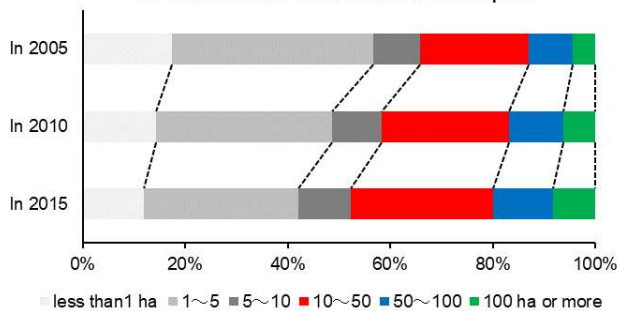
Authors: yuya HONDA ¹, kenichiro ONITSUKA ²

¹ Graduate School of Agriculture, Kyoto University, ² Graduate School of Global Environmental Studies, Kyoto University

Background

In Japanese agriculture, especially in rural regions, there are many problems such as decreasing the acreage of farmlands, decreasing the number of farmers and aging population of farmers. These are severe hurdles in Japan, where food self-supporting ratio is lower than 40%. Moreover, fewer farmers will cultivate their farmlands than ever. As this evidence, you can look at the graph 1 ¹⁾.

Graph 1 : The proportion of the acreage of farmlands of a farmer in Japan



This graph shows the proportion of the acreage of farmlands owned by a farmer. The percentage of more than 10 hectares farmlands has been increasing from 2005. Despite the aging population and the shortage of farmers, Farmer's burden of cultivation is strengthened. We have to improve agricultural productivity by introducing efficient technologies.

Background: Smart agriculture

Smart agriculture is an agriculture using artificial intelligence and information and communications technology. It is expected to solve agricultural problems in Japan. Skilled farmers' know-how becomes explicit knowledge and field-work becomes automated or simplified by introducing these technologies. Table 1 shows some examples.

table 1: smart agriculture's technologies

Technology	Content	Merit
Straight line keeping rice transplanter	Automatic keeping straight line while transplanting	Efficient transplanting
Drone	Remote pesticide spraying	Saving labor and work time to spray pesticide
Water management system	Automatic managing the quantity of paddy fields' water	Preventing decreased growth
Unmanned tractor and combine	Unmanned cultivating and harvesting rice	Saving labor

Objective

The government has started to introduce smart agriculture's technologies on a trial basis from 2019. Compared with regions of large plains, there are many bad conditions of farmlands and workforce in rural regions, which are located in mountainous areas. However, we have many beautiful landscapes, traditional cultures and natural resources in rural regions. It is essential that we develop Japanese agriculture and preserve these advantages. The new technologies will have changed even lifestyles in rural communities. So my research objective is inquiring into the way to introduce new technologies in rural regions and simulating the influence on rural communities .

Methodology

A series of farm works can be replaced with new technologies. As figure 1 shows, farmers can cultivate by using unmanned tractors , transplant rice with partially automated transplanters, spray pesticide with drones and harvest rice with unmanned combines. Farmers' opinions and decision making to introduce them depend on the contents of each technology. I'm going to investigate farmer's will to introduce " Smart agriculture" by doing questionnaire survey.



Figure 1: The process of rice farming

The Ministry of agriculture, forestry and fisheries offered smart agriculture's technologies on a trial basis to 69 districts with a view to testing the efficiency of them ²⁾. I chose one of the districts, a rural region as a study area, where many farmers established an agricultural corporation and integrated some of their farmlands. I questioned its representative director the Ministry's projects. He said that he wanted to try smart agriculture so that his successors could take over it in the future. He also explained present hurdles to be solved regarding smart agriculture, shown in below sentences.

Questionnaire survey

1. **Natural disasters**
The district is near a river that caused many bad floods. The riverside has been improved and repaired through public works, but the threat of floods has been remained. Whatever technologies are introduced in the district, a serious damage may be caused by natural disasters.
2. **Few well operators of IT devices**
Especially, elderly people tend to be unfamiliar with IT devices, and don't know how to operate them. In my study area, farmers cannot operate drones well, because delicate movement of the fingers is needed to move drones.
3. **Initial cost**
Farmers have to obtain loans at high amount of money due to high initial cost of smart agriculture. Adequate funds and operator's viewpoint can realize sustainable smart agriculture.

Future plan

From this survey, the agricultural corporation will be a key model of future rural communities of smart agriculture. I'm going to ask all farmers' thought on smart agriculture in the district by doing an additional questionnaire survey and simulate the prevalence based on the model.

References

- 1) The Ministry of Agriculture, Forestry and Fisheries (2017) : "Agricultural census", http://www.maff.go.jp/j/tokei/census/shuraku_data/2015/sa/index.html
- 2) The Ministry of Agriculture, Forestry and Fisheries (2019) : "About the introduction of smart agriculture", <http://www.maff.go.jp/j/kanbo/smart/attach/pdf/index-14.pdf>

Emerging Trends Associated with Plastic Carrier Bag Policies: A Quick Review

Authors: Isaac Omondi and Misuzu Asari

Graduate School of Global Environmental Studies, Kyoto University

Background:
Plastic Packaging Problem



150 million tons used annually

60% is food and beverage packaging

60% ≈ Single Use Plastic

Global Outlook

Resource Waste



\$80 120 billion lost value annually



6% of global oil used in plastic production


Terrestrial Pollution

-- 95% material loss

Garbage

40% landfill
32% leaks

14% collected with only 5% value



Marine Pollution



- Every year 8 metric million tons of plastic waste leak to ocean
- More plastic than fish in the ocean by 2050


There are global, regional, national and local policies to mitigate plastic pollution. The common strategies include bans, levies/charges, awareness programs or a mixture of the tools. By product, single use plastic carrier bags is the most targeted by these policies. (References 1-4)

Objective: To highlight emerging trends associated with plastic carrier bag policies not limited to diffusion, behavioral response, environmental effects and counter legislation.

Methodology: Primary data through questionnaire survey in Kenya in March 2019; Secondary data from reliable and verifiable publications.

Results: Diffusion of plastic bag policies

Major National Policies		Bans, Taxes and Charges	
		Developing Countries	Developed Countries
Reasons for policy adoption	Policy Popularity	Bans	Levies, Charges
	Global problem pressure: Single use plastic, land and marine pollution	Low plastic production; high plastic leakages	High plastic production; low plastic leakages
	Global public pressure: Media/NGOs	Less	High
	Waste management systems	Undeveloped	Low plastic recycling
	Industry lobby groups	Weak	Strong
	Generic reasons - Influence by other countries; Intergovernmental policy adoption e.g. EU; International political agenda e.g. UNEP, G7; country policy e.g. circular economy, 3R + Renewable; Alternatives/Health Concerns etc.		(References 5-6)



No to little impact **20%**


Reduced consumption or less pollution **30%**

No data on impact **50%**

Ban it?

Change it?

Collect it?



Expected Result	Policy Modalities
Anti-consumption - decision to resist, resent or distaste a product	Ban - Theoretically 100% anti-consumption
	Levy/Charge - Reduced consumption (Effective price).

(References 7-8)

Support towards policies

Country	Policy Type	Year Intro.	Year Tested	Parameter – Self Reported (References 9-13)
India	Ban	2003	2013	Yes 78%; No 22%
S. Africa	Charge	2003	2019	Agree 62%; Neutral 37%; 1%
China	Charge	2008	2011	Yes 57%; No 3% (Rem. not clear)
Wales	Charge	2011	2012	Yes 70%; No 30%
UK	Charge	Proposal	2013	Yes 55%; No 43%; Unsure 2%
Kenya	Ban	2017	2019	Yes 67%; Neutral 15%; No 18%

Policies have **more than 50% support** in different parts of the world. In general, support for plastic bag policies increase upon enactment.

Emerging Trends

Effect on reusable bags

Country	Policy Type	Year Intro.	Year Tested	Reusable Changes	Popular bag (References 13-15)
Wales	Charge	2011	2012	Increase of 20% in own bag usage	-
Portugal	Tax	2015	2015	Increase of 61% in reusable bag usage	Plastic based
Japan	Voluntary Charge	-	2017	-	Plastic based
Kenya	Ban	2017	2019	Increase in ownership from 4 to 12 bags	Plastic based

Reusable bag usage increase with adoption of policies. Plastic based reusable bags are becoming popular by material.

Effect policies on behavior and environment

- Use of stocked plastic and reusable bags (Portugal)
 - Maximize use of plastic bags (Australia)
 - Increased willingness for controls on other plastics (UK)
 - Increase in consumption of waste bags (Portugal)
 - Climate Change / GHG concerns (LCA Studies)
 - Wrong perception – Reusable are ecofriendly (Bangladesh)
- (References 13-17)

National policy shifts

Policy Change	Country
From charge to bans on plastic bags	Uruguay, Iceland (2021)
Extension of bans for bags to single use plastic products	Rwanda (2019), EU (2021), India (2022)
Preemptive law - bans creation of local laws to control plastic use	USA e.g. Arizona, Florida

(References 18)

Conclusion

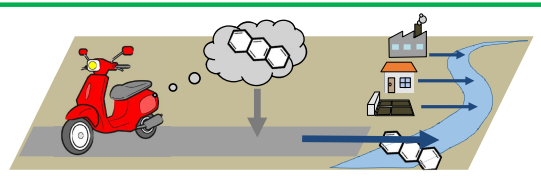
- ❖ The problems associated with single use plastics are outlined.
- ❖ There are various solutions with much uncertainty since their efficacy is yet to be established.
- ❖ Similarly, positive and negative unintended effects are emerging.

- ❖ Additional research is necessary on the backdrop of these issues to establish solutions with the least environmental burden.



Survey on the amount of Polycyclic Aromatic Hydrocarbons contained in Runoff and Atmospheric deposition in Da Nang, Vietnam

Kazumasa WADA, Shuhei TANAKA, Daiki ARISUE, Sana OHASHI, Shigeo FUJII (Grad. Sch., Kyoto Univ.)
Ngoc An Hoang, Tran Van Quang (Da Nang Univ. of Sci and Tec.)

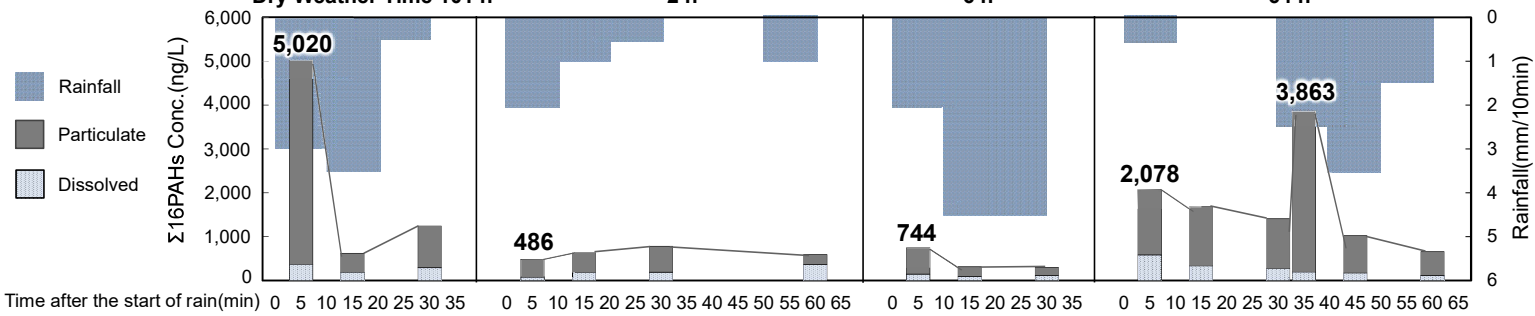


Polycyclic aromatic hydrocarbons (PAHs)

- It is necessary to identify the load path to take efficient countermeasure
- Lack of knowledge on PAHs in emerging countries

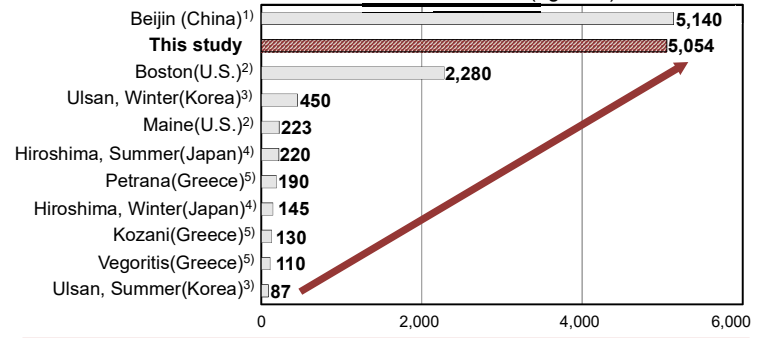
Objective: Understanding the amount of PAHs in Runoff and Atmospheric deposition in Da Nang, Vietnam

1. Road Runoff



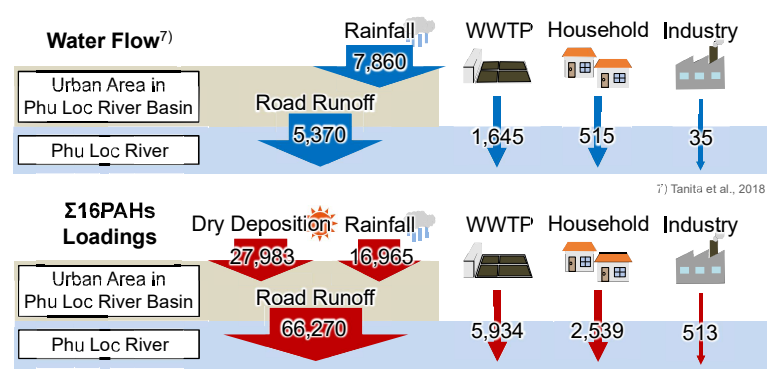
Σ16PAHs concentration was detected at high concentration from immediately after the start of rainfall and after long dry weather.

2. Dry Deposition



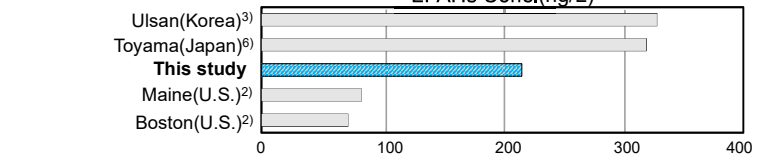
Σ16PAHs amount was maximum 58 times as much as other cities.

4. Σ16PAHs Loadings to Phu Loc River



Road Runoff from urban area was the maximum amount of Σ16PAHs Loadings into Phu Loc River.

3. Rainfall



Σ16PAHs conc. was not particularly high compared to other cities.

Future Work

It is important to prevent outflow of PAHs in Road Runoff at the beginning of rainfall
→ Examining reduction effect of PAHs in Road Runoff by using artificial wetlands



Sampling

Pre-Treatment

- Filtration
- Ultrasonic extraction
- Save to solid phase cartridge
- Elution

Analysis

GC-MS/MS
IDL: 0.1~0.5 ng/mL

Analysis Target : 16 PAHs



A Performance Prediction Method of Ozonation for the Design of a Typical Ozone Contactor in Japan

Authors: Kohei Kawaguchi*, Tadao Mizuno** and Fumitake Nishimura*

* Graduate School of Environmental Engineering, Kyoto University
** Faculty of Science and Engineering, Setsunan University

1. Background

- ◆ Ozonation is a widely used for water purification process.
- ◆ Ozone (O_3) & hydroxyl radicals (HO^\bullet) generated from ozone work during ozonation.
- ◆ The formation/consumption and concentration of HO^\bullet during ozonation are difficult to predict and vary depending on water qualities.

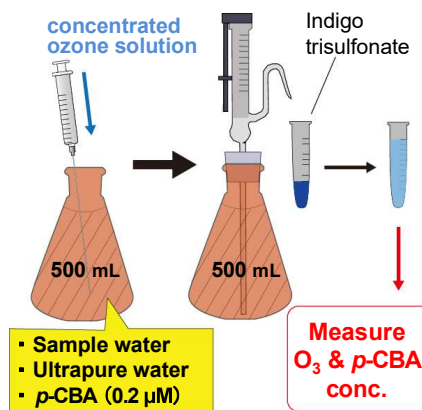
We propose a method which can predict the O_3 & HO^\bullet concentrations in ozonation for the design of an ozone contactor.

This method can answer:

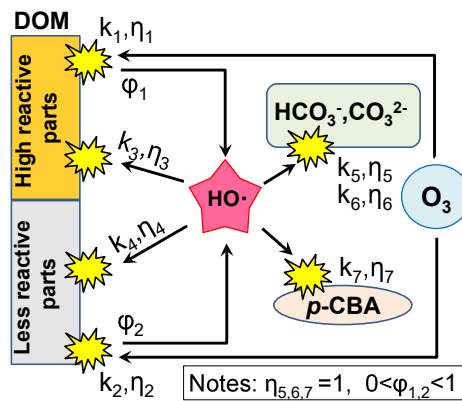
- ✓ Whether ozonation is suitable for a water
- ✓ What ozonation can achieve for a water
- ✓ What the required ozone dose is

2. Method

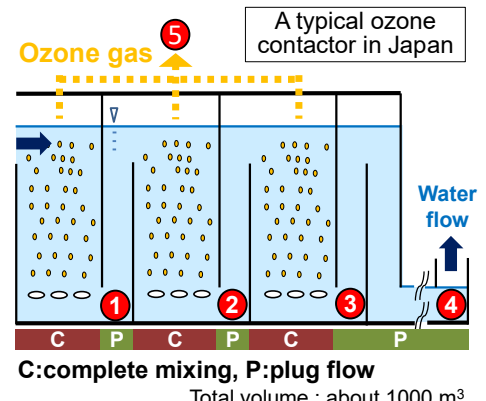
Batch experiment



Reaction model



Ozonation model



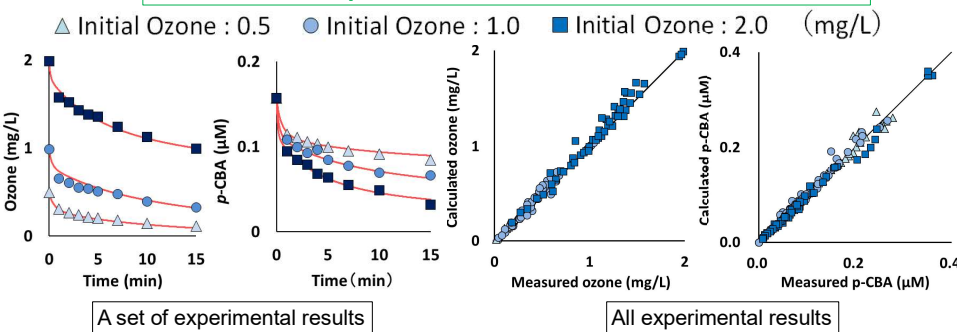
- ◆ Sample water was taken from an effluent of a coagulation-sedimentation process in a water purification plant in Kansai, Japan.
- ◆ Measure the O_3 and p -CBA conc. several times in a given time.
- ◆ The decomposition of 4-Chlorobenzoic acid (p -CBA) represents a HO^\bullet exposure.

- ◆ The reactivity of DOM (Dissolved Organic Matter) were classified into two parts.
- ◆ Each reactive part was characterized by reaction rate constants (k), stoichiometric coefficients (η), and HO^\bullet formation ratios (ϕ) for both of O_3 & HO^\bullet reactions.

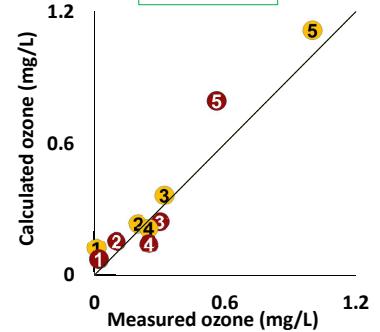
- ◆ An ozonation model consists of the reaction model, mass transfer (ozone gas to liquid), and hydro dynamic behavior.
- ◆ The data of operational conditions were provided by the water purification plant, and applied to the model.

3. Result

Batch experiment & Reaction model Result



Final result



- ◆ The reaction model can reproduce the time course of the ozone & p -CBA concentrations, including the rapid and slow reactions, regardless of the initial ozone doses.

- ◆ The experiment was conducted in the range of 8.4 to 30 , and all the calculation results agreed well with the experimental results.

- ◆ The ozonation model agreed with the experimental results, including four dissolved ozone and one off gas concentrations.
- ◆ Most of the high reactive part of DOM was removed.
- ◆ The HO^\bullet concentrations ranged from 2.6×10^{-14} to 2.7×10^{-13} M.

4. Conclusion

- ◆ A performance prediction method of ozonation, which can evaluate the concentrations of Ozone and hydroxyl radicals in an ozone contactor, was developed.
- ◆ This model can contribute to the design, operation, and control of ozonation in a water purification process.

This poster is undisclosed

comparative effectiveness of different weed management practices in the control of parasitic weeds dodder (*Cuscuta* sp.), in onion.

Author: Regan M. Nyoni¹, Kalunde pilly Sibuga²

* Graduate School of Global Environmental Studies, Kyoto University

** Department of Crop science and horticulture, Sokoine University of Agriculture

Background

- ❑ Lumuma riparian ecosystem is among the three hot spots in Tanzania where extensive onion production is taking place
- ❑ *Cuscuta* weed threaten the sustainability of Onion crop



Discussion

- ❑ The highest onion bulb diameter was observed from hand pulling + rice husk
- ❑ Mulched plots have been comprises of lowest weed density and weed dry weight



Conclusion & recommendations

- ❑ Rice husk + Hand pulling gave good response on bulb weight
- ❑ Rice Husks + hand pulling would best substitute for herbicide use

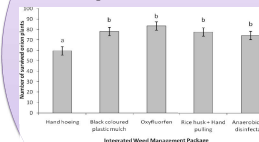
Methods

- ❑ Treatments were arranged in a split-plot and laid out in Randomized Complete Block Design (RCBD) with four replications
- ❑ Main-plot was onion varieties and sub plots integrated weed management practices



Results

Plants survived vs. weed managements options



- ❑ Rice husk + hand pulling is good option of chemical herbicides

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

The Management of Common Land for Conservation and Development: Case Study of Minamikomatsu Village in Shiga, Japan

Mayu Narita* and Chiho Ochiai*

* Graduate School of Global Environmental Studies, Kyoto University

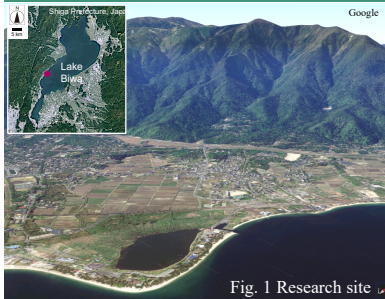


Fig. 1 Research site

Research Background and Methodology

In Japan, there are still many lands that are managed by local organizations. These lands were originally intended for the use of natural resources, but now the purpose of using common lands is becoming diverse, for example, business use. Due to the changes in the law, most of the common lands are belonging to the public as property-ward, or the local. In either case, for the management of the lands, local organizations are directly facing various problems such as securing next-generation personnel and consensus building for a plan. In recent years, researches on property-ward as “local-commons” have been conducted in Japan. However, as for the locally-owned case, there are few detailed studies in modern times. The purpose of this study is 1) to elucidate the actual management of common land where existing in Japan for a long time, taking into account the uniqueness of the region, and 2) to reconfirm the use of the common land as commons. As the research methodology, local documents analysis, interview survey targeting past chairpersons, and on-site field surveys were conducted from January to October 2019 in Minamikomatsu, Shiga, Japan. The beach managed by the village attracts twenty to thirty thousand people annually. In the documents survey, 19-21th-century documents stored in the community center were used. Curators at the Otsu Museum of History supported this process. The on-site field survey was carried out to understand the usage and actual activities on the common land of Minamikomatsu in detail.

Results

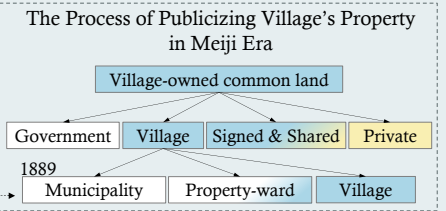
Historical Background of the Common Land

The natural resources of the common land are managed and used by the village. The beach is known for its beautiful scenery from 8th century.

Influential Events	(Year)
1873-1881 Land Survey	1873-1881
1886 Registration Act	1886
1889 Municipal - Government Act Property-ward System	1889
1894 Sino-Japanese War	1894
1896 Flood disaster	1896
1904 Russo-Japanese War	1904
1912- Movements of tourism development around Lake Biwa	1912-
1914 World War I	1914
1935 Flood disaster	1935
1941 Pacific War	1941
1955 Municipal merger	1955
1990 Ownership transferred to the local association	1990
2006 Municipal merger → Otsu city	2006

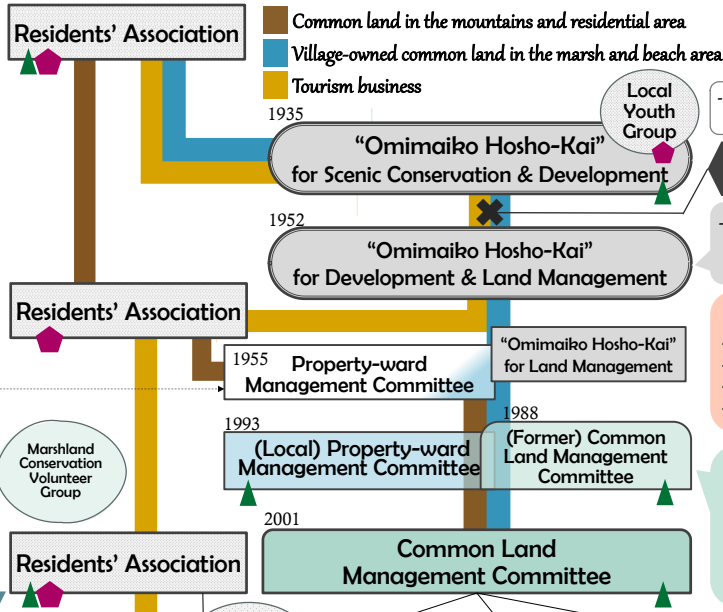
1882 The village submit the application to rent the marshland
 1883 The village submit the application to buy the gov. land
 1885 The village buy the marshland from government
 1886 Three representatives of the village register the marshland
 ▶ **The Marshland Become Common Land of Minamikomatsu**

We have long been sustaining the paddy fields by taking mud and algae to relieve the highland around the marshland.
 We were very surprised at the designation of the gov. land. Without our control, the paddy fields will not be sustained.

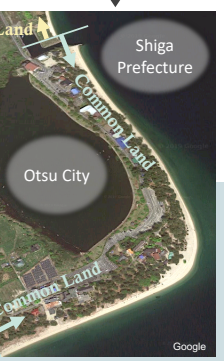


Transition of Management Organizations

In 1900, pioneer tourism business is started by volunteer local residents



The scenery of white sand and blue pine is designated as a scenic spot by government.
 Requisitioned by the US military until 1952
 The "Hoshō-ki" members consulted with Shiga prefecture and private companies on the development.
Tourism Development
 - The Parking area is constructed.
 - The pine forest becomes sparse.
 - The designation of scenic spot is canceled.
 - Security has deteriorated.
 The rights of common land for residents are organized. Residents lay down rules of Common Land Management Committee.



Present Activities and Issues

BBQ
 Cleaning
 Weeding / Planting
 Preparing for cultural event

Neighbor-hood Association

- The reduction of beach sand
 - Illegal dumping of leisure goods
 - Fallen trees due to typhoon

Conclusion

While the tourism development has affected the environment and landscape of the common land, local organizations have continued to manage and carry out conservation activities such as planting, cleaning, or even preventing the large-scale development. It is necessary to reorganize the functions of commons for local and cooperate with other stakeholders.

Acknowledgements I would like to express the deepest gratitude to those who supported the study and to the community of Minamikomatsu. This study has been funded by the Eco-DRR project of the Research Institute of Humanity and Nature. **Reference** 1) Rui, Izumi et al, 財産区悉皆調査報告書—ローカルコモンズとしての財産区—(2008)



Effect of organic amendments on methane emission, soil microbial composition and wheat productivity

Authors: Haro Kumar Ghosh¹, Dr Muhammad Aslam Ali², Dr Md Shahadat Hossen³, Md Zubair Al Islam⁴

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^{**} Department of Environmental Science, Bangladesh Agricultural University

Background of the Study: Phy et al. (2014) reported that the biosolid had tendency to enhance soil pH in loam, but not in clay and loamy sand. In addition, highest EC was in clay, especially with 25 t ha⁻¹ of Biosolid amendment, followed by loam and loamy sand. Furthermore, in loamy sand, the stronger correlation between Biosolid rates, and both pH and EC, compared to loamy and clayey soils. Sarkadi (2012) from an experiment on the utilization of organic manure and mineral fertilizers by wheat concluded that the efficiency of FYM and number of 'rff gene copies was observed in the bulk soil of 5 years organic management. Zhong et al. (2010) showed how long-term fertilization of organic mfertilizer P were very similar. Wang et al. (2012) observed that the abundance and diversity of N-fixing bacteria tended to increase with duration of organic management but the highest anure (with or without NPK application) led to C utilization pattern shifts and increased soil microbial functional diversity. Theunissen (2010) reported that the vermicompost contains a high proportion of humic substances (humic acids, fulvic acids and humin) which provide numerous sites for chemical reaction Ali et ai. (2015) reported that biochar amendments in paddy soils of Japan and Bangladesh decreased seasonal cumulative N₂O emissions by 31.8% and 20.0% respectively, followed by 26.3% and 25.0% reduction with biochar plus Azolla-cyanobacteria amendments. Although seasonal. cumulative CH₄ emissions were significantly increased by 9.5-14.0% with biochar amendments, however, global warming potentials were decreased by 8.0-12.0% with cyanobacterial inoculation plus biochar amendments.

Methodology

Description of research site:

Morphological features	Characteristics
Location	Research field, Department of environmental science, BAU
AEZ	AEZ-9, Old Brahmaputra floodplain
General soil type	Silty loam and fertility is high
Soil series	Sonalota
Topography	Fairly leveled
Drainage	Well drained
Land type	Medium high

Different combinations of treatments

T₁ = 100% Recommended fertilizer dose of NPK (Urea at 190 g or 190 kg ha⁻¹ TSP at 150 g plot⁻¹ or 150 kg ha⁻¹, MoP at 100 g plot⁻¹ or 100 kg ha⁻¹)

T₂ = 75% RFD of NPK + 2.5 kg Bio solids 10 m⁻² (2.5 t ha⁻¹)

T₃ = 75% RFD of NPK + 2 kg Bio slurry 10 ar2 (2 t ha⁻¹)

T₄ = 75% RFD of NPK 2.5 kg Vermicompost 10 m⁻² (2.5 t ha⁻¹)

T₅ = 75 % RFD of NPK +3 kg Composted FYM 10 m⁻² (3 t ha⁻¹)



Figure: Layout of experimental field

Composition of selected organic amendmends

Bio solid : Organic matter-39.42%, C/N ratio-24:1
Bio slurry : Organic matter-49.68%, C/N ratio-18:1
Vermicompost : Organic matter-26.41%, C/N ratio-14:1
Composted FYM : Organic matter-44.1%, C/N ratio-35:1

Calculation of Methane gas flux

CH₄ was collected by closed chamber method (Ali .2008)
CH₄ emission rates were calculated from the slope of the linear regression curve of gas concentration against chamber closure time (ppm per minute)

$$\text{CH}_4 \text{ emission (mg m}^{-2}\text{d}^{-1}) = \frac{\text{Slope (ppm min}^{-1}) \times V_c \times 16 \times 60 \times 24}{22.4 \times ((273 \text{ T})/273) \times A_c \times 1000}$$

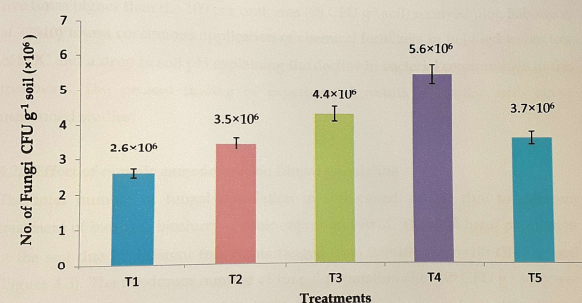


Figure: Number of fungi in different types of organic amendment treated soils

Result :

Table 4.1 Effect of organic amendments on growth and yield contributing characters of wheat variety BARI Wheat-28

Treatments	Plant height (cm)	No. of tillers hill ⁻¹	No. of filled grains hill ⁻¹	Weight of 1000 grain (g)	Ripenin g ratio (%)	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	Harvest index (%)
T1	96	13.67b	490.67c	42.33c	84.16d	3950.00d	6983.33	36.14b
T2	99.67	17.33ab	684.33b	49.00b	90.23b	4920.00ab	7366.67	40.08a
T3	99	16.00ab	618.33b	46.67b	88.78c	4733.33bc	7066.67	40.12a
T4	102	19.33a	790.33b	53.33a	92.44a	5200.00a	7533.33	40.85a
T5	98	14.67b	634.00b	45.67bc	88.47c	4433.33c	7233.33	38.01ab
LSD _(0.05)	2.95	2.32	57.26	2.01	0.82	210.00	414.64	1.65
CV (%)	6.05	5.04	8.03	3.49	2.86	4.81	5.11	4.02
LS	NS	*	**	**	**	**	NS	*

Discussion

Therefore, the present study showed that the application 75% RFD of NPK+2.5 t vermicompost per ha increased wheat productivity, raised microbial population and enhanced soil fertility while reduced methane emission compared to other organic amendments. Considering the above facts of the present study, the following recommendations may be suggested:

- Further experiment may be conducted at other locations of AEZ of Bangladesh for observing the adaptability.
- More types and rates of organic amendments may be needed to include for further study to make sure of the present findings

This poster is undisclosed



Yield potential of cowpea improved lines for the Northeast Thailand under varied environment

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Abstract

Cowpea (*Vigna unguiculata*) is a leguminous crop which can widely adapt among diverse environments, including high temperature and drought prone areas. Due to its short life cycle, the cowpea has been introduced for cropping system. Cowpeas may be consumed as fresh pod, dry grain, fodder, and green manure. The cowpea breeding project herein developed cowpea lines via crossing and pure line selection, in which 27 lines were selected. However, varietal evaluation is most needed prior to release to the farmer. Twenty-seven cowpea lines, together with two check varieties, were evaluated under four environments at Department of Agronomy, Faculty of Agriculture, Khon Kaen University, Thailand in 2016 - 2018. The result found that environment 3 presented the greatest grain yield performance. The high temperature of environment 2 affected days to flowering and days to harvest for 8.61-19.92 and 25.40-28.17 days respectively. Regression analysis and (GGE)-bi-plot across four environments identified the cowpea lines; 33, 305, 39D, and KKM60-2 as high stability and grain yield with short maturity. This demonstrates that selected cowpea lines are wide adaptable and can be planted year-round.

Objective

To evaluate the yield potential and yield stability of early-maturity cowpea elite lines across four varied environments that over all seasons in Thailand.



Methodology

All lines and varieties were evaluated for yield stability in field at KKU Agronomy Field Crop Station, in four environments. The experiments were laid out by randomized complete block design (RCBD) with three replications. Seed were sown directly in 2x4 m² with spacing of 50x25 cm. The data were collected follow IBPGR. Analysis of variance was accomplished by over season combine analysis whereas yield stability was evaluated by AMMI analysis (GGE-bi-plot) and Eberhart and Russell (1996) model.

Table 1 Planting date, max. and min. temperature, average temperature and relative humidity of four environments.

Environment	Planting date	Temperature (°C)		Average temperature (°C)	Average Rh(%)
		Min	Max		
1	3 Nov 2016	19.7	31.6	25.7	86.6
2	9 Apr 2017	24.6	34.5	29.5	92.0
3	15 Nov 2017	17.5	30.7	24.1	87.6
4	25 Aug 2018	22.6	33.0	27.8	93.0

Table 2 Days to harvest and grain yields of the cowpea lines and varieties of four environments.

Line/Varieties	Days to harvest (Environment)				Grain yield (g/m ²) (Environment)				Regression	
	1	2	3	4	1	2	3	4	b	S ² di
CPL 33	86.7	54.7	70.7	76.7	184.4	233.2	323.4	294.0	1.03	0.28
CPL 305	78.3	50.3	82.0	75.3	176.9	245.5	322.8	255.3	0.99	0.27
CPL 39D	77.0	51.0	70.7	77.0	161.6	279.8	273.6	264.5	0.93	0.24
KKM 60-2	76.7	50.7	83.0	75.7	168.8	273.5	251.1	279.4	0.80	0.30
KKU25	78.0	48.0	82.7	78.0	101.5	270.6	278.3	250.0	0.31	0.41
KVC7	73.0	52.0	83.7	75.7	168.7	266.6	313.2	355.7	1.42	0.30
Mean	78.4	50.2	76.8	75.6	160.0	248.3	286.8	268.9		
LSD	13.6	6.3	-	1.4	78.4	77.6	91.6	77.4		
F-test	*	**	ns	**	**	**	**	**		
C.V. (%)	10.6	7.7	15.4	1.1	30.0	17.4	19.3	17.6		

Remark: The same letter in the same column means that there is non significant difference (P<0.05). Mean comparison based on Least Significant Difference (LSD).



Conclusions

The cowpea lines 33, 305, 39D and KKM60-2 have proved as high yield and stability, particularly in cool season (environment 3) due to short maturity, they are suitable for crop rotation and intercropping.

Acknowledgments

This research was supported by the Plant Breeding Research Centre for Sustainable Agriculture and The Salt-Tolerance Rice Research Group, Khon Kaen University Khon Kaen University, Thailand.

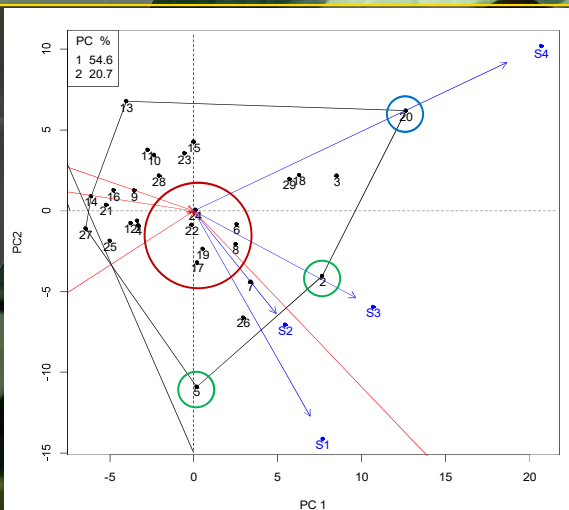


Figure 1 Principle component analyses of the yield stabilities of 29 cowpea genotypes across four environments

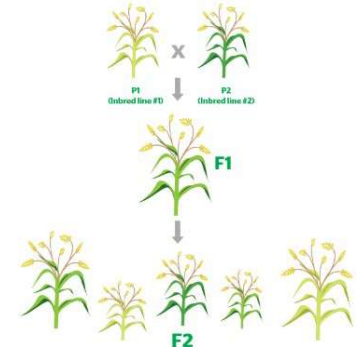
Interests and Chances for Hybrid Wheat Market Penetration in Germany

Authors: REIFENRATH, Benedikt E.; MORI, Akihisa
Graduate School of Global Environmental Studies, Kyoto University
Global Ecological Economics

Background:

How does hybrid breeding works?

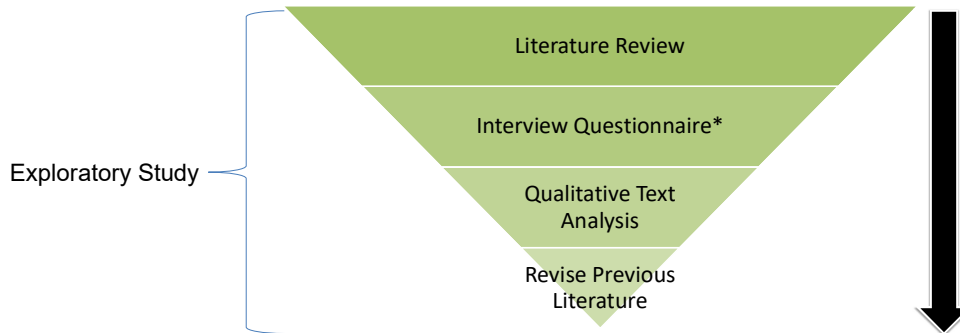
- F1-generation (the hybrid) benefits from heterosis effect
- Heterosis increases yield and other desirable traits (e.g. resistances to pests) (Mette et al., 2015)
- Heterosis significant for cross-pollinators (e.g. maize, tomatoes)
- For self-pollinators heterosis is weak (Nienhuis, Sills, 1992)
- Hybrid breeding for self-pollinators is very difficult, timely, and expensive with unknown success
- Wheat is a self-pollinator



<http://b4fa.org/bioscience-in-brief/plantbreeding/intraspecific-f1-hybrids/>

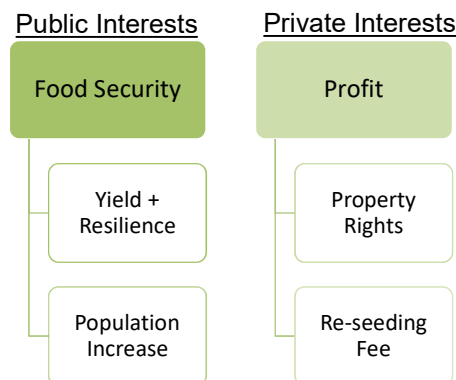
Methodology:

What is the analytical approach?



Results:

Why hybrid wheat is a thing in spite of difficulties breeding it?



Discussion:

What are possible consequences of hybrid wheat market penetration?



References:

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Nienhuis J., Sills G. (1992) The Potential of Hybrid Varieties in Self-Pollinating Vegetables. In: Dattée Y., Dumas C., Gallais A. (eds) Reproductive Biology and Plant Breeding. Springer, Berlin, Heidelberg.
<http://b4fa.org/bioscience-in-brief/plantbreeding/intraspecific-f1-hybrids/> (last accessed: 2019/11/04).

*Interviews conducted by Blaise, Pascal (*BRIWECS Subproject B: Analysis of innovation decisions in the German breeding of winter wheat*, <https://www.briweecs.de/1775.html?&L=1>).

Machine Learning-Based Prediction of 2-MIB Outbreak Occurrence and Concentration in a Drinking Water Source

Ryuichi WATANABE*, Hidenori HARADA**, Hiroataka YOKOI*** and Shigeo FUJII**

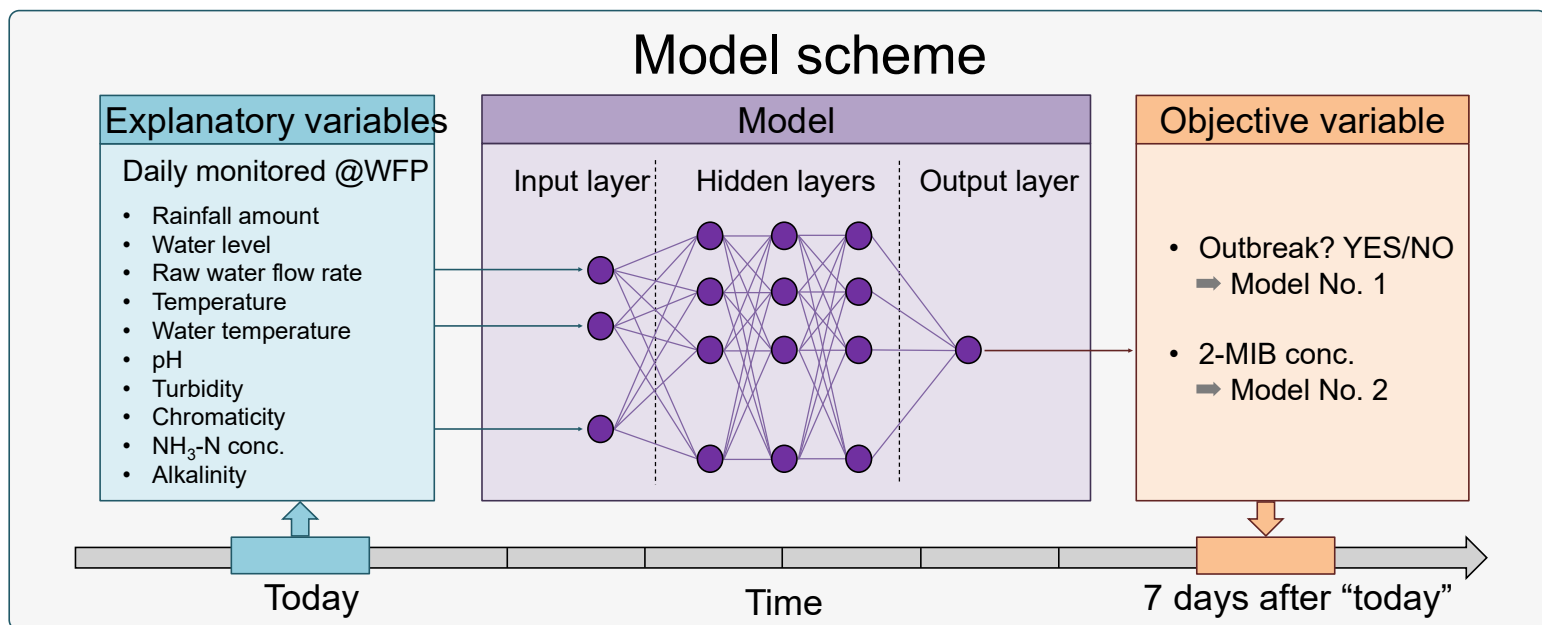
* Graduate School of Engineering, Kyoto University, ** Graduate School of Global Environmental Studies, Kyoto University
*** Waterworks Bureau, City of Kyoto

Background

- ✓ Urgent requirement of adaption to coming society of working population decline, especially in Japan
 - Optimizing treatment process in water filtration plant (WFP)
 - Removing of 2-Methylisoborneol (2-MIB) conducted based on accumulated know-how
- ✓ Predicting future 2-MIB conc. possibly contribute on optimized WFP operations.

Objective

- ✓ Prediction of 2-MIB outbreak occurrence in drinking water source in Kyoto, Japan
- ✓ Evaluation of utilizing an artificial neural network (ANN) model for prediction



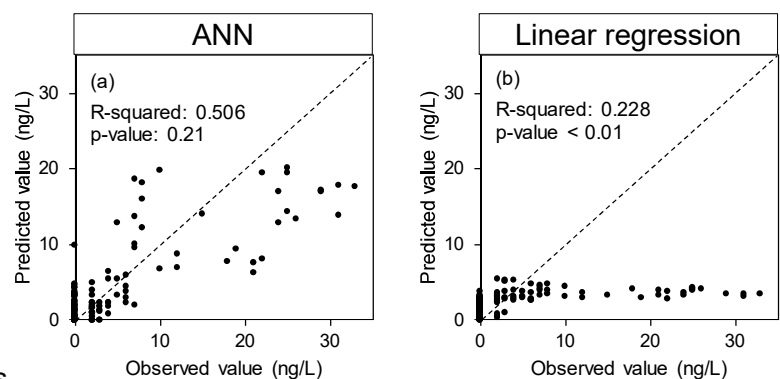
Results & Discussion

Model No. 1: Outbreak prediction

Predicted class	ANN		SVM	
	Actual class		Actual class	
	0 ~ 5 ng/L	5 ~ ng/L	0 ~ 5 ng/L	5 ~ ng/L
0 ~ 5 ng/L	285	11	289	26
5 ~ ng/L	4	27	0	12

- Number of correct prediction on over 5 ng/L outbreaks ANN > SVM
- ANN model likely solve the classification problems accurately and possibly predict the outbreak occurrences more sensitively than SVM.

Model No. 2: 2-MIB conc. prediction



- ANN model also estimated 2-MIB in high concentration range, which linear regression model did not respond.

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This poster is undisclosed

Study on Temperature Effect on Different Colored Steel Bridges caused by Solar Radiation

Authors: Ruobing SUN*, Kuo-chun CHANG**, Kunitomo SUGIURA***, Yasuo KITANE***

* Graduate School of Global Environmental Studies, Kyoto University

** Department of Civil Engineering, National Taiwan University

***Department of Civil and Earth Resources Engineering, Kyoto University

Background

- The sun rises from the east, and goes up to the south and finally down in the west, so that solar radiation to steel structures' surface always change.
- Temperature stress caused by solar radiation on structure is nonuniform and may bury an unpredictable risk for bridge safety.
- Color of the bridges is an apparent factor that may cause different degrees of absorption of the sunlight.

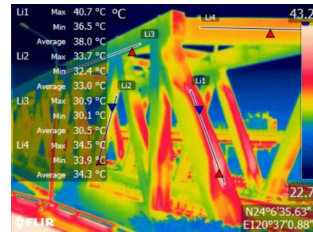
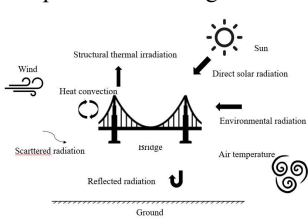


Fig. 1 Bridges subjected to variable actions

Fig. 2 Thermal image of steel bridge under direct sunlight

Methodology

✓Field work:

Measure the surface temperature of steel specimens with different colors over the course of a day.



Fig.3 Steel specimens painted with different colors in Nago, Okinawa

Specimen Size 75mm 150mm
Color Bare, black, brown, red, blue, green, grey and white

Equipment



Fig.4 Temperature data logger

Temperature of specimens



Fig.5 Solar meter

Solar radiation



Fig.6 Weather meter

Wind speed and ambient temperature

Result

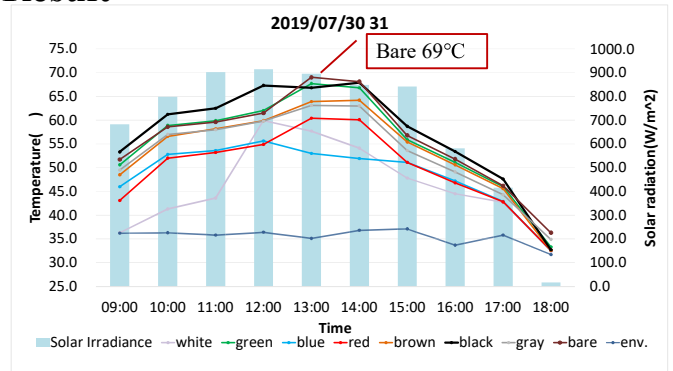


Fig. 7 Temperature change of steel samples on Jul. 30

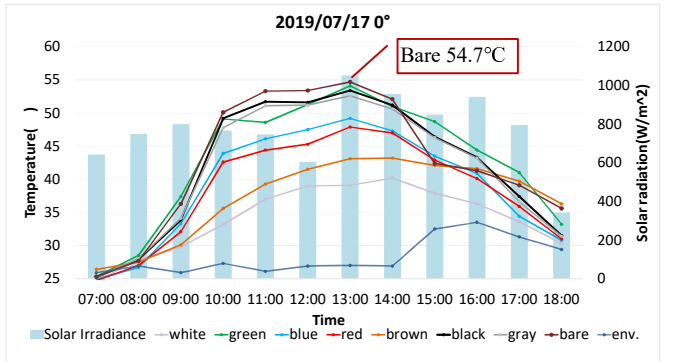


Fig. 8 Temperature change of steel samples on Jul. 17

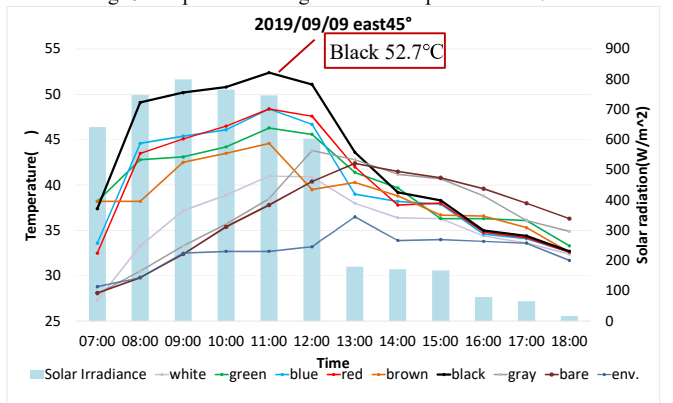


Fig. 9 Temperature change of steel samples on Sep. 9

- The temperature of specimens is the highest in Okinawa, which can reach up to 69°C in summer.
- The maximum of temperature difference between different specimens at the same time is 24.7°C, from the black specimen to the white one.

Discussion

- ✓The solar radiation has a decisive impact on the temperature distribution of steel specimens. The stronger the solar radiation is, the higher the temperature can be. In addition, the more vertical to the sunlight, the higher the temperature can be.
- ✓The ambient temperature acts more like an assisting role.
- ✓The effect of wind speed is relatively hard to judge due to its instability and small difference between areas.
- ✓Different places need to be considered separately.

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Takinana Anuantaeka, Singer Jane, Baars Roger

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Department of Environmental Education, Kyoto University

Introduction

What is Climate Change Education (CCE)?

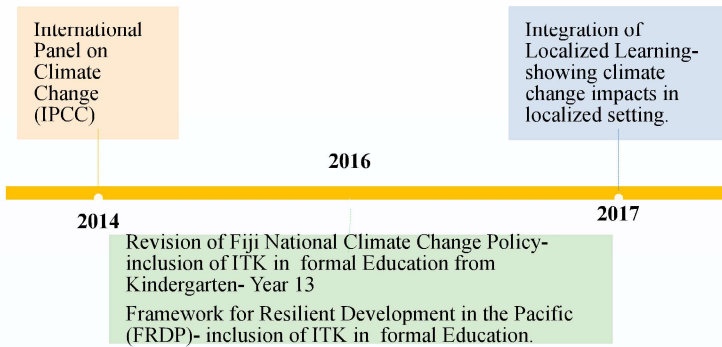
- Climate Change Education encourages changes in students attitudes and behaviour and helps them adapt to climate change-related trends (UNESCO, 2017)
- What are the desired learning outcomes?
- How should the curriculum contents be decided?



Climate Change Teacher Training in Fiji. Source: Apenisa Tamani

Fiji's Climate Change Education certification program.

How the Program Developed in Fiji.



Fiji is the first country to implement CC Education at tertiary level

Level 1-2

- Local community targeted
- A certification in Climate Change Resilience
- Anyone can take this course
- Equivalent to year 10-11
- General introduction (eg: defining climate change and identifying impacts)



Fiji in the Oceania Region. Source: Google Maps

Level 3-4

- Diploma in Climate Change Resilience at university level
- Equivalent to year 12-13
- Need to complete High School or Level 1 and 2
- Online course (DFL)
- Competency in identifying causes of climate change and compiling project proposals
- Implemented in the University of the South Pacific in the Pacific Technical and Further Education College (Pacific TAFE)

Objectives

Investigate the process and elements of climate change curriculum development in Higher Education

- What the stages of curriculum development for the climate change resilience course?
- Who are the stakeholders involved in the curriculum planning?
- Multi-Stakeholder analysis and impacts on the National Qualification for Climate Change Resilience program.
- What are the perceptions of the 1st cohort of students?

Methodologies for Research

Primary Methodology

- Key informants
- Semi-structured interviews with curriculum writers, members of ISACs, Fiji Higher Education Commission officials
- Text analysis

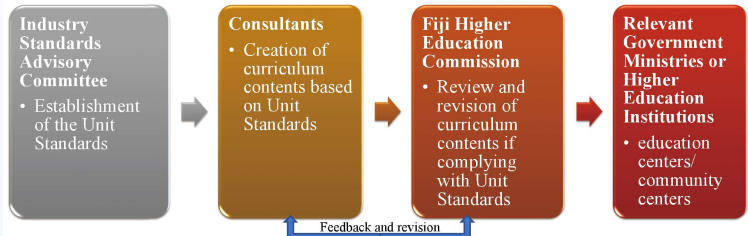
The course book for Certificate 3 and 4 offered at Pacific TAFE

Secondary Methodology

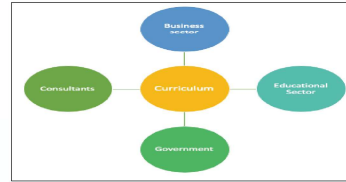
- Participatory Action Observation
- Students
- Online survey with 18/23 students

Results

1. What the stages of curriculum development for the climate change resilience course?

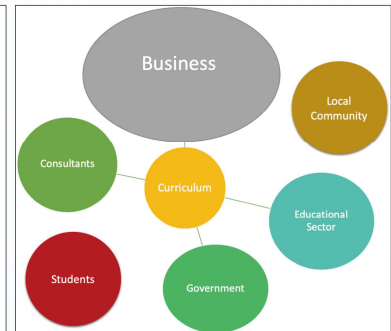
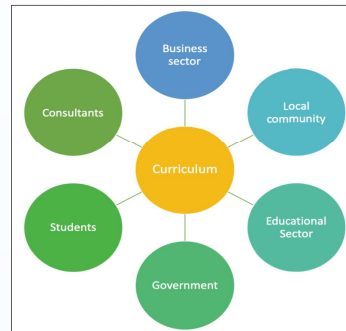


2. Who are the stakeholders involved in the curriculum planning?



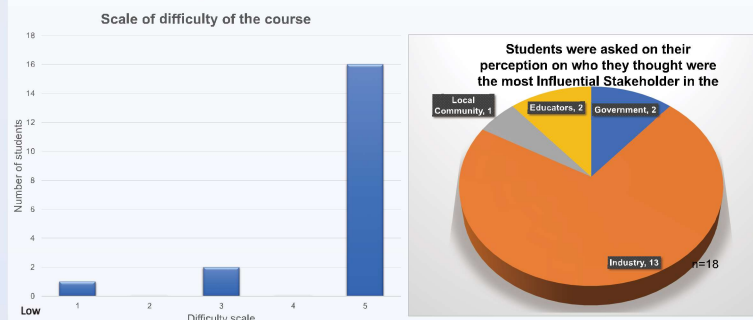
- Business sector (60%)
- Higher Education Representatives/Licensing Authorities
- Consultants
- Technical Staff of Fiji Higher Education Commission

3. Multi-Stakeholder analysis and impacts on the National Qualification for Climate Change Resilience program.



- Based on the Stakeholder model by Freeman 1984
- Ideal framework for equal representation in curriculum development.
- Multi-Stakeholder analysis of ISAC committee

4. What are the perceptions of the 1st cohort of students?



Discussion

- Business sector is most influential stakeholder in the curriculum development.
- Lack of ITK (Indigenous Traditional Knowledge)
- This curriculum development model is being adopted by Tuvalu, Kiribati and Nauru for their own climate change course.

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Contact

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Scan here:



“Ectomycorrhizal community structure and the relationship between Ectomycorrhizae of seedling roots and surrounding roots in beech forest in Western Japan”

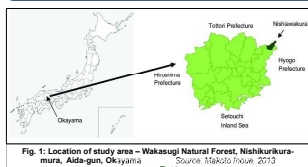
Nguyen Thi Bich Ngoc*, Kazuhiro Yamada*, Yasuaki Akaji**, Takeshi Taniguchi***, Muneto Hirobe*, Yuko Miyazaki*

* Graduate School of Environmental and Life Science, Okayama University;
** National Institute for Environmental Studies; *** Arid Land Research Center, Tottori University

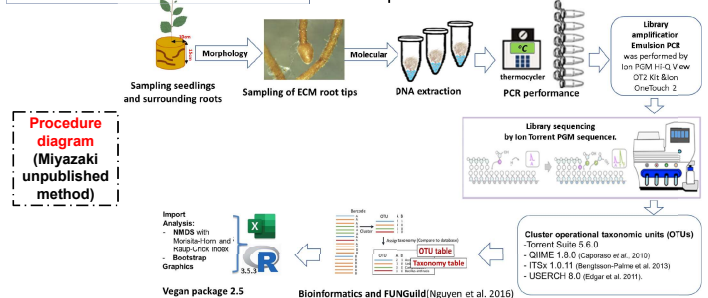
INTRODUCTION

- Beech forest is native and dominant in Japan which have important roles to forest ecosystem. Under the influence of climate change, the habitable areas of beech trees were decreased [1].
- In forests, Ectomycorrhizal (EcM) fungal mycelia are one of main organs for nutrient uptake in many woody plants, and often connect seedlings to mature trees [2]. Although the importance of EcM fungi in the relationship between biodiversity and ecosystem functioning is now being recognized, the EcM effects on seedling performance have been limited in few researches.
- As the first step for investigating on the effect of EcM fungi on the performance of *Fagus crenata* beech seedlings, we studied the EcM community structure and their relationship between seedling roots and conspecific surrounding roots in *F. crenata* beech forest in Western Japan.

METHODOLOGY

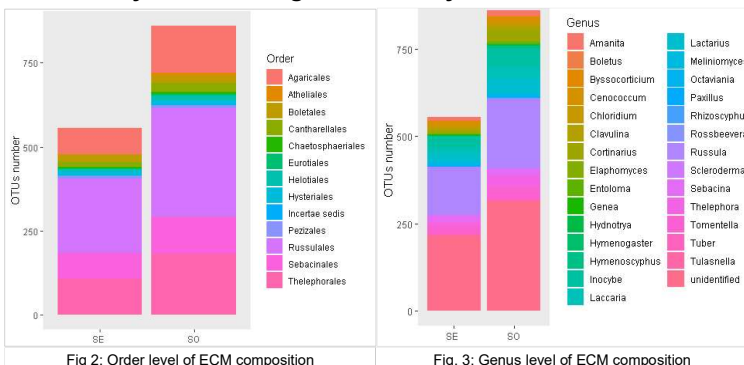


- 10 seedlings were collected in 2016 and 16 seedlings in 2018.
- Soils were collected in columnar shape from ground of seedlings for collecting 26x3 surrounding root samples.



RESULTS

1. Ectomycorrhizal fungal community structure



Family	Site	
	Seedling roots	Surrounding roots
1 Russulaceae	220	324
2 Thelephoraceae	108	182
3 Sebacinaceae	77	109
4 Inocybaceae	33	53
5 Hydnangiaceae	21	36
6 Boletaceae	20	21
7 Clavulinaceae	13	24
8 Gloniaceae	12	12
9 Cortinariaceae	11	33
10 Amanitaceae	10	14

Table 1: 10 Families with the most number of OTUs

- A total of 1806 fungal OTUs were found and 972 (53.5%) OTUs were designated as “ectomycorrhizal” by FUNGuild[3].
- In both EcM seedling roots (SE) and EcM surrounding roots (SO), the dominant fungal phyla across all samples were Basidiomycota (94% of OTUs number) and Ascomycota (6%).

2. The relationship between Ectomycorrhizal fungal community structure of seedling roots and conspecific surrounding roots

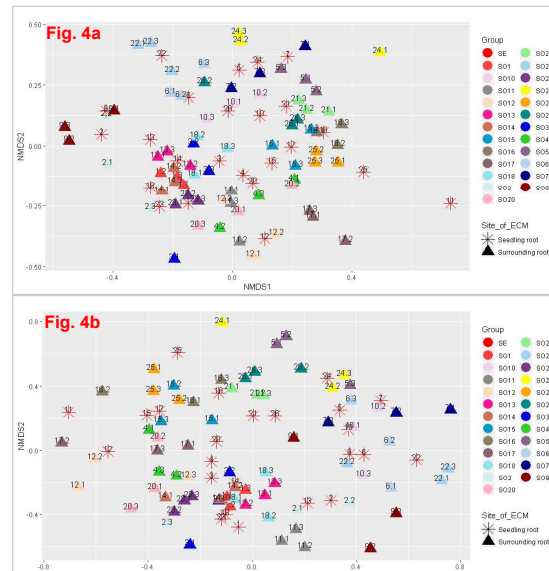


Fig. 4: Nonmetric multidimensional scaling (NMDS) was performed to compare EcM community structures between seedling roots and conspecific surrounding roots. The Morisita-Horn dissimilarity index was used for abundance data (Fig.4a, stress value = 0.25) and The Raup-Crick dissimilarity index was used presence and absence data (Fig.4b, stress value = 0.27). We eliminated OTUs data of seedling No.8 and No.19, due to less than total count of 1000 reads.

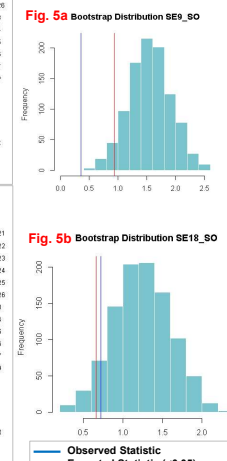


Fig. 5: Example of bootstrap analysis for the total distance from seedling and three surrounding roots on the NMDS result, for No. 9 (a) and No. 18 (b).

- The observed total distance of a SE and its 3 SO was checked by the bootstrap estimates of expected total distance of the target SE and 3 randomly selected SO at $P < 0.05$. The 20 over 24 seedlings showed significantly shorter than total distance between 3 SO, and Chi square test showed the observed ratio of significant close distance and unclosed distance (20:4) was significantly different from the random (1:1 as expected) with $P = 0.001 (< 0.05)$.

DISCUSSION

- In this study, we clearly showed that the taxonomic status of EcM in seedling roots and conspecific surrounding roots is similar. The family Russulaceae presented the highest species richness followed by the families Thelephoraceae, Sebacinaceae and Inocybaceae (Table 1).
- We use both abundance and presence/absence data for NMDS analysis, and our results showed that the composition was similar between SE and SO in both NMDS analysis and bootstrap analysis with Chi square test.
- The EcM composition of the target seedlings roots was mostly similar to that of the surrounding roots, but not all. This suggests that the EcM composition of the seedlings roots is not simply determined by the EcM composition that is physically close together.

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Acknowledgements

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Survey on Behavior of Per- and Poly-Fluoroalkyl Substances (PFASs) in Biological Activated Carbon Process in a Water Treatment Plant in Okinawa

Authors: Yumi MAEDA*, Shuhei TANAKA*, Satoru YUKIOKA*, Sakurako MATSUGAWA**, Shigeo FUJII*, Hisayoshi KAKINOHANA***, Toru YOKOTA*** and Jiro FUKUHARA***

* Graduate School of Global Environmental Studies, Kyoto University **Graduate School of Engineering, Kyoto University ***Okinawa Prefectural Enterprise Bureau

Introduction

PFASs •Artificial surfactant

•Representative substances: **PFOS**•**PFOA**

bio-accumulative
persistence toxic
long-distance migratory



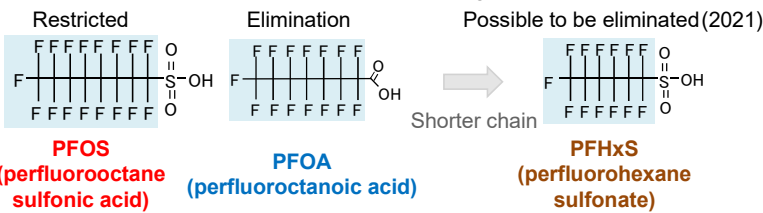
Health advisory levels in drinking water: **PFOS+PFOA 70 ng/L**
(U.S.EPA,2016)



The maximum value of **PFOS + PFOA** in drinking water source is 10 times higher than Health advisory levels

Regulation

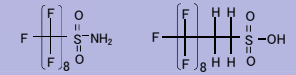
The Stockholm Convention on Persistent Organic Pollutants



3000PFASs

PFAAs
PFOS PFHxS PFOA
 etc
 14PFAAs

Precursors



Per and Polyfluoroalkyl substances formation potentials (PFAA-FPs)

PFASs(per and polyfluoroalkyl substances) PFAAs(perfluoroalkyl acids)

Objective: Survey on behavior of PFASs in drinking water sources and water treatment process

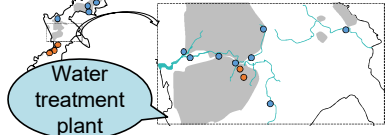
Methods

Sampling points

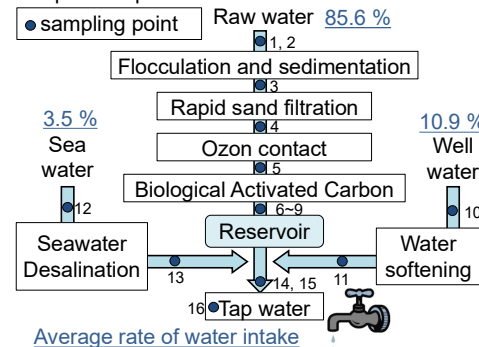
Sampling day: 2018/10/2 and 11

Samples: 16 river (dam) water and 6 ground water

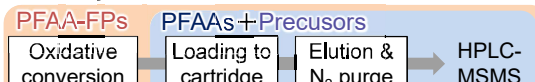
● River water, Dam water
 ● Under ground water
 ● U.S. base



Sampling day: 2018/10/22 and 11/1
 Samples: 16 points

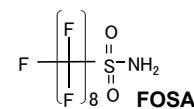


Analytical Method

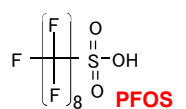


• Alkaline condition: NaOH 150 mM
 • Oxidant: K₂S₂O₈ 60 mM
 • 95 °C, 24 h (Autoclave)

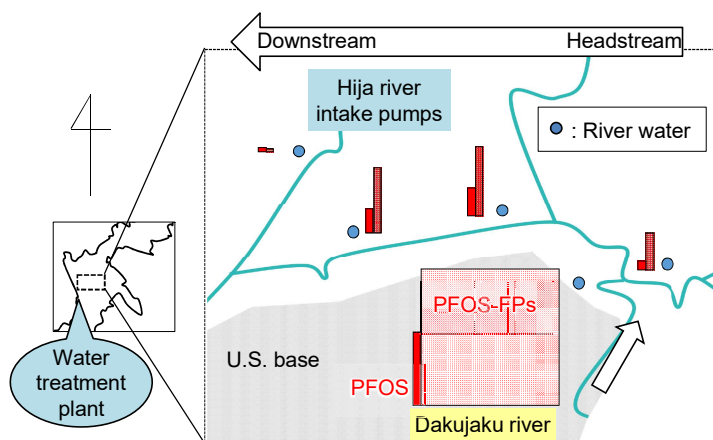
Precursors



PFAAs



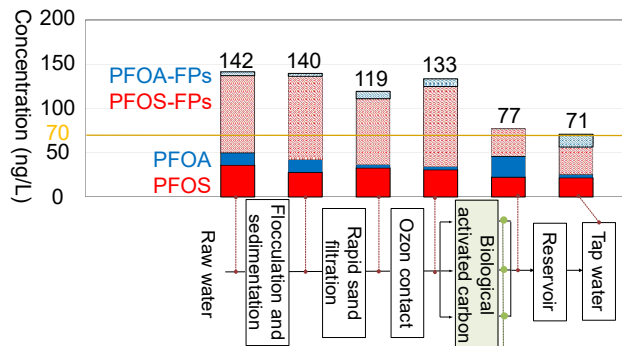
Results & Discussion



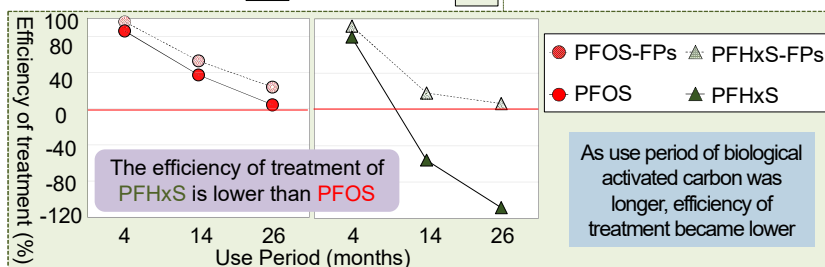
PFASs are flowed into water treatment plant from water source

Future task

1. Survey on behavior of PFASs in biological activated carbon process
2. Examination of treatment process using with ion exchange polymer



Drinking water was not treated under 70 ng/L by taking into account substances formation potentials



PFHxS is possible to be formed from precursors on biological activated carbon which had been used for over 14 months

As use period of biological activated carbon was longer, efficiency of treatment became lower



Organized by Kyoto University

Co-organizer MEXT supporting project “Kyoto University Environmental Innovator Program
- Cultivating Environmental Leaders across ASEAN Region”

Supported by Top Global University Project “Japan Gateway: Kyoto University Top Global Program”
Kyoto University International Symposium Aid
The Association of Environmental & Sanitary Engineering Research

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