Monitoring of Litter along Hong Kong's Coast Using Aerial Drone

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1 INTRODUCTION

Marine conservation is constantly facing challenge from the marine pollution. Considering the high biodiversity in the coastal environment of Hong Kong, It is important to understand the distribution and density of marine debris before assessing its ecological risk and setting out strategy for conservation.
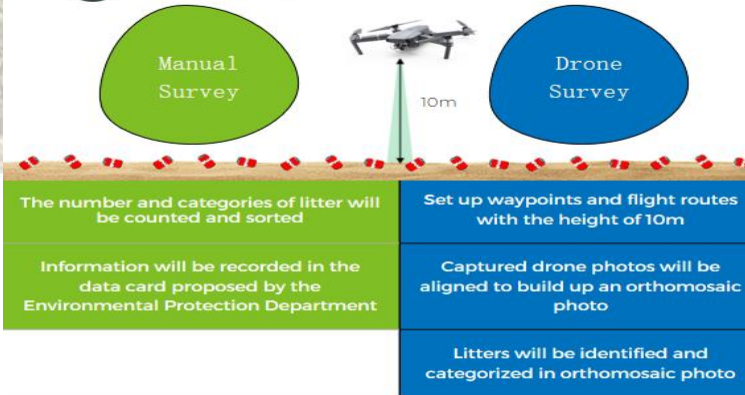
Manual Survey	Drone survey
• Time consuming • High demand in labor	• Efficient • Cost-effective • Able to survey inaccessible area

2 OBJECTIVE

➔ To develop a standardized and easy-to-use method to monitor marine debris distribution

➔ To quantify the distribution of marine debris in 12 ecologically important shores in western and southern waters of Hong Kong

➔ To list the sites with priority following their pollution status

3 METHODOLOGY

Manual Survey	Drone Survey
The number and categories of litter will be counted and sorted	Set up waypoints and flight routes with the height of 10m
Information will be recorded in the data card proposed by the Environmental Protection Department	Captured drone photos will be aligned to build up an orthomosaic photo
	Litters will be identified and categorized in orthomosaic photo

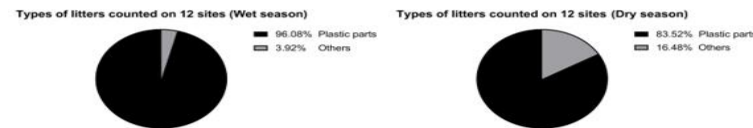Clean-coast index (CCI) will be calculated to evaluate the cleanliness of the corresponding site

$$CCI = k \times \frac{Total\ items\ within\ the\ quadrat}{Total\ area\ of\ the\ quadrat}, \text{ where } k = \text{the coefficient of 20}$$

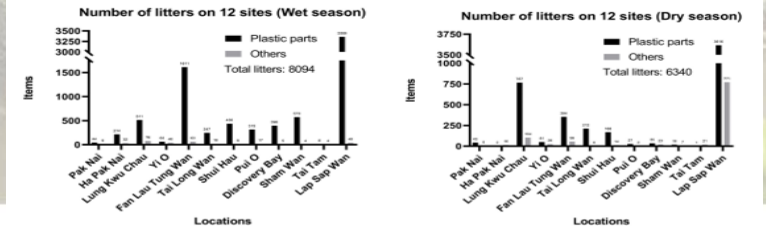| CCI value	Grade	Visual assessment
0 – 2	A – Very Clean	Minimal debris is seen over a large area
2 – 5	B – Clean	Minimal debris is seen
5 – 10	C – Moderate	A few pieces of debris can be detected
10 – 20	D – Dirty	A lot of debris on the shore
20+	E – Extremely dirty	Most area are covered by plastic

Examples of Different CCI Grading

Tai Tam	Pak Nai	Shui Hau	Pui O	Fan Lau Tung Wan
A – Very Clean	B – Clean	C – Moderate	D – Dirty	E – Extremely dirty

4 RESULTS

Types of litters counted on 12 sites (Wet season) — ■ 96.08% Plastic parts ▨ 3.92% Others

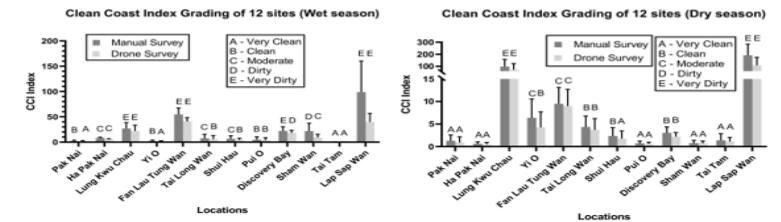Types of litters counted on 12 sites (Dry season) — ■ 83.52% Plastic parts ▨ 16.48% Others

➔ The majority of marine debris was made up of plastic

➔ Plastic is more prevalent in wet season marine debris than in dry season

Number of litters on 12 sites (Wet season) — Plastic parts / Others / Total litters: 8094

Number of litters on 12 sites (Dry season) — Plastic parts / Others / Total litters: 6340

➔ The wet season typically has more litter than the dry season

Clean Coast Index Grading of 12 sites (Wet season) / Clean Coast Index Grading of 12 sites (Dry season) — Manual Survey / Drone Survey / A – Very Clean / B – Clean / C – Moderate / D – Dirty / E – Very Dirty

➔ Manual survey consistently perform better in the CCI index

➔ Due to accuracy issues, CCI index in drone surveys may be upgraded

Accuracy of the Wet season drone survey / Accuracy of the Dry season drone survey
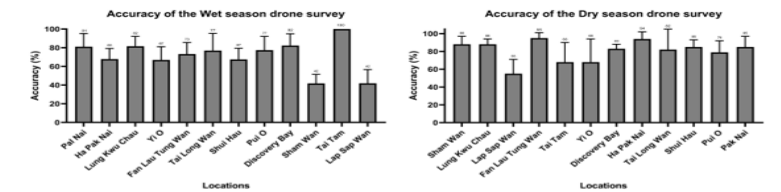
$$Accuracy = \frac{Litters\ of\ drone\ survey}{Litters\ of\ manual\ survey} \times 100\%$$

➔ The mean accuracy of wet season reach to 71.55%

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5 CONCLUSION

➔ The amount of marine debris varies seasonally. Wet seasons characterized by increased rainfall and stronger ocean current, resulting in a higher abundance of litter compared to dry seasons.

➔ Drone survey provides a viable alternative to traditional manual survey method for monitoring marine debris. With their ability to scan large areas quickly, drones have the potential to estimate the amount of litter within a short period of time.