

Study of vegetation composition and plastic concentration in mangroves



Aerial image of Muanivatu site, Fiji



3D render of the mangroves at My Suva Park, Suva

| OVERVIEW | |
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| Flying Labs | South Pacific Flying Labs |
| Geographic area | My Suva Park (Site 1) and Muaivuso village (Site 2) - Fiji Islands |
| Date range | December 2018 - August 2019 |
| Sector program | EcoRobotics |
| Main SDGs | GOAL 14: Life Below Water GOAL 15: Life on Land |

| SCOPE | |
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| Project stakeholders | School of Marine Science - University of the South Pacific |
| People impacted | <p>Researchers at the School of Marine Science who are trying to study the types of plastics which get caught up in the mangroves as well as study the vegetation composition.</p> <p>The people in Muaivuso village.</p> |
| Number of people impacted | <p>30 people</p> <p>6 researchers and research assistants</p> <p>15 youth who used the data derived from this project for youth-led projects</p> <p>9 villagers of Muaivuso</p> |
| Challenge | The mangrove forests at the two sites (My Suva Park and Muaivuso, Lami) frequently trap plastics which linger around for years. The methods used to understand and assess the amount and type of plastic which ends up in the mangrove forests as well as its effects on the environment were highly inefficient and new solutions were needed. |
| Scope | <p>This research project tried to assess the type and amount of plastic concentrated in these locations through aerial imagery and soil samples (for micro and macro plastics) in different seasons. It also tried to identify vegetation composition.</p> <p>The aim of this project was to identify and understand the most common plastics which end up in mangrove forests and its effects on the ecosystem. In addition to this, it also aimed to simplify the method adapted for assessing plastic concentration in mangrove forests as well as monitoring the composition for an extended period of time.</p> |
| Outcome | Several maps and orthomosaics were created during the study, which were later used by the researchers to determine the location of the most common types of plastics accumulating in the mangrove forests. The composition of the mangrove forest was also studied and a mangrove species identification and classification index was created using pixel based image analysis. |
| Impact | The maps and orthomosaics will act as baseline data for medium and long term change detection in that area for further studies while the mangrove classification index data will be published by the respective researcher. This research will simplify the task of further classification and preservation of mangrove forests in Fiji. |
| Next steps | The possible next steps are perhaps to study the health of the mangrove forests using multispectral sensors mounted on |

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| | <p>multicopters in these areas and see the correlation of plastic concentration to overall mangrove health.</p> |
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| COMMUNITY ENGAGEMENT AND STAKEHOLDER SUPPORT | |
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| Consent for data acquisition | <p>Muaivuso village - the team members participated in a sevusevu where permission to enter the village as well as collect data was received from the village elders.</p> <p>My Suva Park -a NOTAM (a notice to airmen) was submitted to the CAAF(Civil Aviation Authority of Fiji) and a copy of that alongside a project plan was submitted to the nearby police station to notify them of repetitive drone flights.</p> |
| Activities to engage with the community | <p>Muaivuso village - the team members participated in a sevusevu (more details here) where permission to enter the village as well as collect data was received from the village elders.</p> <p>In this same community engagement activity, the project's objectives were discussed in the local dialect as well as field operations, so that the people of Muaivuso were aware.</p> |
| Community groups engaged with | Muaivuso village elders and residents |
| Community attendance | Approximately 10 people attended this community engagement meeting (sevusevu) which included village headmen and other custodians. |
| Community feedback | The community members were pleased with how local protocols were followed, from the permission seeking gesture to appropriate attire. |
| Stakeholder support | Not relevant as the villagers did not use or interact with the project outcomes or data collected since this was purely a research project. |

| DATA ACQUISITION | |
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| Size of area | 8 ha (0.08 sq km) |
| Drone | DJI Phantom 4 Pro DJI Phantom 3 DJI Inspire 2 |
| Sensor(s) | RGB - Zenmuse X4S (Inspire 2) RGB - Phantom 4 Pro camera |

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| Flight plan software | PIX4Dcapture |
| Flight height | Flight height varied from 40 m to 60 m depending on the site |
| GSD (Accuracy) | 2 cm/pix |
| Number of images acquired | Approximately 12,600 images |
| Number of flights | 18 flights |
| Time invested in data acquisition | Roughly 40 days over a period of 9 months |
| Georeferencing | Onboard GPS |

DATA PROCESSING & ANALYSIS

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| Processing software | PIX4Dmapper |
| Processing time | Roughly 63 hours (3.5 hours per flight) |
| Data products | Orthomosaics, KML |
| Analysis tools | ArcGIS Desktop |
| Analysis outputs | Mangrove classification and identification maps Maps showing the location and range of the different sites |
| Final outputs shared with stakeholders | Maps of Muaivuso site Orthomosaics Report |
| Data sharing | Hard drive |