

The Rufford Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Chee Su Yin
Project title	The World Harbour Project: Penang Island.
RSG reference	20933-2
Reporting period	24 th March 2017 – 23 rd June 2018 (incl. 3 months RSG approved extension)
Amount of grant	£5000
Your email address	suyinchee@usm.my
Date of this report	12 th July 2018

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
To test the effects of green engineering techniques in enhancing native bivalve communities and reducing non-indigenous species on artificial structures in harbours and ports.				The green engineering aspect we tested were microhabitat enhancement through physical and biological modification. However, results suggested that our experiment reveals the need to incorporate other manipulative variables design that is responsible in tropical climate settings to better indicate relationship between native bivalve communities and alien species. Current result showed an indistinct relationship.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

a. A concern arose when the settlement plates were hit from storm waves resulted from both the monsoon and Typhoons Doksuri and Damrey (September and November 2017 respectively): a total of 50% of settlement plates fell onto the seabed during the middle of the experiment. Soon after the events, we recovered 80% of the settlement plates from the seabed and reattached them to the breakwater/seawall. The plate's number was then recorded and monitored cautiously for the effects from falling.

b. Frame damage was more frequent than expected, and took considerable amount of time and money for contractor to repair.

c. Original proposed monitoring method included removing the aluminium frame from seawall and reinstalling after the monitoring were heavily labour dependent. In addition, we realised that many juvenile mobile animals that hide in the crevices left the frames due to vibration during lifting up of the frame, lost on their way back to seawall and killed quickly under extreme hot temperatures. Hence, the method above was aborted and deployed ourselves into surveillance. This was done by going onto the ground level of seawall, floating in the water while attached to a fixed point on seawall to prevent it drifting away. After photography and naked eye count, positions were changed by simply swimming to the next frame. This method employed only a minimum number of personnel (two compared to six), was quicker (2+ hours compare to 6+), was able to observe animals closely (animal hides but not scared away), and efficient. The only disadvantage was photography quality often disturbed by morning sunlight.

d. Huge amount of thrash floated on the water and often carried big objects such as drifting wood with nails, ropes, and plastics debris which could be hazardous. An observer was then deployed on the seawall to stand guard and informing the surveyor below if the debris flow approached.

3. Briefly describe the three most important outcomes of your project.

- a. The result provided us informative ecology on the coastal conservation decision, particularly on modified artificial habitat that has never been studied.
- b. The potential use of green engineering technique on artificial shorelines in Malaysia was primarily tested, although some improvements must be made.
- c. The forming reef of native oyster species on seawall provided alternative habitat along the modified concrete structure giving insight into role and capability of ecosystem engineers.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

As the sampling site was publicly accessible, we had the chance to encounter curious visitors/locals who were interested in our work. Simplified information was used to explain to them and improve their current knowledge towards Malaysia's coastal defence structure and conservation status.

We also organised workshops and undertook conversation education among several stakeholder groups to discuss Malaysia's ecological engineering possibilities.

The public was also engaged in a social survey which assessed their perceptions and willingness to accept eco-engineering in Penang.

5. Are there any plans to continue this work?

Yes, this pioneering project was providing us valuable knowledge on green engineering design components in tropical climates, and the datasets can be used to produce eco-concrete more efficiently and that is relevant to Malaysia's conditions. This locally produced product will suit our interest in better promoting native biodiversity, faster reef-forming, and wave energy reduction, a multi-functional seawall prototype.

6. How do you plan to share the results of your work with others?

- a. We are actively searching for comments and feedback through participation in relevant symposiums and conferences.
- b. Several research papers will be published in high impact journals to share our result with other academicians for ideas exchange.

c. Our work has also been published in local magazines namely the Watercolours and Penang Monthly.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

The grant was implemented over a period of 15 months. This is 3 months longer than anticipated. There was a 2-month delay in one of the steps in the experiments and an additional month was needed for data analyses.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Engagement of contractors	3117	2979	+138	
Reefnet tidal loggers	608	372	+236	
Hobo loggers	392	239	+154	
Plaster of Paris, ice trays, straws	2	2		
Plastidip	196	196		
Cable ties	2	2		
Construction material	585	1145	-560	Difference was supported by savings in previous items.
Transport of biofilm samples	98	238	-140	Money was used for replacement of loggers that fell into the sea during typhoon Damrey. Difference was supported by savings in previous items.

Exchange rate = 1 MYR = 0.187338 GBP

9. Looking ahead, what do you feel are the important next steps?

Prototype development for commercialisation is critical. Malaysia's coastline is being hardened at a fast pace. The traditional approach is no longer enough to serve the needs of humans and the ecosystem. Besides that, community support on coastal conservation must improve simultaneously. Although many Malaysians agreed that going green is a must, they failed to connect their behaviour and ecosystem, especially their knowledge on coastal conservation. Therefore, it is important to educate the public and create awareness and acceptability and forge cooperation on multiple stakeholder levels towards the idea of eco-engineering.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?

Yes. Acknowledgement was made during our participation in conference International Marine Science Conservation Conference (IMCC5) in Sarawak, June 2018 and the Australian Marine Sciences Association (AMSA) 2017 Conference in Darwin, July 2017. Rufford was also mentioned in the articles published in the local magazines.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Name	Role	Affiliation
Prof. Dr. Aileen Tan	Providing oyster spats	Centre of Marine and Coastal Studies, USM
Dr. Chee Su Yin	Project head and coordinator	Centre of Marine and Coastal Studies, USM
Dr. Strain Elisabeth	Data analytics and fieldwork consultant	Sydney Institute of Marine Science
Dr. Firth Louise B.	Fieldwork consultant	School of Biological & Marine Sciences, University of Plymouth
Yee Jean Chai	Fieldwork coordination and primary data entry	Centre of Marine and Coastal Studies, USM
Loh Jian Rong	Fieldwork assistant	Centre of Marine and Coastal Studies, USM
Amni Nabilah Mat Adam	Fieldwork assistant	Centre of Marine and Coastal Studies, USM
Sim Yee Kwang	Fieldwork assistant	Centre of Marine and Coastal Studies, USM
Rajindran A/L Suppiah	Fieldwork assistant	Centre of Marine and Coastal Studies, USM
Abdul Latif Omar	Fieldwork assistant	Centre of Marine and Coastal Studies, USM
Abdul Rahman Pawanchik	Fieldwork assistant	Centre of Marine and Coastal Studies, USM
Mohamad Ikhram Mohamad Rusli	Fieldwork assistant	Centre of Marine and Coastal Studies, USM
Yusri MD Yusof	Fieldwork assistant	Centre of Marine and Coastal Studies, USM
Munawar Muhamed Noor	Logistics	Centre of Marine and Coastal Studies, USM
Rosly Basarudin	Technical support	Centre of Marine and Coastal Studies, USM