Evaluating the influence of the policy of "Green @ Community" in promoting sustainable recyclable waste management: a case study in the Yuen Long district

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Introduction

General Background

- More prosperous cities, more municipal solid waste production from daily consumption
  - due to advanced lifestyles, adjusted food habits as well as higher living standards
- Hong Kong as a well-developed city
  - encounter the same issue of dealing with tremendous solid waste generation
  - annually 5.5 million tonnes of waste disposal and only < 30% of them can be recovered or recycled
  - indicate heavy reliance on strategic landfills
- A resolute way to ensure a longstanding waste management without depleting the current land availability and sacrificing future prosperity
  - recycling as an alternative should be strengthened
  - lead to the development of **Green @ Community**

Background of Green @ Community

- Operation in 11 districts since 2015
- Promising a recycling service for at least eight types of recyclable waste such as paper, glass, metal, plastic and E-wastes
- "GREEN$ Electronic Participation Incentive Scheme" since 2020
- Each kilogram of recyclables will be awarded with 10 GREEN$ points for redeeming gift items
- Higher rate of incentives for particular types of recyclables, e.g. plastics and glass bottles (EPD, 2022)

Methodology

- Survey-based data analysis (145 valid samples)
  - 5-points Likert scale
  - Sample study of Yuen Long residents
- Statistical analysis with SPSS, excel and other possible tools; e.g.
  - Two-tailed pearson correlation testing
  - T-test, ANOVA-test, z-score test
- GIS technique given in ArcGIS pro to make proper planning suggestions; e.g.
  - Service area in network analyst
  - Vector-based site selection
  - 2SFCA

Research Objectives

1. To evaluate the sustainability of running a district-inclusive recycling network (i.e. Green @ Community)
2. To understand a correlation between various attributes such as economic incentive/ accessibility/ socio-economic characteristics and citizens' environmental awareness and participation.
3. To study any possible limitation by comparing the past and current approaches in order to suggest enhancements for the current execution of recycling system

Research Significance & Questions

Grand Research Question

How does a community-inclusive recycling network play a role in improving the proportion of public environmental participation?

To figure out the needs and purpose for people to recycle

RQ1

To what extent, are Hong Kong people having high environmental knowledge and participation when concerning the topic of recycling?

1.1. Which type of people has a higher environmental awareness?
1.2 Which type of people has a higher willingness to participate?
1.3 Any reasons for users to participate

To interpret and classify the difference in the impact of the new and old recycling methods on public engagement in environmental activities

RQ2

How do the brand-new Green @ Community and traditional recycling bins differ in facilitating community engagement in recycling?

2.1. What variables in public environmental engagement do the users experience regarding both types of recycling?
2.2. How do the users rank and prioritize those variables for each recycling approach?

To acknowledge elements which may further improve the environmental participation of citizens and accordingly provide advice on upcoming planning

RQ3

What are the needs for the future development of the Green @ Community?

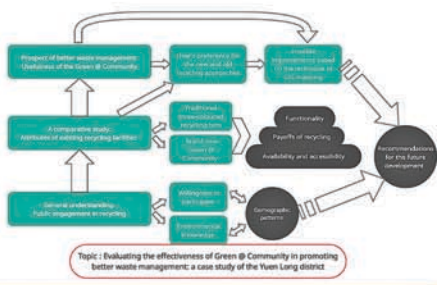
3.1. Is the level of environmental participation improved in reality?
3.2. Why do the users prefer the new or old recycling method?
3.3. Which attributes in the Green @ Community should be fortified when designing a similar station in the future?
3.4. What are the potential solutions based on GIS mapping?

Literature Review

Overview of coping strategies for municipal solid waste management

- **Definition**
  - Recycling as a sustainable MSW management tactic
- **Relationship between recycling practices and public engagement**
  - Environmental knowledge
  - Willingness to participate
- **Demographic indicators**
  - Gender
  - Age
  - Income level and occupation
  - Education level
  - Social norms
- **Attributes of recycling facility**
  - Economic incentive
  - Functionality
  - Availability and accessibility

Conceptual Framework



Research Findings

Recyclers' Demographic Characteristics

- **Education level:** the most significant demographic indicator as higher educational level is always correlated with better environmental knowledge and higher willingness to participate in pro-environmental activities
- **Age:** aged respondents may have slightly better knowledge on the MSW issues but young respondents may be relatively more enthusiastic and proactive to participate in recycling
- **Income level:** higher income groups are found to be knowledgeable towards environmental issues but they generally have a lower intention to participate in recycling than lower income groups
- **Gender**: no difference in terms of the environmental performance between male and female statistically

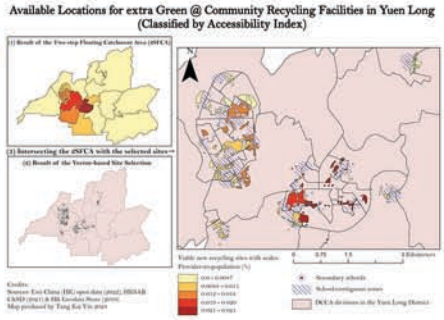
Attributes of Recycling facilities

- **Comparisons of the existing facilities:** as a rather insignificant attribute, **"the payoffs of recycling"** seldom affects the view of the respondents on using either the new Green @ Community or the three-coloured recycling bins. **"The functionality"** may be the major strength of the Green @ Community while **"the availability and accessibility"** may be its undeniable shortcoming when compared with the traditional recycling bins
- **User's priority:** a ranking of importance in driving recycling participation as followed, **"Availability and Accessibility" > "Functionality" >>> "Payoffs of Recycling"** (estimated by normalized z-score)

Implications

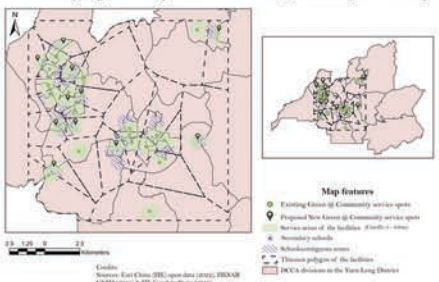
- **GIS evaluation:** anticipate the realm of secondary schools as the potential clients of recycling (certain education level, younger and lower-income groups) and assess how well the service of Green @ Yuen Long have covered the schools' contiguous scopes by employing **(1) service area in network analyst, (2) vector-based site selection and (3) 2SFCA**
- **Implications:** zones with darker red colour (e.g. the southern pieces of Yuen Long urban areas) present a relatively high accessibility index related to the Green @ Yuen Long recycling service and vice versa (e.g. poor accessibility among the pale-yellow coloured Tin Shui Wai urban areas)

Available Locations for extra Green @ Community Recycling Facilities in Yuen Long (Classified by Accessibility Index)



Recommendations

Possible Recycling Service Expansions for the Green @ Community in Yuen Long



- **GIS illustration:** simulate a scale of establishment like extra facilities according to the accessibility index (shown by colour from yellow to red) and check for their practicality through **(1) service area in network analyst and (2) Thiessen polygon**
- **Proposed establishments:** 10 new recycling spots have been added and the new service polygons may compensate for the gaps among the currently existing recycling infrastructures
- **Bordered Thiessen polygon formation**: spatially envision which available recycling facility ought to serve which school-contiguous area and signify the most accessible recycling facility within each of the representable division