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Immediate Release

Sembawang Shipyard's Green Wave Environmental Care Project for Schools 2009 attracts record number of project entries from more than 1,000 student participants

Singapore, January 29 2010 – Sembawang Shipyard Pte Ltd, a subsidiary of Sembcorp Marine Ltd, is pleased to announce the winners of Green Wave Environmental Care Competition for Schools 2009 at the award presentation ceremony at the Marina Mandarin Hotel, Singapore. This event is supported and well represented by both the private and public sectors.

The Guest-of-Honour for this award ceremony is Mr K Shanmugam, Minister for Law & Second Minister for Home Affairs and Member of Parliament for Sembawang GRC. Sembawang Shipyard's Green Wave Environmental Care Project was launched in January 2003 and is an annual competition opened to all students at Primary, Secondary, Junior Colleges and Institute of Technical Education (ITE) and Tertiary Institutions. Organised by Sembawang Shipyard and jointly sponsored by the yard's alliance partners, Shell International Trading and Shipping Company Limited (UK) and BP Shipping Limited (UK), the competition aims to encourage young environmentalists to further create, sustain and implement ideas on environmental issues for the improvement and sustainability of our planet. This is the seventh year of the competition and it is widely encouraged and supported by prominent environmentalists and environmental groups in Singapore.

The 2009 Green Wave Environmental Care Competition attracted a total of 292 project entries with participation from more than 1,000 students from Primary, Secondary, JC/ITE and Tertiary Levels, setting a record level of participation since 2003. Compared to 2003 when the competition was first launched, the number of participants in 2009 increased by 72% and 20% from 2008. In terms of project entries, the increase is 150% compared to 2003 and 12% from 2008. During the ceremony, a total of 53 awards will be presented by Mr K Shanmugam to the winning teams (See Appendix 1 and Appendix 2).

The Top Prize for the Tertiary Level Competition has been won by a team from Temasek Polytechnic for their innovative project entitled "Use of recycled plastics in building materials". This award comes with S\$10,000 cash prize and a one-month development attachment with a Shell associate company, Northwest Shelf Shipping Company, in Perth, Australia. The Top Prize is jointly sponsored by Shell International Trading & Shipping Company and Sembawang Shipyard Pte Ltd. This is the second time since 2003 that the 1st prize has been awarded.

Other interesting and innovative projects include the 1st prize winning project from Hwa Chong Institution at the Secondary School Level which presented a range of environmentally-friendly beauty products made from active ingredients extracted from waste materials.

The shipyard is grateful to the panel of dedicated judges from the schools, BP Shipping, CH₂M Hill, DHI Water & Environment, Housing Development Board, Ministry of Education, NParks, Nanyang Technological University, National Environment Agency, National Institute of Education, National University of Singapore, Ngee Ann Polytechnic, Public Utilities Board, Singapore Environment Council, Singapore Polytechnic and Singapore Science Centre. We also thank our alliance partners and co-sponsors of this competition, Shell International Trading and Shipping Company Limited and BP Shipping for their continued strong support. Special appreciation also goes to the Green Wave Advisory Board for their guidance.

Mr Ong Poh Kwee, Managing Director of Sembawang Shipyard, said “Environmental education and commitment are keys to innovation and sustainability. As such, we are heartened by the enthusiasm and passion of our students in sharing their green ideas via our Green Wave platform. 2009 saw yet another record number of project entries and participants and their contribution and ideas have grown in depth and innovativeness. This bodes well for our long-term objective of engaging our students and nurture them towards a lifelong journey of responsible involvement in environmental care and protection. We congratulate all winners and thank all participants and supporters for making this a challenging and meaningful competition”.

The Green Wave Environment Competition 2010 is now open for registration and all students and schools are invited to participate and share their ideas on environmental care and protection. Winning teams can expect the following attractive awards:

Primary Schools	1st Prize	S\$4,000
	2nd Prize	S\$2,000
	3rd Prize	S\$1,000
Secondary Schools	1st Prize	S\$6,000
	2nd Prize	S\$4,000
	3rd Prize	S\$2,000
Junior Colleges / ITEs	1st Prize	S\$8,000
	2nd Prize	S\$5,000
	3rd Prize	S\$3,000
Tertiary Institutions	1st Prize	S\$10,000
	2nd Prize	S\$6,000
	3rd Prize	S\$4,000

The 1st Prize in the Tertiary category is jointly sponsored by Shell International Trading and Shipping Company Limited and includes a one-month attachment to a Shell associate company. The 1st Prize in the Junior Colleges / ITEs category is jointly sponsored by BP

Shipping and includes a one-month development attachment to BP Singapore. Winners of the top prizes at the Junior College/ITE and Tertiary levels will also be offered attachments with Sembawang Shipyard in divisions such as Engineering, IT, Human Resources, Operations and Business.

The prize money for the Primary, Secondary and Junior Colleges and ITEs should be shared on a 60%-40% basis with 60% of the prize award going to the school fund and the remaining 40% to the student/students in the project team. The prize money for the Tertiary Level will be shared by the student participants in the teams and the tertiary institutions on a 60% / 40% basis.

About Sembawang Shipyard

Sembawang Shipyard, a wholly-owned subsidiary of Sembcorp Marine, has one of the largest integrated ship repair and conversion facilities in Southeast Asia. With more than four decades of experience and proven track record in ship repair and offshore conversions, the shipyard's world-class reputation is based on the company's commitment to superior customer service, innovative solutions, quality, and strict Health, Safety, Security and Environment standards.

Besides the traditional sectors of tankers and bulkers, Sembawang Shipyard is a recognised specialist in the niche markets of FPSO/FSO conversions, offshore vessels conversions and newbuildings, complex lengthening conversions, passenger ship conversions/refurbishment, chemical tankers, liquefied gas carriers, offshore rigs and navy ship repairs.

In July 2002, Sembawang Shipyard became the first shipyard in South East Asia to achieve ISO14001 Environmental System Certification by Det Norske Veritas Ltd. The certification is a firm endorsement of the shipyard's commitment and efforts towards environmental preservation and protection. The Green Wave Environmental Care Project for schools is one of the shipyard's key environmental outreach programme. The shipyard is pleased to be the first in the industry to promote environmental care and protection to all schools in Singapore.

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The press release and details of the Green Wave Environment Competition is also available at our website: www.sembship.com/greenwave

APPENDIX 1

The Winners for the Green Wave Environmental Care Competition for 2009 are:

(A) PRIMARY LEVEL

Prizes	School	Title of Project	Participants
1 st Prize S\$4,000.00	Hougang Primary School	Podcasting at X-Cell Zone	Laura Tan Jia Min, James Lee Jia Jian, Jasmine Teo Xin Jia
2 nd Prize S\$2,000.00	Qihua Primary School	Saving Electrical Cost with our Mobile Greener	Germaine Yeo Jie Min, Anadier Ong Soo Teng, Rena Png Si Hwei
3 rd Prize S\$1,000.00	CHIJ Our Lady of the Nativity	OLN E-book with interactive game	Adithi Surya Swaminathan, Rachel Goh Rui-Ling, Nicole Anne Hia Yen Ling
3 rd Prize S\$1,000.00	Si Ling Primary School	Recycling CD covers the Si Ling way	Meagan Tan, Cathrine Cheah, Brenda Mah, Monsalve Samantha, Kogina Goh
Merit Award S\$500.00	Kuo Chuan Presbyterian Primary School	The Amazing Toilet Bowl	Sarah Tan Khay Yi, Tay Tong Ying
Merit Award S\$500.00	Kuo Chuan Presbyterian Primary School	The Green Game	Xavier Pok Zheng Hao, Hong Ji Hoon, Tan Jhing Yein, Elaine Soh Yi Lian
Merit Award S\$500.00	Stamford Primary School	Voices	Cheng Li Yi, Angie Leong, Ng Li Ling, Quek Foo Yong, Natalie Wu Xin Yun, Gan Chin Yi, Yu Tengfei, Cheryl Ng Wen Xin, Koh Wan Ting, Yao Leyang, Aashi Chhabra, He Shiyang, Lee Ming Hui, Sivashanmugam Shakti Swetha, Haridharan s/o Karthikeyan, Immanuel Leong Kay Yann, Lim Kai Jian, Theophilus Lim Kang Le, Ng Yao Zhu, Wu Weiling, Riswana Begum, Stepahanie Goh Li Yin
Merit Award S\$500.00	Xingnan Primary School	Go green detergent	Cheng Wan Ying, Afqah Syalwani bte Hamir, Nicholas Phoon Jing Zhi, Keane Wee Jin Yen
Merit Award S\$500.00	Zhenghua Primary School	Protecting The Marine Environment - "Save The Oceans, Save Lives"	Lim Chen Xi, Lim Lee Chin, Kwang Yuan Xin, Janice Toh Ying Ying
Encouragement Award S\$200.00	Fuhua Primary School	Solar-powered waterfall	Seah Jia Jun, Harish Vatsen, Christopher Anthony Simm, Zane Wong Yu Jun
Encouragement Award S\$200.00	Lakeside Primary School	Zero Dirty Toilets	Nicholas Decena Chee Ze Lin, Alyna Khoo Yi Jie, Ray Chua Yue Chern, Rohit Rajesh Bhat, Loo Yi Tian
Encouragement Award S\$200.00	Pasir Ris Primary School	A Race Against Time - Save the Tree Frogs, Save the World	Iffah Durrhah, Jane Ang Yu Zheng, Yap Sheem Lay, Teoh Rui Ting, Chua Jia En
Encouragement Award S\$200.00	Woodlands Ring Primary School	Nature Trail at Admiralty Park	Adela Teo Leting, Ho Yee Lin, Corrine Chong Kailin, Nurjamalina, Ooi Ming Hui

(B) SECONDARY LEVEL

Prizes	School	Title of Project	Participants
1 st Prize S\$6,000.00	Hwa Chong Institution	Green Cosmetics	Ernest Chen Zhengkai, Ng Chow Hui, Chan Wei, Toh Zheng Xiang, Benjamin Chin Yujin, Theron Ng Sir Yuan
2 nd Prize S\$4,000.00	Hwa Chong Institution	Synthesis of biodegradable plastics by bacteria	Alexander Lim Geng Wang, Sim Meng Ying, Nicholas Kee Jia Hao
3 rd Prize S\$2,000.00	Raffles Institution	Issue on incense paper burning	Goh Kwang Yi, Lee Ji Heng, Mohammad Iqbal B Roslan, Huang Yiheng
Merit Award S\$1,000.00	Hwa Chong Institution	Compost Inc.	Yang Bohan, Soh Cheong Keat, Lim Kiat
Merit Award S\$1,000.00	Canberra Secondary School	The Green Board Game	Aparvee Wirawong, Alice Lok Yee Fong, Nur Hana Pikriyah Bte Noorul H, Aaron Udomsak Chen Guang Jie
Merit Award S\$1,000.00	Anglo-Chinese School (Independent)	Environmental Education in Primary Schools	Loh Guo-yang, Mervyn Lim Jun Rui, Wang Yi Feng, Joshua Lim Chee Hian
Merit Award S\$1,000.00	Raffles Institution	Recycling the liquid gold in Raffles Institution and More!	Eddy Goh
Commendation Award S\$500.00	River Valley High School	Feasibility study on the use of aquatic plants to reduce nutrient levels in sewage water	Elton Tai Keng Boon, Lim You Xiang, Tan Jun Ming, Wang Si Qi
Commendation Award S\$500.00	Raffles Institution	Algae Bioreactor: The Future of clean green energy	Jordan Leong, Dexter Leow, Chua Kok Peng
Commendation Award S\$500.00	Raffles Institution	Mangrove vs. Man-growth	Fong Pei Yuan, Wilson Pek Wei Sheng, Bong Yuho, Tan Chek Hoe
Commendation Award S\$500.00	Raffles Institution	Eco Adventures!	Jack Tan Jie Ze, Koh Teng Chuan, Benjamin Chin, Dominic Kuek, Mervyn Lim
Commendation Award S\$500.00	Hwa Chong Institution	Recycling Vinasse for use as an antifungal agent and plant fertiliser	Cheng Yong Jian, Er Yuan Zhi, Sin Ming Da
Commendation Award S\$500.00	Seng Kang Secondary School	Project Jatropha@SKSS	Shaik Jifridin, Ng Jiasheng, Gary Sim, Teng Jun Wen, Ng Wei Jie, Lee Xue Ting, Ong Shi Ke, Michelle Eng
Commendation Award S\$500.00	Raffles Girls' School	Rainforests Revisited	Cheng Jingjie, Clarisse Chu, Grace Kong, Low Kay Yi
Commendation Award S\$500.00	Tanjong Katong Girls' School	To investigate into the potential of using garden waste compost as a natural source of plant nutrient supplement	Chng Pei Wen, Kwang Su Wen, Low Jun Yu, Sofea Bte Mahad, Rebecca Tan Hui Ying, Eliza Poh Yu Xin, Jacelyn Yam Chin Wei, Tan Hui Ying
Encouragement Award S\$200.00	Nanyang Girls' High School	Toilet Roll Dispenser	Vanessa Chan Wei Qi, Wong Fang Yi
Encouragement Award S\$200.00	Commonwealth Secondary School	Rejuvenation of Marsh Garden at West Coast Park	Koh Ming Guang, Samuel Ang Ding Xiang, Tim Ye Ling, Ng Qing Yi, Boo Kwok Ying, Justin Japit, Ernest Tay Jun Jie

(C) JUNIOR COLLEGE / INSTITUTE OF TECHNICAL EDUCATION

Prizes	School	Title of Project	Participants
2 nd Prize S\$5,000.00	ITE College West (Dover Campus)	Conservation and repopulation of fiddler crab for improving the quality of sands at shorelines	Poh Taiwen, Teo Jun Hao, Yeo Wei Sheng, Millicent Chew Zhi Jie
3 rd Prize S\$3,000.00	ITE College Central (Tampines Campus)	Wide angled energy saving LED Lighting System	Alan Yeo Jun Xiong, Ng Rei Kun
3 rd Prize S\$3,000.00	Hwa Chong Institution (College)	Singapore Environmental e-book discovery (SEED)	Cao ZheHou, Cai Yong, Remus Tan Wei Jie, Tan Wen Shan
Merit Award S\$1,000.00	ITE College East	Bio-degradable detergent (BioClean)	Chua Chun Yong, Cameron Walsh, Pereira Teresa Roderica, Tan Bee Guat, Desmond Khoo Chin Chung, Lee Yan Ping, Por Wei Ting
Merit Award S\$1,000.00	ITE College West (Balestier Campus)	Zero power HP battery charger	Tang Zhi Yang, Jiang KaiGuang, Teo Jia Hao
Commendation Award S\$500.00	Anderson Junior College	Egg Shell Membrane Purification System	Sunshine Huang Ruizhi, Pramesh s/o Prabakaran, Terence Teoh, Joleen Chan, Ng Ang Hui, Tan Sze Gee, Joyce Ng Hui Shuen, Ong Yun Qi
Encouragement Award S\$200.00	ITE College East	Green Bank	Eric Chia Wee Guang, Dorina Cai Yu Ting, Lee Yi Xiang, Pereira Teresa Roderica, Ricson Tan Jia Hao, Joseph Bok De'en
Encouragement Award S\$200.00	Raffles Institution	Mr Can	Tay Wee Kuang, Lee Qian Yi, Jasper Chan Wei Tang, Chan De Sheng, Lim Yi Ting
Encouragement Award \$200.00	Hwa Chong Institution (College)	The eco-room concept (TERC)	Eugene Lee Ying Mao, Tan Wei Jie
Encouragement Award S\$200.00	ITE College Central (Yishun Campus)	Solar powered fan for parked vehicle	Noorina Begum Bt Abdul Ghafur, Siti Naquiah Bte Dali, Nang Shwe Yin
Encouragement Award \$200.00	ITE College West (Dover Campus)	SMS Alert - Automated Gardening Kit	Syed Baktiar Bin Syed Sallim Shahab, Zulkarnain Bin Ismail, Muhammad Khairi Bin Abdul Rashid
Encouragement Award S\$200.00	ITE College East	Detoxification of heavy metal water pollution using marine sponges	Michelle Ong Shi Ning, Lim Kwei Hoon, Eileen Chu Niao Ling, Chong Wan Ling

(D) TERTIARY LEVEL

Prizes	School	Title of Project	Participants
1 st Prize S\$10,000.00	Temasek Polytechnic	Use of recycled plastics in building materials	Jonas Png Dong Jie, Muhammad Haiqal B Mohamed I, Yeo Zhi Yuan, Shamini d/o R Manogaran, Sheik Abdul Hafidz B Sheik A H, Teo Soo Fang
2 nd Prize S\$6,000.00	National University of Singapore	Eco mushroom cultivation	Goh ZhiQian
3 rd Prize S\$4,000.00	Temasek Polytechnic	Refuse chute inspection robot	Zheng Hanyang, Wee Tuck Wei, Ang Ding Chang, Rosie Ng Ying Ying, Fawn Christal Lim Mei Yin, Ishyam Lal Abdul Jalal, Muhammad Farhan B Burhanuddin, Mohamad Rizal Bin Mohamad, Nurhidayat Bin Suhaimi, Dickson Yeo Zi Rong, Cheong Teck Choon
3 rd Prize S\$4,000.00	Singapore Polytechnic	Salvaging energy along the expressway	Jason Lee Jia Sheng, Loh Mei Qi, Glenda Chin Ying
Special Merit Award S\$2,000.00	Singapore Polytechnic	Studies into the extraction of proteins from moringa oleifera	Tham Ai Lin, George Thng Yew Hock, Muhamad Noor bin Muhamad Hussian, Shih Yu Chen
Special Merit Award S\$2,000.00	Singapore Polytechnic	Mobility vertical greening	Stefan Tan Jin Yang
Encouragement Award S\$200.00	Singapore Polytechnic	An environmentally friendly system to handle waste recovery	Tang Poh Ling, Tai Zhang Hao, Gerry Neo Shun De, Tan Wei Zhen
Encouragement Award S\$200.00	Ngee Ann Polytechnic	Wave-driven beacon prototype	Gan Jia Hao, Tan Han Bin, Su Sze Leng, Teo Li Heng, Liu Enshao, Thein Myint Win Tun
Encouragement Award S\$200.00	Ngee Ann Polytechnic	Green and clean cooking (Hydrogen stove)	Dai Jia Jun, Gu Linling, Hu Ting, Ang Wee Sin
Encouragement Award S\$200.00	Singapore Polytechnic	Water filter box	Chan Hui Yi, Go Rin See, Justin Tan Yong Li
Encouragement Award S\$200.00	Singapore Polytechnic	ECO CUBE (Prefabricated bathroom)	Ong Li Yen

APPENDIX 2

Summary of the winning projects:

(A) PRIMARY LEVEL

Prizes	School	Title of Project	Participants
1 st Prize S\$4,000.00	Hougang Primary School	Podcasting at X-Cell Zone	Laura Tan Jia Min, James Lee Jia Jian, Jasmine Teo Xin Jia
Project summary	<p>At Hougang Primary School we have an Eco Garden that is unlike those in many other schools. The Eco garden has butterfly garden, Fernery, Eco Pond, Fruit Orchard, Medicinal plants and herbs, vegetable plots, Plant nursery, Water recycling plant, Animal enclosure, Creature watch and many other areas. There is over 400 species of plants and many species of insects and animals can be found there. Students come to the Eco garden regularly, either by themselves or with their teacher.</p> <p>As Life Science Ambassadors, a title bestowed upon students who help out at the eco garden which we call X-Cell Zone, we are always thinking of ways to improve teaching and learning at this place. We would like to make the garden more interactive so that it makes it more interesting for students who come to the garden. At the moment if a student is at a particular area in X-Cell Zone, he will not be aware about the type of plants and animals around him unless the teacher is present. Even if there is a teacher present, it is difficult for the teacher to explain about all the areas in X-Cell Zone as the place is quite massive.</p> <p>We decided to tackle the problem by creating a podcast of the various areas in the school. We did this with the help of our teacher who gave us the information and we took the pictures and did the recording. Refer to the CD given. We have over 40 i-pods in the school so the teacher can use it for 1 class.</p> <p>Our next step is to create the check points for the various areas so that students will be able to go to these areas and listen to the podcast accordingly. These checkpoints will need to be made of a material that can withstand the outdoors. It will have the check point number and the description of the place printed on it. Our school also has various charts on animals and plants which we would like to install in the garden. The information on these charts will be relevant to the area that they are at. Putting these in place will make the garden more conducive for learning.</p> <p>This project is an interactive tour guide and it enables the user to access any of the 13 stations found in X-Cell Zone. The podcast will ensure that the user will not miss out on anything that is found in X-Cell Zone. Most importantly it enables pupils to be responsible for their own learning.</p> <p>The podcast coupled with the combination of strategically located outdoor charts, plant labels, and our diverse plant and animal life promise every pupil an exciting learning experience.</p> <p>This podcast can also be a useful tool for teachers. Most of the checkpoints cover learning concepts found in our Science Curriculum.</p>		
2 nd Prize S\$2,000.00	Qihua Primary School	Saving Electrical Cost with our Mobile Greener	Germaine Yeo Jie Min, Anadier Ong Soo Teng, Rena Png Si Hwei
Project summary	<p>Growing vertically will help to reduce the room temperature and when the temperature is lowered, the cost of air-conditioning will be minimised thus save electrical costs.</p> <p>We designed and constructed by using plastic pipes, wooden planks, metal mesh and rubber wheels. After connecting the plastic pipes together, metal screws were drilled into the intersecting parts to further secure the structure. Lastly, the wooden planks and rubber wheels are added for added strength, stability and mobility.</p> <p>Next choosing plants, we have various types of ferns, money plant and morning glory plant germinated in recycled plastic bottles and pots during the June school holidays. The plants were watered everyday except over weekends.</p>		

	<p>A month later, when school re-opened, the bottles of plants were tied to the vertical greener. Plastic cable ties were used to secure the bottles of plants onto the structure. We ensure that the structure was fully covered with plants. We took turns to water the plants after school daily and fertilise them.</p> <p>Our experiment results show that vertical greening helps to reduce temperature in a concrete room. Furthermore, if external and internal greening is carried out simultaneously, indoor temperatures will be reduced even more significantly by an average of 2.5° C.</p> <p>This project shows that vegetation cover is effective in lowering indoor temperatures of concrete buildings. However, more significant results will probably be noticeable if vertical greening is done on a larger scale basis. Besides helping to reduce electrical consumption, in a highly urbanised country like Singapore, vertical greening will also beautify our residential HDB blocks and strengthen the nation's distinction as a "Garden City".</p>		
3 rd Prize S\$1,000.00	CHIJ Our Lady of the Nativity	OLN E-book with interactive game	Adithi Surya Swaminathan, Rachel Goh Rui-Ling, Nicole Anne Hia Yen Ling
Project summary	<p>OLN E-book and interactive game is a package that has been created to instill informative and responsible values towards the environment. The e-book documents the process of compost making and the game provides the element of fun and infused learning. The package also encompasses the scientific concept, that is the promotion of self-made compost from food scraps as an environmentally friendly and sustainable alternative to chemical fertilisers. The e-book and game have been written in a narrative form so that the scientific concepts can be made accessible to the young children.</p> <p>The new ideas are to introduce scientific concepts in a narrative form and make it into an interactive e-book and game for young children to gain access. The e-book and interactive games act as an added teaching resource for the Primary one and two STELLAR programmes, a programme that encourages teaching from the platform of storytelling.</p>		
3 rd Prize S\$1,000.00	Si Ling Primary School	Recycling CD covers the Si Ling way	Meagan Tan, Cathrine Cheah, Brenda Mah, Monsalve Samantha, Kogina Goh
Project summary	<p>Plastics are one of the materials most frequently used to make CD covers and many other things around us. However, most of the time some non-biodegradable plastics like CD covers end up in the dumping ground, giving rise to the pollution of the environment. Also, some people might find it a hassle to drag their CD covers to be recycled. Hence, our team decided to compile a book of interesting ways to recycle CD covers without using much effort or time, which may help families to bond and learn about caring for the environment at the same time.</p> <p>The team proposed to compile a book on the various different ways to recycle the CD or DVD cases. The team planned to think of various and creative but most importantly, easy ways to recycle the cases so as to encourage more people not to throw the cases away. The recycled cases can even be given to friends or relatives as gifts! This book will also comprise some challenging ideas to recycle the cases for families to work together, thereby promoting bonding.</p>		
Merit Award S\$500.00	Kuo Chuan Presbyterian Primary School	The Amazing Toilet Bowl	Sarah Tan Khay Yi, Tay Tong Ying
Project summary	<p>We have learnt that water is a precious resource and we should reduce, reuse and recycle water. From our observation, we realised that when taking a bath or shower, the soapy water that was used will often be drained away even though they can be recycled. We also found out that around 1/5 of the total amount of water used by a family in a month is used for flushing the toilet. So, we decided to come out with a model named "The Amazing Toilet Bowl" that is mainly used to recycle water used to bath or shower.</p> <p>Soapy water after a shower or bath will flow down a pipe and be collected in a container. Then, it will be transferred to another container using a pump. It is then pumped into the cistern and finally flushes the toilet.</p>		

	<p>Why do we need to use clean water to flush our toilets? We can recycle water by using soapy water after a shower or bath to flush our toilets. Flushing the toilet using the soapy water not only recycles water, but it can also clean the toilet bowl when it is being flushed down.</p> <p>We hope that this model will be a step towards reducing, re-using and re-cycling water and contribute to the conservation of water efforts in Singapore.</p>		
Merit Award S\$500.00	Kuo Chuan Presbyterian Primary School	The Green Game	Xavier Pok Zheng Hao, Hong Ji Hoon, Tan Jhing Yein, Elaine Soh Yi Lian
Project summary	<p>Many people are blissfully unaware of environmental issues. They go through life thinking that good old Mother Nature and Earth will always be the same as before, supplying us with fresh air, clean water, abundant food, natural resources, lovely climate and all the other necessities of life. Unfortunately, this is not so. Global warming, pollution, etc have wrecked havoc and are threatening our survival. Thus, we wanted to do a project that will raise people's awareness of the damage done to the environment and how they can do their part to protect it for future generations before it is too late.</p> <p>We decided to look at other ways in which we could raise people's awareness of environmental issues so that everyone, both young and old, will find it fun to learn how to be eco-friendly and do their part for the environment. Then we came up with the idea of a board game with cards containing information on how to be environmental friendly. We all felt it was a good idea because our target group was met. Furthermore, parents could bond with their children while playing the game.</p> <p>By playing the game that we designed, players will be made aware or reminded that being eco-friendly is not so daunting after all. The information in the cards about very simple and "do-able" things in everyday life, when acted on, will go some way in helping to save the environment. Moreover, this game reaches out to the younger generations who are less likely to learn from books, speeches, etc. than from fun games like this one.</p>		
Merit Award S\$500.00	Stamford Primary School	Voices	Cheng Li Yi, Angie Leong, Ng Li Ling, Quek Foo Yong, Natalie Wu Xin Yun, Gan Chin Yi, Yu Tengfei, Cheryl Ng Wen Xin, Koh Wan Ting, Yao Leyang, Aashi Chhabra, He Shiyong, Lee Ming Hui, Sivashanmugam Shakti Swetha, Haridharan s/o Karthikeyan, Immanuel Leong Kay Yann, Lim Kai Jian, Theophilus Lim Kang Le, Ng Yao Zhu, Wu Weiling, Riswana Begum, Stepahanie Goh Li Yin
Project summary	<p>"Voices" was first conceptualised when the Straits Times featured some news on Sumatran tigers killing some villagers. Before launching onto this project, we were a bunch of ignorant students happily living our lives without giving any thought to the precarious existence of so many endangered species. After doing some research on endangered plants and animals and especially on the Sumatran Tiger, we felt that children all over Singapore and developing countries should be encouraged to look beyond their own little world. The Sumatran Tiger, a sub-species, would become extinct by 2012 if nothing is done to help them. Zoos all over the world have some Sumatran Tigers which in a way are protecting them and helping them to multiply but the zoos are not their natural habitat. They should be allowed to live in the wild without threats from humans.</p> <p>The main objective of this project is to develop an educational multi-media package to educate children on the awesome responsibility of saving the Sumatran tiger. There are 7 stories written by Primary 5 and Primary 6 students which hope to bring forth the feelings and thoughts of 7 characters which play important roles in the tiger's life. They are the Male Sumatran Tiger, Female Sumatran Tiger, Tiger Cub, the Hunter, a member of the Public, a Friend of the Tiger and the Forest. Children may also find it interesting to listen to and watch the story in a poem to the accompaniment of some</p>		

	<p>images and animation. A storybook and a VCD are provided in this package. Children are also encouraged to make a commitment to saving these animals and others by signing a letter of commitment or by adopting an endangered animal.</p> <p>It is hoped that what we have learnt may be imparted to others like us throughout Singapore. We may be young now and can only play a small part but like the mustard seed, we will grow up into being responsible adults who can play a bigger part in caring for Gaya.</p>		
Merit Award S\$500.00	Xingnan Primary School	Go green detergent	Cheng Wan Ying, Afiqah Syalwani bte Hamir, Nicholas Phoon Jing Zhi, Keane Wee Jin Yen
Project summary	<p>All households use detergents for various cleaning jobs at home. Research has shown that most of the dish washing detergents contain chemicals such as phosphate and surfactants. Surfactants help to get rid of grease, oils and fats which are present on the crockery. Some surfactants may not break down totally but remain in the environment by entering the food chain which will affect us eventually. They can cause cancer or birth defects if these surfactants are consumed or being absorbed through the skin (Cicutti, N, 2007).</p> <p>Phosphates can cause excessive growth of algae when they are discharged into the water bodies. The rapid growth of algae will disrupt the delicate aquatic ecosystem. According to WWF (2008), manufacturers are reluctant to sell phosphate-free detergents in countries which do not impose a ban on phosphate. Typically, phosphate-free detergents are slightly more expensive than the conventional detergents.</p> <p>Therefore, in this project, our team would like to explore the development of a 'green' detergent using low cost food waste materials which are widely available from our school canteen, e.g. different fruit peels, rice water, etc. Our investigation would be based on our hypothesis that food wastes are able to remove oil stains with different efficiency from the crockery. The possible impact of our investigation is to reduce the amount of detergents used in school canteen and households for cleaning the crockery, hence reducing the amount of harmful chemicals down the sink, which will eventually enter the water bodies.</p> <p>Our investigation explored using food wastes such as orange peels to clean off the oil from the Petri dishes. The dish was tested for oil remains by using an oil control film. The matte oil control film will turn translucent if rubbed against with oil. Our investigation has proven that some food wastes are effective in removing oil from the Petri dishes.</p> <p>Our team would like to recommend some possible future developments to our investigation such as to extend our investigation on a wider range of fruit peels for oil removal and to investigate on the optimum dosage of food wastes for oil removal.</p>		
Merit Award S\$500.00	Zhenghua Primary School	Protecting The Marine Environment - "Save The Oceans, Save Lives"	Lim Chen Xi, Lim Lee Chin, Kwang Yuan Xin, Janice Toh Ying Ying
Project summary	<p>The marine environment has been facing destruction and exploitation due to many human activities. It is essential that we do not simply neglect the fact that our oceans are dying and many marine animals are facing extinction. Hence, the team has designed an awareness campaign, targeted at the youth and young adults of Singapore, to help in the marine conservation efforts.</p> <p>This project aims to raise awareness about the destruction of the marine environment and the increasing threats the oceans are facing. It also aims to educate the society about the importance of the oceans and the marine life and to decrease the pollution of the oceans. With the group's proposed product of a short educational video clip, a poster and an informational brochure, we hope to protect the beautiful marine environment from becoming a gigantic rubbish dump with a dying marine ecosystem. In addition, the most important objective is for the society to understand their role in this fight against extinction and the simple things that everyone can do for the marine environment. The takeaway from this project would be for everyone to understand and remember to "Save the Oceans, Save Lives!"</p>		

	<p>This report presents the team's findings about the marine environment, as well as the team's recommendations about marine conservation. The report begins with a brief introduction about the topic of Marine Environment and provides some background information. The objectives and the aims that the team hopes to achieve are outlined clearly in the next section. The report also details the product that the team has designed in achieving the objectives of the project. The product consists of three parts: a video clip, an informational leaflet and an educational poster.</p>		
<p>Encouragement Award S\$200.00</p>	<p>Fuhua Primary School</p>	<p>Solar-powered waterfall</p>	<p>Seah Jia Jun, Harish Vatsen, Christopher Anthony Simm, Zane Wong Yu Jun</p>
<p>Project summary</p>	<p>The theme for Fuhua Primary School's project is energy conservation, particularly electricity conservation.</p> <p>In Singapore, electricity is produced by burning fossil fuels, which are non-renewable sources of energy. The burning of these fuels produces pollutants and greenhouse gases which is often associated with global warming. Global warming can be slowed down by using conserving electricity.</p> <p>Fuhua has an ideal location in its classroom building which receives an abundance of solar radiation. The abundance of solar energy readily available meant that the Fuhua Green Wave team could utilise it in the project. Solar energy is renewable and using it to provide electricity would reduce reliance on burning of fossil fuels. Solar energy also provides sustainability in meeting energy demands for the long-term future.</p> <p>The fuhua team chooses to make a solar-powered waterfall which would demonstrate the utilisation of solar energy to power domestic electrical appliances. It is relatively easy to make and the circuitry is simple to construct. Its aesthetic value would also attract other students' attention and can help raise their awareness about conserving electricity.</p> <p>The team members develop their prototype systematically. They choose their components carefully; taking into consideration various design factors. They choose to reuse and recycle materials collected from various sources as part of their responsibility towards the environment. A schematic diagram and a detailed description of how the waterfall works are included in this report.</p> <p>During the construction, the team encounters several difficulties but managed to overcome them. The completed prototype is tested and the results are satisfactory. A step-by-step instruction guide on using the prototype is also included.</p>		
<p>Encouragement Award S\$200.00</p>	<p>Lakeside Primary School</p>	<p>Zero Dirty Toilets</p>	<p>Nicholas Decena Chee Ze Lin, Alyna Khoo Yi Jie, Ray Chua Yue Chern, Rohit Rajesh Bhat, Loo Yi Tian</p>
<p>Project summary</p>	<p>The objectives of our project are to educate our schoolmates in:</p> <ul style="list-style-type: none"> ● Good personal hygiene habits, toilet etiquette and social responsibility in the toilet ● Harmful effects of a dirty toilet ● What they can do to maintain a clean toilet <p>We are inspired by the graphics and health warning labels on the cigarettes packaging that discourage smoking. We hope to take photographs of existing situations in our school toilets after recess and lunch break, and make them into poster, postcards and bookmarks to highlight the importance of good personal hygiene habits, toilet etiquette and social responsibility in the toilets.</p> <p>The new idea in our project is to make use of photographs with warnings which act as strong messages to make sure that our schoolmates are educated about clean toilets. We have never seen such posters, postcards and bookmarks in school before. We hope that our project will make the situation of the school toilets after recess and lunch break better.</p> <p>The posters were put up around the school while the postcards and bookmarks were distributed to our schoolmates at a booth in the canteen.</p>		

Encouragement Award S\$200.00	Pasir Ris Primary School	A Race Against Time - Save the Tree Frogs, Save the World	Iffah Durrah, Jane Ang Yu Zheng, Yap Sheem Lay, Teoh Rui Ting, Chua Jia En
Project summary	A survey was conducted to find out students' awareness for endangered species and how their disappearance is linked to Man's habits. The team looked into ways to create awareness in the school. A number of ideas were proposed and we decided to go ahead with the Green Cards. We came up with idea of The Green Card with pictures taken by ourselves of endangered animals from the Singapore Zoo to spread the message of conservation through fun and games. These cards have been created so that students can identify endangered species featured on them. The Green Cards is a set of 26 pairs of endangered animals including our "star card" the tree frog. They can be played in a variety of ways depending on the age and number of players involved.		
Encouragement Award S\$200.00	Woodlands Ring Primary School	Nature Trail at Admiralty Park	Adela Teo Leting, Ho Yee Lin, Corrine Chong Kailin, Nurjmalina, Ooi Ming Hui
Project summary	<p>Every flora and fauna that exists on Earth has a role to play in the ecosystem. The flora for example is important in many ways. They help to replenish the oxygen in the Earth's atmosphere when they carry out photosynthesis. Flora helps to beautify the environment. Without them, many places such as schools, parks and housing estates will appear bare. Many plants also provide food for humans as well as other animals. Many plants especially trees found in the forests provide homes for animals. In urban areas like Singapore, trees provided shelter for people. Not to mention that plants also provide raw materials for making paper, furniture and many other useful products. Animals also play an important role in the natural world. Many animals provide food for other animals. Some animals such as birds, bats, bees, wasps, and other insects help to pollinate flowers. Other animals help in the dispersal of fruits and seeds.</p> <p>Plants and animals are interdependent on one another. Without plants, animals will not thrive and vice versa. Many of the natural habitats in Singapore such as forests, mangrove swamps and coastal areas have been cleared to make way for urban development. When natural habitats are cleared, not only will the flora disappear. It is not surprising that many plants and animals are becoming rare or endangered or worst still become extinct due to the activities carried out by Man. Plants and animals found in Singapore are also facing similar threats due to urban development. Hence, it is important to conserve some of the existing natural habitats so that the flora and fauna will continue to exist. We cannot deny the fact that every flora and fauna plays an important role in the ecosystem. Without them, there will be a disruption to the natural balance.</p> <p>The aim of the project is to promote awareness amongst visitors, in particular primary school students, the diversity of wildlife (flora and fauna) in Admiralty Park and to promote the conservation of the various natural habitats found at Admiralty Park so that these habitats can continue to support the rich diversity of wildlife there. Our team will study the wildlife found living in the various habitats at Admiralty Park and come up with card games such as Memory Game Cards and Jigsaw Cards which teachers can use as a resource package to support teaching and learning when they bring their students out to Admiralty Park for a Nature Trail. We would also like to create bookmarks. Each bookmark features a particular type of flora or fauna found in this park. Our team will also create a power-point slides of the flora and fauna found at Admiralty Park.</p>		

(B) SECONDARY LEVEL

Prizes	School	Title of Project	Participants
1st Prize S\$6,000.00	Hwa Chong Institution	Green Cosmetics	Ernest Chen Zhengkai, Ng Chow Hui, Chan Wei, Toh Zheng Xiang, Benjamin Chin Yujin, Theron Ng Sir Yuan
Project summary	In Singapore, food waste from food processing industries are being processed into animal feed or turned into methane and compost using anaerobic digestion process. However, the food waste is not		

	<p>commonly collected from homes for recycling, leading to a loss of precious resources.</p> <p>In this study, we aim to recycle domestic waste, mainly food waste, by extracting useful chemicals from it. The wastes which we worked on include human hair, waste tea leaves, fruit peels and crab shell. The reason why these wastes were chosen is that they are easily available and also contain valuable substances which can be made into useful products.</p> <p>Our group presents a range of environmentally-friendly beauty products, made from a range of active ingredients extracted from waste materials, such as crab shells, hair, waste tea leaves and fruit peel. These active ingredients exhibit beneficial properties, including antioxidant property, UV protection property and antibacterial property. Our products include lip balm, sunblock, moisturizing cream and pimple cream. Coupled with the fact that these products are made from almost 100% organic ingredients and free from synthetic chemicals, our beauty products are likely to be appealing to the consumers. Also, our products capitalize on the “willing but lazy” attitude of some consumers. More people are likely to be willing to save the environment, as long as it is convenient and not time-consuming for them. While some consumers may be unwilling to walk two blocks away to the nearest recycling bin when they can throw their trash into the bin in their house, they would probably buy our beauty products as it is not a hassle to them – since they are already in the shop to buy the beauty products, why not buy ours as it is environmentally friendly and probably competitively priced, since these waste materials are abundant and cheap! Our project is another step to environmental conservation, as from trash we are able to extract valuable substances which can be used in everyday products. Hence by simply choosing our products which are made from waste, consumers can do their part in saving the Earth, conveniently and easily. Every bit counts!</p>		
2 nd Prize S\$4,000.00	Hwa Chong Institution	Synthesis of biodegradable plastics by bacteria	Alexander Lim Geng Wang, Sim Meng Ying, Nicholas Kee Jia Hao
Project summary	<p>Plastics are one of the most widely used materials in our daily lives. They make up a significant percentage of wastes disposed every year. The overusage of synthetic, non-biodegradable petroleum-based plastics leads to environmental problems such as the release of harmful chemicals from incineration of these plastics and insufficient landfill space.</p> <p>The objective of this project is to produce biodegradable plastics from the bacterium <i>Alcaligenes eutrophus</i> ATCC17699. The plastics are polyhydroxyalkanoates which are polymers synthesized by the bacterium under conditions of nutrient imbalance of high carbon and low nitrogen content. Production of plastics from bacteria is based on renewable agricultural sources, like carbohydrates and oils in plants, rather than diminishing fossil fuels such as petroleum.</p> <p>In these experiments, the bacterium <i>A. eutrophus</i> was grown in trypticase soy medium before being transferred to fermentation medium with high carbon and low nitrogen content. Extraction of the polymer from the bacterium was through the reflux method with chloroform followed by precipitation of the polymer in cold methanol. The growth rate of <i>A. eutrophus</i> and the yield of polymer from palm olein was the highest among other carbon sources used like soybean oil, olive oil, deep frying oil, glucose and fructose. The polymer from <i>A. eutrophus</i> grown in palm olein also had the highest mechanical strength. Various other properties of the polymer were also tested, and it was found to be flexible, did not show any tears when crumpled or folded, waterproof, resistant to acid corrosion and could block out most ultraviolet and visible light. Thus it is suitable to be used as carriers or light protective shields. Plastics produced by the bacterium can be degraded by soil microorganisms, reducing the need for landfills and incineration of plastics. Waste materials like sugarcane bagasse and decaying leaves rich in cellulose are currently being explored as possible carbon sources for the bacterium, thus recycling these materials.</p>		
3 rd Prize S\$2,000.00	Raffles Institution	Issue on incense paper burning	Goh Kwang Yi, Lee Ji Heng, Mohammad Iqbal B Roslan, Huang Yiheng
Project summary	<p>For our project, we would like to improve the situation of this issue by providing a two-fold solution consisting of:</p> <ol style="list-style-type: none"> 1. A practical solution to the problem 2. Ways of raising awareness about its harmful effects to encourage the public to take action 		

	<p>A practical solution is proposed because in order to encourage action, practical and tangible means must be shown, which will also directly solve the problem. The root of the problem lies with the large amounts of pollutant ashes and air particles released from the burning itself.</p> <p>Therefore, our group has thought of targeting several areas to practically solve the problem, of which, are the options of introducing an environmentally-friendly way of burning incense paper, having incense paper that does cause as much pollution, or modifying the ash containers such that they retain most of the ashes.</p> <p>We felt that the most feasible idea to execute would be modifying ash containers, such that they aid in trapping pollutant particles, while not compromising the practical functions of previous containers. Diagrams and illustrations have been made of our proposed prototype in the next section, and explanations are provided too.</p> <p>We made changes to the original design of the chute, while retaining the overall look of the chute. This is to prevent the possible problems that could arise if the people, especially the older generation are unable to accept a totally different chute.</p> <p>In the original design of the chute, the interior of the chute was empty. In our design, we modified it such that the interior of the chute replicates a fractionating column in a chemical distillation set-up. There are 3 layers in the chute, with one protrusion from each side of the chute in each layer. This new design would be able to trap dust particles and ash under the protrusions, while allowing the hot air to escape, purifying the air that escapes from the chute.</p> <p>Another modification we made was to the small holes on the sides of the chute. Instead of the small holes in the original design of the chute, our design of the chute has extended, protruding holes in the side of the chute. Our original design used a tea-bag to cover the extended protruding holes, trapping dust particles while allowing air to go through. However, the tea bag would get torn and burnt easily. Thus, we created funnel-like protrusions from each side of the exxtended protruding hole, similar to the fractionating column idea used in the interior of the chute. This traps a portion of the dust particles while allowing the air to escape, and for oxygen to enter the chute.</p> <p>With these modifications being made to the original chute, putting the incense paper into the chute would not be as easy as before. So, we included shafts at the sides of the chute. These shafts can easily be opened to place the incense paper into the chute, and closed after putting the incense paper in.</p>		
Merit Award S\$1,000.00	Hwa Chong Institution	Compost Inc.	Yang Bohan, Soh Cheong Keat, Lim Kiat
Project summary	<p>Most fertilizers in use today are largely inorganic Nitrogen, Phosphorus and Potassium fertilizers. These fertilizers are effective but their use may bring about much adverse effects to the environment. If not kept in check, overuse of such fertilizers might lead to leaching and cause eutrophication problems in water sources.</p> <p>In the agricultural industry, organic fertilizers are shunned due to their high costs. Farmers with lower literacy and affluence understand little about the benefits of organic fertilizers, much less be inclined to purchase them, thus explaining their disutility.</p> <p>As such, the compost fertilizer will serve to plug this gap. A 100% organic cost-productive fertilizer, this fertilizer emerged from a series of environmentally friendly production methods and can be marketed to the agricultrural sector in developing countries at an affordable price. In line with the increasing demand for fertilizers and rising price of fertilizers, our Compost Fertilizer is poised to be able to reach out to a large target market.</p> <p>Taking the technology one step further, we have created the Compost Bin, an affordable bin that allows the efficient production and collection of compost fertilizers. These bins allow farmers to produce their own compost fertilizers and reduce their dependency on purchased fertilizers.</p> <p>With a series of combination of organic materials, an effective method of producing Compost Fertilizer</p>		

	has been designed.		
Merit Award S\$1,000.00	Canberra Secondary School	The Green Board Game	Aparvee Wirawong, Alice Lok Yee Fong, Nur Hana Pikriyah Bte Noorul H, Aaron Udomsak Chen Guang Jie
Project summary	<p>The Green Board Game was inspired by the American Politician, Former Vice President Al Gore, the most fanatic environmentalist to ever exist on this planet. He tried rally hard to get into the minds and hearts of people about climate change, and started the modern environmentalism movement in the world by spreading knowledge, lecture by lecture, seminar by seminar, conversation by conversation. We believe that knowledge is crucial for people to understand more about our planet, and what is happening to it. Sometime, such knowledge is incomprehensible because of the barrier between lay men and the scientific world. What more for the youths of today? They are distracted by too many elements in the world that such knowledge does not reach them accurately or not at all.</p> <p>With this board game, we hope to have a fair share of their time and attention, so that knowledge about the earth, and our effects on it, can be passed down to the coming generations. The next generation of young people will be the agents of change for a better world to live in. The Green Board Game is not just any other board games. Its main objective is to excite, and instill fun into gaining knowledge about issues that affect our environment and the earth, with the hope that they are motivated to take real actions, to help save the earth.</p>		
Merit Award S\$1,000.00	Anglo-Chinese School (Independent)	Environmental Education in Primary Schools	Loh Guo-yang, Mervyn Lim Jun Rui, Wang Yi Feng, Joshua Lim Chee Hian
Project summary	<p>The impact of environmental education & awareness is best realized when learnt at young and hands-on. Our team of classmates from Anglo-Chinese School (Sindependent) has planned out the 'Environmental Education' programme for primary schools with the following aims for primary school students in mind: (i) to raise awareness of the environment through education, (ii) to let the students recognize the potential of the youth to contribute to the environment through fieldwork, and (iii) to let the students realise the scientific principles in the study of ecology though practical work.</p> <p>The syllabus of this programme is ordered in a systematic manner: it begins with simple environment appreciation, further appreciation of the environment, and the eventual acquisition of knowledge to manage the environment seen in global and individual level. This is expressed in the themes expressed from Primary 1 to Primary 4, namely, Our Wonderful Environment (Primary 1), Impact of the Individual on the Environment (Primary 2), Environmental Science (Primary 3) and Enviromental Management (Primary 4).</p> <p>The features of this programme include its flexibility in the pedagogical approaches, the series of activities included that makes learning fun and enriching (different from the typical exam-based assessment) and its function to provide young Singaporeans a richer mature outlook of the situation of the world at a young age. A unique component of our programme is to allow the young to actualize their ideas through the activities (for example tree planting).</p> <p>This programme shall be proposed as a year-long course to be taken by primary school students with proper assessment mechanisms to give a check on their understanding of the syllabus. In fact, this programme was supposed to be implemented in partiality with Care Community Services Society (CCSS) only to be marred by the H1N1 situation that hit Singapore recently.</p>		
Merit Award S\$1,000.00	Raffles Institution	Recycling the liquid gold in Raffles Institution and More!	Eddy Goh
Project summary	<p>This project consist of 4 phases namely</p> <ol style="list-style-type: none"> 1. Research Phase 2. Proposal Phase 3. Implementation Phase 4. Expansion Phase <p>I kicked off this project by researching the foundational knolwedge on the relevant topics that helped</p>		

	<p>me in the later phases. Research was done to learn more about Biodiesel, what is the current methods of waste oil disposal in our school and our local community including restaurants. To learn more about the waste oil collection process and gain first-hand experience, I joined a crew from Alpha Biofuels on a long but eye-opening day of work, going around the various locations across the island to collect waste cooking oil from restaurants and school canteens.</p> <p>With the first-hand knowledge and experience, I came up with a proposal of setting up a waste oil recycling point in my own community – my School. An educational publicity poster was then created to relay the message proper disposal of waste oil and problems associated with neglecting the correct method.</p> <p>After getting the school admin and the company to agree on the proposed terms and agreements, decision was made on the size of barrel – 60-litres barrel for the school dining hall and 40-litres for the school canteen.</p> <p>As this initiative has a host of benefits for both the school and the company, I have compiled a blueprint so that this environmentally-friendly and sustainable system of waste oil disposal can be adopted by other schools and organisations. The blueprint serves as a complete guide that contains all the relevant information and the process involved for the implementation of a waste oil recycling point in your school or organisation. Most importantly, it also reports the host of benefits that this proposed system brings that benefits the school, the canteen vendors, the students, the company, and most importantly the Mother Earth.</p>		
Commendation Award S\$500.00	River Valley High School	Feasibility study on the use of aquatic plants to reduce nutrient levels in sewage water	Elton Tai Keng Boon, Lim You Xiang, Tan Jun Ming, Wang Si Qi
Project summary	<p>The high nutrient level of sewage effluent causes common problems to our water bodies. In this study, we explored the capabilities of various aquatic plants namely, Water lettuce, Water Hyacinth, Salvinia and a submerged plant in purifying and reducing the nutrients in sewage effluent. This investigation was carried out in two separate experiments.</p> <p>In the preliminary study, we experimented with salvinia, Water hyacinth and Water lettuce over a period of 3 weeks. For the second experiment, we repeated the use of Salvinia and Water hyacinth and included a submerged plant over a period of 7 weeks. The plants were grown in tubs of sewage effluent of 5 litres each. We hypothesize that the aquatic plants would proliferate rapidly upon growing in the sewage effluent due to the large presence of nutrients, leading to a decrease in nutrients level.</p> <p>Our results showed that the plants appeared green and healthy in the first three weeks. Salvinia and Water lettuce showed better growth than Water hyacinth and the submerged plant. After Week 3, plants started to die. Salvinia and Water lettuce were able to reduce nitrate levels; only Salvinia was able to reduce phosphate levels. Hence, we concluded that Salvinia has the greatest potential in reducing nutrients in sewage waters. The plants growing in the sewage waters did not affect the pH drastically. pH remained in the neutral or slightly alkaline range of 7.0-7.5. Hence, we concluded that it is feasible to use water plants, particularly Salvinia and to a lesser extent, Water lettuce, in the reduction of nutrient levels in sewage water. In this way, eutrophication can be minimized.</p>		
Commendation Award S\$500.00	Raffles Institution	Algae Bioreactor: The Future of clean green energy	Jordan Leong, Dexter Leow, Chua Kok Peng
Project summary	<p>For our topic focus, we decide to zone in on air pollution in Singapore. Although the situation in Singapore is not as bad as compared to other countries, the level of suspended particulate matter (SPM) and amount of greenhouse gas emissions per year has been steadily rising. Therefore, we decided to tackle this issue, and came up with the idea of using algae as an air purifier. This is because algae can spread quite rapidly, photosynthesizes efficiently and is of relatively low maintenance. Already in the research and development field, algae have been touted to be the next big thing in renewable energy sources, as biofuel can be collected and burnt. Even leftover algae can be burnt or used as compost. However, we realized that algae has not been used as an air purifier, despite its useful ability in helping to reduce greenhouse gas emissions as a plant. Therefore, we decided to build a working algae bioreactor prototype which cultures algae for air purification. To make the bioreactor more useful, we also decided to use it for purifying industrial air emissions.</p>		

	<p>When designing our bioreactor, we decided to build based on two principles. As many bioreactors in the research and development fields are often expensive and space-consuming, we decided on a cheap and compact bioreactor that can be easily mass produced for better and more prominent effect. Furthermore, all our bioreactor needs is a small power supply and a light source, and it can work quite efficiently. Bearing that in mind, we also designed the bioreactor to be able to be put on light industrial smokestacks, or even in factory rooms.</p> <p>We hope that our bioreactor will be able to be put into use and believe that it will have quite a substantial effect on the level of greenhouse gasemissions, especaially when mass-produced.</p>		
Commendati on Award S\$500.00	Raffles Institution	Mangrove vs. Man-growth	Fong Pei Yuan, Wilson Pek Wei Sheng, Bong Yuho, Tan Chek Hoe
Project summary	<p>To study the factors leading to the rapid depletion of Singapore's last few remaining coastal and mangrove forests over the last few decades, our study explores the variations in biodiversity index and species evenness on the mudflats at Sungei Buloh Wetland Reserve, Singapore. This is because biodiversity is a clearest indication of the ecological stability and the availability of habitats in any given environment. Five ecological characteristics of the mudflat habitat: pH values, the air temperature (AT), surface temperature (ST) around the organism as well as the relative humidity (RH) and the tide level (TL) were measured simultaneously with species and number of each species within each sample area observed. The species observed within each study are were then subjected to the Shannon Weaver formula involving logarithms to calculate biodiversity indices (BI) and species evenness (SE) of each are. Mudflat habitat orgainsms (both flora and fauna) in 3 belt transects each covering an area of 100m² were randomly positioned at 3 tide levels; high (20m – 30m), mid (10m – 20m) and low (0m – 10m) at the start of this study and were not shifted during subsequent sampling sessions. Our study showed that, in analyses of the statistically significant factors by ANOVA (Analysis of Variance) tests performed on data collected during each sampling session and at all 3 levels, there was a significant difference between the biodiversity indices and species evenness of the 3 areas. Through correlation, 2 tests were again significant, showing that 2 of 5 linear ecological characters were significantly correlated with both biodiversity index and species evenness. Multiple regression was used twice to simultaneously compare AT, ST, pH, RH to BI and SE respectively, and results differed significantly between the habitat areas based on tide level (TL) (p <0.05). We hypothesize that in this study, all the five different ecological characteristics of the mudflat organism population at different tide levels will be significantly different due to the sedimentary quality in the substratum such as the presence of minerals and moisture content.</p> <p>In addition, after studying the ways that different factors affect the rate of depletion of the remaining mangrove forests in Singapore (and in turn affect the rate of decrease in biodiversity), our group has decided that because we cannot directly affect abiotic factors (such as the impossibility of adding large quantities of NaOH sodium hydroxide solution to maintain the pH of the mangrove habitat), educating the public, increasing their knowledge about the sorry state of our mangroves, letting people realise the importance of mangrove habitats, and imploring them to change their lifestyle to help conserve mangroves, we can in effect effect a bigger change and reduce or even prevent the depletion of mangrove forests. These creative educational ideas will be detailed further in this report.</p>		
Commendati on Award S\$500.00	Raffles Institution	Eco Adventures!	Jack Tan Jie Ze, Koh Teng Chuan, Benjamin Chin, Dominic Kuek, Mervyn Lim
Project summary	<p>Our project is the creation of an original game-book in which readers can choose how the story progresses and ends. It will be a personal adventure for everyone and along the way, they will learn about environmental issues, the beauty of the ocean, and how their actions will affect the environment around them. Our book is targeted at 10 - 14 year-olds, in hopes of them treasuring and valuing their marine environment. We also attempt to stir up their interest in marine conservation through a captivating storyline, while increasing their knowledge of these marine environmental issues, and hope they will continue to care for the environment even when they grow older.</p> <p>Through this interactive system, the readers will be drawn into the story and more easily retain what is written, including the wonder of the oceans, causes and the some of the solutions pertaining to the most serious of threats to our marine environment.</p>		

	<p>The features of our book include:</p> <ol style="list-style-type: none"> 1. Lively Drawings 2. Compelling Storyline 3. Game 4. Factsheets 5. Educational Value <p>Our system of gameplay as well as a brief overview of how our story would go if the reader makes all the correct choices, are explained in our report.</p> <p>We conducted a trail run prior to the final prototype of our book, by allowing relatives of our target age group of 10 - 14 years old to have a chance to try out our game-book and provide us with constructive suggestions. The main concerns and our actions taken were:</p> <ol style="list-style-type: none"> 1. Too many pages filled with words – Increased number of drawings 2. Certain routes in game found to be able to allow readers to avoid facing the planned environmental problems in the story – Made it more difficult to do so, and implemented some penalties, if these important plotlines were to be sidestepped 3. Some misleading phrasing and words – Modified word usage and phrasing to simplify language. 4. Fundamental errors in language or formatting – Corrected them and did run-throughs to check yet again. 		
<p>Commendati on Award S\$500.00</p>	<p>Hwa Chong Institution</p>	<p>Recycling Vinasse for use as an antifungal agent and plant fertiliser</p>	<p>Cheng Yong Jian, Er Yuan Zhi, Sin Ming Da</p>
<p>Project summary</p>	<p>Vinasse is produced in huge quantities from the brewery industry and if not disposed of properly will cause severe environmental pollution. As recent studies have shown that vinasse possesses antifungal properties and high in organic mineral contents, vinasse has great potential to be recycled for use as a 2-in-1 antifungal agent cum fertilizer for plants.</p> <p>There are 3 phases in our project: Phase 1 – preparation of vinasse extract, Phase 2 – screening the vinasse extract for antifungal activities and lastly Phase 3 – plant growth studies. In Phase 1, vinasse extract was prepared and this was screened for antifungal activities against <i>Phytophthora parasitica</i> and <i>Sclerotinia sclerotium</i> in Phase 2. The optimum inhibitory concentration of vinasse was determined and vinasse extract of this concentration was used for our plant growth studies involving Chinese cabbage.</p> <p>Our results showed that vinasse concentration of 50% (v/v) was most effective in inhibiting the growth of both of the soil fungus <i>Phytophthora parasitica</i> and <i>Sclerotinia sclerotium</i>. We are currently in the process of studying the effect of the vinasse on plant growth. In this phase of our project, plant growth will be determined by the chlorophyll content of the leaves and height of the plants.</p> <p>Findings from our project can provide information to design a method for recycling vinasse and for the creation of an organic antifungal agent that can prevent fungal infections of valuable crops. Results of the plant growth study will serve to indicate the suitability of vinasse for use as a fertilizer.</p>		
<p>Commendati on Award S\$500.00</p>	<p>Seng Kang Secondary School</p>	<p>Project Jatropha@SKSS</p>	<p>Shaik Jifridin, Ng Jiasheng, Gary Sim, Teng Jun Wen, Ng Wei Jie, Lee Xue Ting, Ong Shi Ke, Michelle Eng</p>
<p>Project summary</p>	<p>The Singapore Government has invested \$170 m to boost clean energy research in areas such as solar energy and biofuels. In the area of education, all 5 polytechnics offer courses in clean energy. The challenge is for schools to support and promote the green movement. The Jatropha Project@SKSS is a “green entrepreneurship” project by 8 students under the school’s Science</p>		

	<p>Research Programme, which develops pupils' thinking skills through inter-disciplinary projects that offers practical solutions to real-life problems.</p> <p>The Jatropha Project@SKSS aims to transform communities by providing practical and scalable solutions to environmental problems. It aims to improve the lives of people in rural communities, by providing them with a simple and convenient way to obtain oil from Jatropha seeds and purify it. The farmers can profit by selling the oil and the proceeds can be used to supplement their income and livelihood. Through outreach and education initiatives, we hope to inspire the young about the potential of clean biofuels and to do their part in saving the earth.</p> <p>The Jatropha Project@SKSS is an inter-disciplinary project between Science and Design and Technology (D&T) departments to explore the ecophysiology of the Jatropha plant (grown in the school compound), followed by extraction of oil from its seeds and purification of oil using a process called trans-esterification. The aim is to establish a cost-effective, scalable and practical approach to the growth, extraction and purification of Jatropha.</p> <p>The Jatropha Project@SKSS has two deliverables – products and publications.</p> <p>Products designed by the students are the ME-O (Mechanical Expeller of Oil) and PuJo (Purification of Jatropha oil into biodiesel). The ME-O is an handy device invented to expel oil from seeds through mechanical compression. It can be carried anywhere and used anytime, in all weather conditions as it is made of sturdy materials such as bronze and copper.</p> <p>The PuJo is a experimental kit to convert oil to biodiesel. The fatty acids in oil go through a process called trans-esterification, using chemicals sodium hydroxide and methanol, to produce methyl ester. The mixture of methyl ester and methanol gives better performance compared to oil direct from seeds.</p> <p>A photo-book targeted at children from ages of 7 to 16 is published. This book presents information about harmful effects of fossil fuels and the potential of clean fuels such as biodiesel from Jatropha in a simple and colourful format, to attract young readers. In addition, a total of four educational posters have been produced, two of which explains the workings of the ME-O and PuJo, while the other two shares about the Jatropha plant and its current uses, and the differences between bioethanol and biodiesel.</p>		
<p>Commendation Award S\$500.00</p>	<p>Raffles Girls' School</p>	<p>Rainforests Revisited</p>	<p>Cheng Jingjie, Clarisse Chu, Grace Kong, Low Kay Yi</p>
<p>Project summary</p>	<p>Our current knowledge about the pivotal factors in leading people to adopt and maintain an ecologically-friendly lifestyle is merely infinitesimal. However, recent research published in the Journal of Environmental Systems strongly supports the notion of a strong relationship between intrinsic motivation, personal satisfaction and everyday conservation behaviour. We have decided to use this theory to guide the making of our workbook.</p> <p>Our target audience is primary school students, for an obvious reason – they are our future. Our group's activity book aims to inculcate a love for nature in them, and we believe that this will multiply into positive environmental action on a greater scale. Our youth are the deciding agents of change that will determine the future of our rainforest, so such an education would instill ideal environmental habits in them, ensuring an environmentally friendly Singapore in the years to come.</p> <p>Our workbook will feature and present to students an array of fascinating plants, birds, mammals, reptiles, and even fungi, which they can find locally in their very own rainforests. What is unique about it is that it focuses on conservation in Singapore specifically. We have observed that few people in Singapore realize just how rich our biodiversity is in our backyard, believing in a myth that biodiversity can only be found in the Sumatran rainforests or the Amazon basin. We hope that through process of discovery, they will learn to appreciate nature and have a desire to help her. We strongly believe that environmental conservation should start at home.</p>		
<p>Commendation Award S\$500.00</p>	<p>Tanjong Katong Girls' School</p>	<p>To investigate into the potential of using garden waste compost as a natural source of plant nutrient</p>	<p>Chng Pei Wen, Kwang Su Wen, Low Jun Yu, Sofea Bte Mahad, Rebecca Tan Hui Ying,</p>

		supplement	Eliza Poh Yu Xin, Jacelyn Yam Chin Wei, Tan Hui Ying
Project summary	<p>The increased in standard of living brings about increased waste generation. As a holistic approach towards waste management, biological reprocessing is one of the many methods that one can employ. Biological reprocessing covers many forms of which composting is one of them. Being a garden city, Singapore generates much garden waste that can serves as good candidate for composting.</p> <p>In our project, our primary aim serves to explore into the feasibility of composting garden waste and to use it as a supplement to plant nutrients need. Secondary aim serves to study and explore the feasibility of introducing measures to bring about tapping into composting as a means of waste management in school and parks. The composting of garden waste last about 6 weeks per cycle and physical factors such as temperature and signs of condensation were recorded. Presence of fauna within the compost and around the compost sites are recorded accordingly. The potential of the leachate as a source of nutrients were investigated using plant grown in Nutrient Sollution Agar. Temperature is significantly higher when the compost process in on going and generally the temperature increases before returning back in a cycle of about 10 days, which is close to our topping up of garden waste which was once every two weeks. The leachate was found to stimulate root development and when used in conjunction with nutrient solution, it contributes to better root and shoot development. The compost was able to promote germination of seeds but the nutrient level was inadequate to promote healthy development in the seedling. Merging of findings from our composting process and the nutritional potential of the compost together with the pruning process in our school, plus the observation of garden waste treatment in East Coast Park, we realised that there is much potential in drafting of policy to better manage garden waste reducing cost in disposal of waste yet saving cost by churning out compost as plant growth enhancer. By tapping into scientific findings coupled with sound policy measures, biological reprocessing as a means of holistic waste management certainly has vast potential in Singapore.</p>		
Encouragement Award S\$200.00	Nanyang Girls' High School	Toilet Roll Dispenser	Vanessa Chan Wei Qi, Wong Fang Yi
Project summary	<p>This project is about investigating ways to improve on the toilet roll dispenser that is currently sold in the market. This not only reduces the cost of producing one, it is also more environmentally-friendly than the automatic dispenser as it's main energy source is not electrical energy, but rather, chemical potential energy. The main reason as to why we were insistent on making the toilet roll dispenser semi-manual was to reduce the harm brought about because of the use of electricity. As quoted from Thin-quest library, "the production of electricity contributes to global warming since greenhouse gases are released every time it is used". Moreover, as compared to the manual toilet roll dispensers, this semi-automatic dispenser would be more convenient.</p> <p>To do so, research was done on the current toilet roll dispensers before deciding to make use of elastic potential energy, magnetic energy and chemical potential energy by using rubber-bands, magnets, springs, pulleys, levers and gears in our repective ideas. After a total of 6 ideas, we started making our prototype, using the trial and error method to find the most suitable type of system the toilet roll dispenser should use.</p> <p>After much improvement on the final prototype, it was completed. A toy dial, taken from a toy phone; and the gears from a hand-powered torch, as they were one-directional, were used. It is essential that the toilet roll dispenser is one-directional so that the toilet-roll will not roll back when the lever returns to its original position. The final prototype we made worked.</p> <p>In our opinion, reducing the amount of tissue paper students can take every time the lever is turned will inevitably reduce the amount of paper wastage generated by the school annually. With that, less land will be turned into land-fields, which allows for more space for other activities, instead of reclaiming more land. Furthermore, fewer trees will be removed in order to provide for the demand for toilet paper. This would in turn save the environment.</p> <p>Thus, we conclude that our prototype is beneficial to humans and to the environment at the same time.</p>		

Encouragement Award S\$200.00	Commonwealth Secondary School	Rejuvenation of Marsh Garden at West Coast Park	Koh Ming Guang, Samuel Ang Ding Xiang, Tim Ye Ling, Ng Qing Yi, Boo Kwok Ying, Justin Japit, Ernest Tay Jun Jie															
Project summary	<p>Rejuvenation of Marsh Garden is a collaboration project between Commonwealth Secondary School and West Coast Park. This collaboration project is a long term project that will last about 4 – 5 years. This collaboration project is supported by Shell which provides the funding for this whole project. In other words, this provides opportunities for synergistic partnership between our school and different partners mainly Shells and NParks. Besides funding, Shell also provides volunteers that will work closely with our pupils in many programmes held at West Coast Park.</p> <p>Through this project, the partners will provide our pupils with their authentic experience, expertise in their various fields, concepts beyond the pupils' normal school curriculum as they share with the pupils. At the same time, with the knowledge and passion of the partners, this will better engage the pupils, indirectly enrich students' learning, hence providing a education for the pupils.</p> <p>This project comprises of a total of 3 phases which align closely to our school philosophy : Head, Hand and Heart.</p> <table border="1" data-bbox="537 741 1143 894"> <thead> <tr> <th>Phase I</th> <th>Phase II</th> <th>Phase III</th> </tr> </thead> <tbody> <tr> <td>Site Visit</td> <td>Planting</td> <td>Paint a shelter</td> </tr> <tr> <td>Workshop</td> <td>Mapping</td> <td>Eco-Amazing Trail</td> </tr> <tr> <td>Research</td> <td>Monitoring</td> <td></td> </tr> <tr> <td>Head</td> <td>Hand</td> <td>Heart</td> </tr> </tbody> </table> <p>Our school believes that total learning will only takes place when students think, do and internalize when touching their hearts.</p> <p>We hope that through the various green activities, as they share with the community and contributing back to the society, the pupils will develop their sense of fulfillment, compassion and commitment towards the environment. Hence touching their hearts.</p>			Phase I	Phase II	Phase III	Site Visit	Planting	Paint a shelter	Workshop	Mapping	Eco-Amazing Trail	Research	Monitoring		Head	Hand	Heart
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Prizes	School	Title of Project	Participants
2 nd Prize S\$5,000.00	ITE College West (Dover Campus)	Conservation and repopulation of fiddler crab for improving the quality of sands at shorelines	Poh Taiwen, Teo Jun Hao, Yeo Wei Sheng, Millicent Chew Zhi Jie
Project summary	<p>Our team had decided to choose this marine project for reasons that we were excited and inspired by articles appeared in several US websites describing these small fiddler crabs playing an important part in cleaning up many parts of the shorelines, especially mentioned was Florida. The main reason is that fiddler crabs constantly sifting sands for food, feeding on organic matters (microscopic, algae and bacteria) that they find. Therefore the natural cleaning of sands was possible in the long term due to this type of eating habits, that helps keep Florida's coasts clean. They are known as the 'beach cleaners of the world' as claimed by some experts.</p> <p>From our site survey at the local river shorelines during low tide period, we witnessed the true bad taste condition commonly found at many of these shore lines. The sands quality appears dark, and most areas can be spotted with thick layers of muds, there was also some stretches of areas with unpleasant odour. Any visible sign of marine life can be hardly spotted.</p> <p>We decided to construct a prototype incubator to repopulate the fiddler crabs to save the existing ones from extinction in Singapore. After successful breeding, the offsprings can be released back into shorelines to let them further improve quality of sands.</p> <p>The primary purpose of this project is to repopulate the fiddler crabs which are found in declining numbers at our coastal areas. A near-to-nature environment incubator was constructed by applying of</p>		

	<p>programmable electromechanical and automation skills and knowledge. The incubator serves to repopulate the fiddler crabs in large quantities than what would be less in the nature.</p> <p>In the process, we would also investigate the various stages of life cycles of the fiddler crabs and their adaptability in our prototype incubator. From here, we adjust and improve the incubator design and seek the best methods and practical solutions in upgrading breeding design and process.</p>		
3 rd Prize S\$3,000.00	ITE College Central (Tampines Campus)	Wide angled energy saving LED Lighting System	Alan Yeo Jun Xiong, Ng Rei Kun
Project summary	<p>The project is the development of energy saving lighting system utilising arrays of super bright light emitting diodes (LEDs). As LED consumes less power and has dimmable possibility, great saving in electrical energy can be achieved. Through use of pulse width modulation in the system, the LEDs can be dimmed to suit the ambient light condition, and hence reducing energy further. As long ranging LEDs are highly directional in lighting, wider area brightness coverage can be made possible by creative alignments of these LEDs, and ensuring further optimizing of resources.</p> <p>The approach was to reduce the unnecessary wastage of energy from rigid or inefficient electrical power conversion to visible light. A few of this rigid conversion in current lighting product has been identified and targeted for solution/improvement. They were:-</p> <ul style="list-style-type: none"> - a simple on / off lighting regardless of environmental brightness - human interaction to lower luminance level to suit desire lighting condition - only a single light source or tube, non-multiple in nature - multiple light source but non-selectable - energy loss from wasteful conversion to heat (unnecessary loss) - insufficient are coverage, thus, requiring more light sources <p>Based on the above factors, the product solution, S-ENERGY LEDmino', was developed. It catered to all the problems faced above.</p> <p>S-ENERGY LEDmino' comes with a control switch unit, main control unit and light panel consisting of 3 LED clusters. This LED system is powered through the normal mains supply.</p> <p>The prototype was developed using LEDs as the main light source. Besides well-known benefits of using LED as lighting element, another advantage of it is the ability of pulsing it electrically to adjust its brightness. This feature was fully explored bad implemented.</p> <p>Instead of having rigid on / off lighting of the area, dimming control was designed into S-ENERGY LEDmino' to save unnecessary energy. Dimming possibility allows the user to adjust the light to suit the desired environmental brightness at that point of time and preference. The area will not be too brightly lighted up wasting unnecessary power and also heating up the region. The eyesight of the user can be protected with less glare occurring.</p>		
3 rd Prize S\$3,000.00	Hwa Chong Institution (College)	Singapore Environmental e-book discovery (SEED)	Cao ZheHou, Cai Yong, Remus Tan Wei Jie, Tan Wen Shan
Project summary	<p>Inspired by the "teach less learn more" concept, we realised that students will best be able to absorb knowledge that they have discovered for themselves.</p> <p>Our group hence proposes the Singapore Environment E-book Discovery (SEED) as the solution to this problem. SEED is essentially a competition whereby students have to create a learning package, in the form of an e-book, to spread environmental awareness among their peers.</p> <p>Upper primary students are our target audiences of our project, seeing as they have reached a level of maturity necessary for environment education, yet are still relatively impressionable, such that we can instill the correct mindset with regards to green issues.</p> <p>As previously mentioned, students will best be able to assimilate and apply the knowledge through this project, reaping enormous benefit from the process of discovery. Therefore, needless to say, they will have heightened environmental knowledge and environmental awareness.</p>		

	<p>Furthermore, the resource packages created by students can be used by the schools and teachers to better teach environmental awareness - since the content was created by Primary School students, it will definitely be at an appropriate level of difficulty, and the information will be organised in a way that students can relate to. This hence leads to a multiplier effect, whereby the material created by students through this competition can further propagate our cause in the form of education material.</p> <p>Moreover, participants also stand to pick up IT and research skills. To create the e-books for this competition, students need to be able to research the information, and weave them together into a coherent resource package, while integrating interactive media into their work. Therefore, SEED would be a perfect avenue for them to pick up these skills, which are, undeniably, crucial skills in today's world.</p> <p>Our team will facilitate this learning journey by providing training as well as the logistical necessities of the competition, particularly through the establishment of a web portal, liaison among schools, and engagement of authorities such as the National Environment Agency to further enrich the experience.</p> <p>To sum it up, SEED is about the students embarking on a journey of discovery, which is, really, the best way to learn, and pick up environmental awareness and knowledge. Our project aims to facilitate this process, and hence help to increase the environmental awareness of our fellow citizens in the long run.</p>		
Merit Award S\$1,000.00	ITE College East	Bio-degradable detergent (BioClean)	Chua Chun Yong, Cameron Walsh, Pereira Teresa Roderica, Tan Bee Guat, Desmond Khoo Chin Chung, Lee Yan Ping, Por Wei Ting
Project summary	<p>This is a main project undertaken by Environment Club in 2009. Club members are given a challenge of searching for a long term and sustainable idea or product to contribute to the 3R (Reduce, Reuse, Recycle) movement.</p> <p>Presently there are not many products or services in the market that are environmentally friendly. Our aim is to create a product or service that the public will buy and consume, thus providing them, especially those environmentally conscious people, a mean to contribute to environment conservation.</p> <p>Our solution is BioClean. BioClean is a cleaning detergent made of enzyme produced from fruit waste. We chose detergent amongst other proposed products because it is a necessity and a product which every household would use regularly. Our survey showed that there is no bio-degradable or enzyme washing/cleaning detergent in supermarkets such as FairPrice and Shop N Save. We therefore are confident of our selection of BioClean is right.</p> <p>The project consists of 2 parts: Production and Marketing. Students major in Chemical Technology cover the production and experimentation. They are responsible for 'inventing' the detergent and develop a scientific production process. Students from Business School are mainly responsible for the packaging and marketing of the end product.</p> <p>One special characteristic of project BioClean is that it is an on-going real business. We believe we should bring our words on papers to life, providing a real solution to our environment woes.</p> <p>The principle guideline and philosophy for our project is not only the product we are going to create is environmentally friendly, it must be user-friendly and market-friendly, meaning it must be a product people would use and affordable.</p> <p>In conclusion, project BioClean is a very meaning venture that not only helps us to reuse and turn waste into something useful, it also helps to reduce global warming and provide economic return. We have learned a lot from this project in terms of science and business knowledge.</p>		
Merit Award S\$1,000.00	ITE College West (Balestier Campus)	Zero power HP battery charger	Tang Zhi Yang, Jiang KaiGuang, Teo Jia Hao

Project summary	<p>Currently, when charging the handphoned or MP3 players with a battery charger, the charging current will initially be high when the battery condition is weak (low). However, as the battery is fully charged, the charging current will drop to a reasonably low value, but the charger still draws a small power from the AC power source. The battery chargers sold in the market do not disconnect the power source automatically when fully charged. This is not energy efficient.</p> <p>Our project aims to design a gadget attached to the battery charger to overcome this limitation. The device senses the charging current continuously and when the battery is fully charged, the device will cut off the power supply to the battery charger automatically.</p> <p>In this way, the user is able to conserve energy and save cost. This will also help to eliminate the danger of explosions or fires, resulting from overcharging the battery.</p> <p>The key feature of this project is that once the battery is fully charged, the AC power supply is totally disconnected from the device, including the supply to electronic control circuit, i.e. effectively no electrical energy is consumed (true zero power device).</p> <p>The gadget can also be used in other applications where the monitoring or control of charging current conditions is required.</p>		
Commendation Award S\$500.00	Anderson Junior College	Egg Shell Membrane Purification System	Sunshine Huang Ruizhi, Pramesh s/o Prabakaran, Terence Teoh, Joleen Chan, Ng Ang Hui, Tan Sze Gee, Joyce Ng Hui Shuen, Ong Yun Qi
Project summary	<p>Our group aims to create an ideal and efficient water purification system that can produce clean water through simple means and is long-lasting. We decide to make this purification system using raw materials such as eggshell membrane, which are cheap and most importantly, environmentally friendly.</p> <p>The eggshell membrane (ESM) and peat combination is our chosen combination as both exhibited ideal surface properties, which make them suitable adsorbents. Essentially, unclean grey water is made to flow through the packed column of ESM and peat. In order to find the optimum ratio of ESM and peat needed for maximum efficiency, we investigated the different absorbance level of the filtered grey water after passing through the filter. This is achievable by utilising the UV spectrometer. Thus, we found out that the optimum ratio concentration (the main component in household cleaning products) decreased by approximately 25 % with a run time of around thirty minutes. Thus this water can be reused for other household applications, i.e. to clean the toilet and car washing, thereby decreasing the total household water consumption.</p> <p>There are two main aims of our project. The first is to reduce the domestic and possibly industrial water usage by treating the contaminated water and 'reusing' this water for other purposes by creating a cheap packed column that will be largely available to the masses.</p> <p>The second is to spread the message of household grey water recycling to the public. Household grey water recycling is a relatively novel idea in Singapore. Currently, the only recycled water in Singapore is the NEWater, which is mainly the recycling of industrial sewage water. Thus there is market loophole for domestic greywater recycling to further maximize water resources. Thus, if this idea works, the low material cost and simple production process will enable the people to conduit to an additional water supply.</p>		
Encouragement Award S\$200.00	ITE College East	Green Bank	Eric Chia Wee Guang, Dorina Cai Yu Ting, Lee Yi Xiang, Pereira Teresa Roderica, Ricson Tan Jia Hao, Joseph Bok De'en
Project summary	<p>We started out from reading a news article in The Straits Times about the abuses the existing recycling bins suffered in public places in Singapore. The picture of overflowed recycling bins showing all kinds of rubbish filling to its brim saddened us.</p>		

	<p>Our further investigation and research show that amongst the group of economically advanced countries such as Europe and Japan, we score quite low in recycling especially in plastic bottles and aluminum cans. The existing recycling bins and the mode of operation are clearly not effective. While the awareness of the benefits of recycling is quite high in Singapore, the public in general not supportive to recycling when it comes to action.</p> <p>Our solution is a 2-in-1 recycling machine named Greenie that can compress plastic bottles and aluminum cans. To overcome the monotony and lack of pull factors of existing recycling bins in the market, we decided to use modern technology and innovative marketing strategy to help us make a new generation of recycling bin that will attract the users. With this objective in mind, the concept of Greenie is born.</p> <p>Greenie is a recycling bin equipped with an interactive touch-screen monitor that would allow people to form teams to compete amongst each others. "Green Points" will be credited to team with each recycled items. Winners will be rewarded by prizes sponsored by corporations. When the machine is idle, the touch-screen monitor will double up as a TV monitor, broadcasting video clips such as cartoons or commercial or advertising messages etc to attract people.</p> <p>With this interactive feature that combined the use of technology and innovative marketing twist, Greenie has created quite a buzz since it was launched in April 2009. From the feedback we received from students and teachers from primary and secondary, we are happy that Greenie is well received and well liked by them. Positive comments we received from private sector further confirms the value and success of Greenie.</p>		
Encouragement Award S\$200.00	Raffles Institution	Mr Can	Tay Wee Kuang, Lee Qian Yi, Jasper Chan Wei Tang, Chan De Sheng, Lim Yi Ting
Project summary	<p>Coined as 'Mr. Can', our project aims to breed the 'can do' attitude in the public with regard to environmental conservation in Singapore. Incorporating various projects that partners governmental organisations like NEA and PAYM, we will reach our objectives via 3 approaches known as the 3E, "Educate, Empower and Effectuate", equipping the public with knowledge to conserve our environment and allowing them to understand that we 'can' play a part for our environment and eventually, such an attitude will cultivate the spirit and willingness to conserve our environment.</p> <p>A programme set to revolve around the objective of encouraging individual effort, Mr. Can achieved an estimated outreach to 5,000 households and 10,000 youths through a myriad of creative events. With the help of various community and educational establishments, Mr. Can attained commendable outreach in education and direct conservation and received favourable feedback from many of the participants who benefitted from the programme in one way or another. As a sustainable project, our team is ready to continue promote the "Can Do" spirit among Singaporeans and bring personal effort in environmental protection to even greater heights.</p>		
Encouragement Award \$200.00	Hwa Chong Institution (College)	The eco-room concept (TERC)	Eugene Lee Ying Mao, Tan Wei Jie
Project summary	<p>Rising global energy prices and the scarce availability of energy sources are growing concerns in today's society. Despite measures and campaigns to reduce our reliance on energy for work, energy demand remains high. Since attempts to reduce demand remains futile, TERC will look into how modern buildings can be conceptualised to maximise energy efficiency. Along with a stylistic approach towards addressing this issue, TERC will investigate concerns over light retention, ventilation, and suitable surfacing materials. In doing so, we shall propose a model for future constructions.</p>		
Encouragement Award S\$200.00	ITE College Central (Yishun Campus)	Solar powered fan for parked vehicle	Noorina Begum Bt Abdul Ghafur, Siti Naquiah Bte Dali, Nang Shwe Yin
Project summary	<p>Car parked in the open space parking lot were constantly exposed to the hot Sun ray especially during the period from 12 noon to 5 pm in the afternoon. The internal cabin temperature of these cars was usually much hotter than the surrounding open space due to air inside the car cabin trapped heat.</p>		

	<p>In this project, we harnessed the Sun energy to drive an exhaust fan automatically so that the internal car cabin would not trap heat during hot weather. The project made use of solar cell and a solar charger to charge a series of rechargeable battery. The solar cell also functioned as a heat sensor to turn on the fan when sufficient voltage had built up by the Sun energy. The rechargeable battery served as mean to store solar energy for other applications such as night lighting for reading purpose or emergency.</p> <p>Low power high luminance LEDs were used for the lighting as they consumed minimal power and would not emit heat or caused fire hazard when turned on. Low current solid-state relays were used in the design to conserve energy for longer operation. A DC inlet jet was included in this project to allow the rechargeable battery be charged directly from the car battery during rainy day or night driving.</p> <p>This project allowed the car to be cooled by clean energy and the stored solar energy in the rechargeable battery provides zero cost lighting for the user in the night.</p>		
Encouragement Award \$200.00	ITE College West (Dover Campus)	SMS Alert - Automated Gardening Kit	Syed Baktiar Bin Syed Sallim Shahab, Zulkarnain Bin Ismail, Muhammad Khairi Bin Abdul Rashid
Project summary	<p>This Automated Gardening Kit (AGK) has all the items to build your own water garden feature, including fountain, batteries, pot and liner.</p> <p>The AGK is just the thing to build your dreams right in the comfort of your own yard, a meditative center that fills the environment with peace and tranquility; replenishing lost energies. AGK is able to pump water that suits your plant size and its needs. Keeping your plants well hydrated through the day. Beside the customise timing for the water pump, the water garden kit has a special pot for your plants, in which if you set the water pump to pump in too much water, the excess water will flow back to the tank which in turn save water.</p> <p>It will also be able to interact with its owner. When the water level falls below its normal water level in the tank, it sends a SMS to the owner to alert him that the water level has fallen to its danger red zone within the next few days. Once the owner is alerted, they can refill water in the tank and let the AGK ensure that the plants are well taken care off without any risk of water wastage or mosquitoes breeding etc.</p> <p>Aside from the decoration on it top, this project aims to eliminate the breeding of mosquitoes, which can cause Dengue fever, malaria etc, and to create a trouble free watering plants system. Thus we can ensure that the environment is not contaminated in any way from this particular project.</p>		
Encouragement Award S\$200.00	ITE College East	Detoxification of heavy metal water pollution using marine sponges	Michelle Ong Shi Ning, Lim Kwei Hoon, Eileen Chu Niao Ling, Chong Wan Ling
Project summary	<p>With the increase in human and industrial activities, results in the increased water pollution released to the rivers and coastal environment. Heavy metals are one of the common pollutants introduced to the seas, among which mercury, silver and copper are the most toxic. Research on marine sponges Haliclona sp. (Order: Halichondrida) has indicated that they have potential to be used as bio-indicators for heavy metal pollution. Sponges prove to be potentially better bio-indicators because they possess no internal organs specifically designed for filtering large volumes of water. Therefore this project will focus on the efficiency on the marine sponges to absorb the chemical pollutant such as silver, copper and cadmium through a special design of filtration. And also the possible effect on the marine sponges with elevated concentration of the pollutants.</p>		

(D) TERTIARY LEVEL

Prizes	School	Title of Project	Participants
1st Prize S\$10,000.00	Temasek Polytechnic	Use of recycled plastics in building materials	Jonas Png, Dong Jie, Muhammad, Haiqal B

			Mohamed I, Yeo Zhi Yuan, Shamini d/o R Manogaran, Sheik Abdul Hafidz B Sheik A H, Teo Soo Fang
Project summary	<p>(1) This report describes the work and findings of the student project entitled "Use of Recycled Plastics in Building Materials" submitted for the Green Wave Environmental Care Competition 2009.</p> <p>(2) This project utilizes recycled plastics as partial replacement of aggregate ingredients in building blocks for infrastructure, green building and protective structure applications.</p> <p>(3) Particular focuses on the construction of a permeable interlocking pavement system for infrastructure application.</p> <p>(4) The innovation and uniqueness of this project include:</p> <ul style="list-style-type: none"> ▪ A viable technology to reuse large volumes of plastics waste with varying physical and chemical compositions in Singapore and worldwide. ▪ Capitalizing on the advantages of recycled plastics which provide the building materials with enhanced physical and mechanical properties compared to conventional construction materials. ▪ Utilizing a simple production method to fabricate building blocks. ▪ Ensuring chemical inertness and environmental safety through stabilization and solidification of recycled wastes within the building blocks. <p>(5) The report is divided into three sections, namely;</p> <ul style="list-style-type: none"> ▪ Part 1: Testing and Selection of Materials ▪ Part 2: Development of Prototype ▪ Part 3: Applications <p><u>Part 1: Testing and Selection of Materials</u></p> <p>(6) The experimental results based on physical properties (mixture homogeneity, hardened density, water absorption), mechanical behaviour (compressive and flexural strengths, modulus of toughness) as well as cost consideration were used as a basis for the development of prototype in the form of a permeable interlocking pavement system in Part 2.</p> <p>(7) Mixtures P8, P2, P7 and P3 are most cost-effective due to the low price of recycled plastics used in these mixtures; whereas P4 and P6 are not economically viable due to the high cost of silica fume (SF) in these mixtures. The use of blast-furnace slag (BFS) in mixture P5 did little to improve the physical and mechanical properties of concrete with recycled plastics, and mixture P1 was too brittle and prone to cracking.</p> <p><u>Part 2: Development of Prototype</u></p> <p>(8) The use of recycled plastics to develop and construct prototype for a permeable interlocking pavement system had been successfully implemented. Design considerations were based on pavement material, pavement type and pavement layout as follows:</p> <ul style="list-style-type: none"> ▪ Pavement block ▪ Filled joints ▪ Bedding course ▪ Base material ▪ Geotextile ▪ Pavement type ▪ Pavement layout 		

	<p>(9) A simple production method using a block-making equipment had been successfully employed to fabricate and mass-produce building blocks of different shapes and sizes incorporating recycled plastics for infrastructure, green building and protective structure applications.</p> <p><u>Part 3: Applications</u></p> <p>(10) The originality and innovation as well as the relevance, impact and sustainability of the permeable interlocking pavement system (developed and constructed as a prototype in Part 2) were discussed, and the potential use of recycled plastics for other applications in building materials were explored.</p>		
<p>2nd Prize S\$6,000.00</p>	<p>National University of Singapore</p>	<p>Eco mushroom cultivation</p>	<p>Goh ZhiQian</p>
<p>Project summary</p>	<p>Beverage industries based in Singapore generate large quantities of organic waste. Local beer breweries generate approximately 15,500 tonnes of spent beer grains (SBG) annually which are wastefully incinerated or delivered to local or overseas farms to be used as animal feed. The high moisture content of the beer spent grains requires additional precious and limited fossil fuels in order for complete incineration to take place. This further contributes to the large carbon footprint that Singapore already possesses. Using the SBG as animal feed is also not an optimal use as they are high in lignocellulose, which are tough for animals to digest. A more environmentally sustainable method to handle the large amount of nutrient rich BSG is missing in the sustainable waste management equation of BSG in Singapore.</p> <p>In recent years, an increasing market demand for fresh mushrooms in Singapore has been observed. The steady increase in the amount of fresh mushrooms imported into Singapore highlights the inability of the local mushroom supplier to meet consumer demands. Moreover, the limited variety of locally produced mushrooms has resulted in imports of 8 out of 10 varieties of mushrooms found in a typical supermarket.</p> <p>The increased awareness of medicinal and health benefits of eating mushrooms resulted in imports of more than 90% of fresh and chilled mushrooms demands for fiscal year 2007. With barely less than 10% of mushroom demand supplied by the single local mushroom producer, there is a huge deficit in the local mushroom supply. The import of up to 90% of our still growing mushroom demand means that mushrooms have to be flown in daily, contributing to increased carbon dioxide emissions into our atmosphere. Famous as a Greenhouse Gas (GHG), carbon dioxide is contributing to intense climate change in different parts of the world. There is a need to increase local mushroom supplies with a methodology that imparts a low carbon footprint.</p> <p>Blessed with 4 national taps and good water management practices, Singapore does not have to worry about problems of water scarcity till date. However, up to 1.2 billion continue to face water scarcity each day (WHO, 2009). What many Singaporeans are unaware of is that we owe virtual water debts to countries from which we import foods high in water content. In Ecological Economics, the import or export of foods which carry a high water content has been discussed under the terminology of 'virtual water'. Comprised up to 80% of water by weight, mushrooms thrive in humid environments and uptakes a high volume of water during growth. An increase in the import of mushrooms (ie. Virtual water) into Singapore is made at the expense of the availability of drinking water to the poor in developing countries, since precious water used for irrigation purposes yields higher economic benefits. As a result, developing countries with strong agricultural sectors continue to face simple problems such as shortage of clean drinking water. An alternative way to meet local mushroom demands without incurring an increasing virtual water debt that translates into drinking water scarcity problems in other countries is required.</p> <p>Mushroom farming is also a fertilizer intensive form of agriculture as soil nutrients have to be constantly replenished to support the highly intensive form of agriculture required to meet the burgeoning world demand for food. This is a function of both increasing world population and increased affluence resulting in greater affordability for food. Fertilizers comprise Nitrogen (N), Phosphorous (P) and Potassium (K) which are vital to the growth of most agricultural crops, however, there has been a decrease in the worldwide supply of NPK (Scheer, 1999). This signals the need for new environmentally friendly agricultural practices that can ensure a high level of soil fertility while</p>		

	<p>meeting the growing world demand for food and avoid further depletion of global NPK supplies.</p> <p>Eco Mushroom Cultivation will deliver an unprecedented solution to meet the burgeoning mushroom demand in Singapore. Environmental sustainability is achieved either through the local practice or through the export of this environmentally friendly methodology of mushroom production. Eco Mushroom Cultivation promises reduced negative environmental impacts and would impart a low carbon footprint, thus reducing Singapore's contribution towards Global Warming and Climate Change; reduce our import of virtual water that comes at the expense of water scarcity in other countries; to offer a simple solution to close the global nutrient loop without further depleting global NPK supplies; to inject a revenue-generating step into the conventional waste management of organic outputs from the Singapore beer brewing industry.</p> <p>Most importantly, Eco Mushroom Cultivation is not just an environmentally sustainable mushroom farming practice. Based on the principles of sustainability, it is the embodiment of sustainable planning being translated into practice. A cocktail of creative thinking and small efforts to modify conventional ways of operation is all it takes to reduce the negative externalities that Singapore imposes on our environment and on people of other countries. Eco Mushroom Cultivation is proud to demonstrate that sustainability principles can be incorporated into every sector of the economy, so as to inspire other sectors of the economy to think sustainably in (re-)designing the life cycle of their processes. Eco Mushroom Cultivation also clearly illustrates the inversely proportionate environmental and revenue benefits that can be reaped from just small efforts invested into being a responsible global environmental citizen.</p>		
3 rd Prize S\$4,000.00	Temasek Polytechnic	Refuse chute inspection robot	Zheng Hanyang, Wee Tuck Wei, Ang Ding Chang, Rosie Ng Ying Ying, Fawn Christal Lim Mei Yin, Ishyam Lal Abdul Jalal, Muhammad Farhan B Burhanuddin, Mohamad Rizal Bin Mohamad, Nurhidayat Bin Suhaimi, Dickson Yeo Zi Rong, Cheong Teck Choon
Project summary	<p>Vertical chutes of high-rise buildings are essential in collecting garbage. It is dangerous and difficult to clean, inspect and disinfect the internal area of these rubbish chutes. Regular cleaning or disinfecting of the vertical rubbish chute is a necessity to avoid diseases and foul smell.</p> <p>The objectives of this project are to investigate the danger of the existing method to human and the environment, determine the pitfall, and recommend an effective solution in cleaning, inspecting and disinfecting the internal area of the rubbish chute. One of the possible solutions to do the dangerous tasks is to introduce a robot.</p> <p>We designed, constructed and developed a Chute Inspection Robot (IR) that can enter the dangerous area of the refuse chute and able to do the tasks of cleaning, disinfecting and inspection. The main features of the CIR are the modular system for cleaning, inspecting and disinfecting. The CIR has a built in camera for inspection that can be attached and detached to the robot. The camera rotates 360 degrees with night vision feature. A modular cleaning system with pressurized water can be also attached and detached to the CIR for cleaning. A modular chemical spraying system for disinfecting the internal area of the refuse chute is also available. Four extendable and retractable arms are incorporated in the CIR to stabilize the position and the vertical movement of the robot. The CIR can be controlled from a remote control panel. In this project, no human being enters the rubbish chute hence; injuries, health hazard and casualties will be avoided. As the CIR enters the rubbish chute to clean and disinfect, there would be a close proximity with the surface leading to an economical and environmental-friendly system. Hence the system can be used as an instrument for further research in solving some problems of household pests, repairs of internal wall cracks and use as data logger.</p>		
3 rd Prize S\$4,000.00	Singapore Polytechnic	Salvaging energy along the expressway	Jason Lee Jia Sheng, Loh Mei Qi, Glenda Chin Ying
Project summary	<p>The objective of the project is to inform the public about salvaging energy along the expressway and to promote conservation of energy. It makes use of the drag force produced by the moving vehicles along the expressway to rotate the turbine so as to create electrical energy. With this conversion of</p>		

	<p>energy, the product is able to make use of the amount of energy to light up the LED circuit sign board where it is very expensive or not practical to lay new electrical cables for power supply.</p> <p>Basically, the Power Turbo Saver consist of two parts, the LED circuit board and the wind turbine kit. Under the wind turbine kit, it consists of two anti-clockwise and clockwise directional turbines, a small turbine and a generator attached to the kit. One spin of the main turbine is equivalent to four spins of the small turbine that is attached to the generator.</p> <p>The LED circuit board consists of nine super bright LED lights which is around 10 volts and resistors. The LED circuit board is placed in a wooden box with acrylic base and it is covered with a transparent slip to enhance the intensity of the LED lights.</p> <p>The Power Turbo Saver has been tested on the arterial roads and the expressway. With the speed of 10m/s, the generator can produce around 15 volts and 0.1 amperes. From the test results that we obtained along the expressway, there is an average traffic flow of 1858 vehicles per hour. The average wind speed calculated in the expressway is 3.93 m/s.</p> <p>There are several uses of the Power Turbo Saver, besides using it for electronic road signs. One such use is as a wind monitoring device. The power and the energy generated by the Power Turbo Saver are able to send out warning signals and data to control stations if any major disaster such as tornado or hurricane occurs. Hence, it is able to alert the public of any imminent danger. The Power Turbo Saver has many advantages such as it is an environmentally friendly product. It uses LED lights instead of fluorescent tubes which cause harmful effects to the environment. It is also marketable and easy to maintain as it is both lightweight and portable. The turbines can be easily detached from its main stand and the material of the turbine and the turbine kit is made of plastic and stainless steel respectively.</p>		
<p>Special Merit Award S\$2,000.00</p>	<p>Singapore Polytechnic</p>	<p>Studies into the extraction of proteins from moringa oleifera</p>	<p>Tham Ai Lin, George Thng Yew Hock, Muhamad Noor bin Muhamad Hussian, Shih Yu Chen</p>
<p>Project summary</p>	<p>Potable water for third world economies is a project that aims to allow easier access the clean and drinkable water for people living in areas where drinkable water are scarce.</p> <p>This project is part of an overall project that utilizes both physical and chemical aspect of water treatment. Physical treatment involves the use of mechanical filter inclusive of various media that aid in the removal of suspended particulates at the same time increasing the clarity of the water. The second stage of treatment, which is the primary aim of this present investigation, involves the use of a plant derivative with a property known to cause coagulation of micro particles and remove other impurities. After treatment of filtered water increases its suitability for consumption; based on international water standards from the world health organization (WHO) and the public utilities board (PUB). In addition to water treatment, the excess filtrate from the mechanical filter is reused, acting as a pond filter system, removing impurities that affect the well being of the reared fish. Collected residues, consisting of mainly carbon and nitrate compounds are in turn recycled; making useful fertilizers for plants.</p> <p>Moringa Oleifera is a plant available in many countries across the globe. Its hardy nature makes it easy to plant and grow. Sections of the plants, from the seeds to the leaves have been used as both food sources for the poor in rural areas as well as a natural remedy for various ailments. One outstanding property of this plant is its seed's contains proteins with coagulating properties.</p>		
<p>Special Merit Award S\$2,000.00</p>	<p>Singapore Polytechnic</p>	<p>Mobility vertical greening</p>	<p>Stefan Tan Jin Yang</p>
<p>Project summary</p>	<p>Think of sliding doors and panel systems. A typical sliding panel component consists of the frame, mullion and transom rails and possibly intermediate rails, supporting the selected panel material being used. Moreover the select panel materials are generally metal, glass, timber, plastics and etc.</p> <p>This project prototype takes on step further and re-analyses the thoughts and usage of a sliding green wall system in place of the traditional panel materials mentioned of a cladding system. In other</p>		

	<p>words, plantation – As an alternative to panels and screens.</p> <p>The modification first came to mind when the similar buildings were noticed in Singapore. These residential projects and housing developments with high floor-to-floor height glass windows came equipped with external sliding screen system to reduce sunlight, and heat gains to aid facades with large windows. During the course of study the greenwall system was proved to be a new feature constructed on the wall of a structure to reduce room temperatures, to keep cool due the growth of plants. The greenwall system is one strategy to improve environmental soundness of buildings and its contribution to greenmark, Singapore. This idea was brought forward to the sliding screen panel as displayed.</p> <p>Sizing of this system varies with the façade design of the building.</p> <p>The Green Mark for Buildings is developed to promote sustainable development for the construction industry and raise environmental awareness among developers, designers and contractors when they start project conceptualisation and design, as well as during construction.</p> <p>A bold initiative to move Singapore's building and construction industry towards environment-friendly buildings and help strengthen Singapore's position as a global city committed to balancing its development with care for the environment.</p>		
<p>Encouragement Award S\$200.00</p>	<p>Singapore Polytechnic</p>	<p>An environmentally friendly system to handle waste recovery</p>	<p>Tang Poh Ling, Tai Zhang Hao, Gerry Neo Shun De, Tan Wei Zhen</p>
<p>Project summary</p>	<p>The project investigates the use of human waste produced by Autothermal Thermophilic Aerobic Digestion.</p> <p>In this project, we have designed and built a 2 stage digester to handle toilet waste from a holiday camp site. The toilets are used by secondary school students attending training camps organised by Adam Khoo.</p> <p>Our two stage design cuts down energy requirements by minimising aeration, and at the same time generating useful methane gas.</p> <p>We also carried out testing on the manure we produce through cultivating alfalfa plants. Unfortunately, we did not do an uptake analysis due to a lack of time and analytical equipment. However, from the comparative studies we did with standard manure obtained commercially, showed that our samples performed reasonably well generally and significantly better in other circumstances.</p> <p>The outcome of our work here may potentially affect the way our country handle sanitation and waste disposal. Hopefully more research can be done in this area to further our understanding on the age old waste disposal methods, and hence creating a better future for future generations.</p>		
<p>Encouragement Award S\$200.00</p>	<p>Ngee Ann Polytechnic</p>	<p>Wave-driven beacon prototype</p>	<p>Gan Jia Hao, Tan Han Bin, Su Sze Leng, Teo Li Heng, Liu Enshao, Thein Myint Win Tun</p>
<p>Project summary</p>	<p>This is a design-and-build project that converts wave energy to usable energy for sustained powering of a beacon. It requires the integration of offshore engineering, mechanical and electromagnetic designs.</p> <p>The design concept hopes to demonstrate and propagate the idea of harnessing and storing wave energy for sustained powering of marine applications in Singapore coastal waters.</p> <p>The Wave-Driven Beacon (WDB) prototype demonstrates the feasibility and practical application of the concept with due considerations of the operating environment in Singapore waters. The concept integrates a new mechanical design with a commercial-off-the-shelf (COTS) electromagnetic induction and energy storage.</p> <p>This environmental-friendly maritime product eliminates the use of electricity or stored batteries and aims to preserve the environment through the use of renewable energy.</p>		

Encouragement Award S\$200.00	Ngee Ann Polytechnic	Green and clean cooking (Hydrogen stove)	Dai Jia Jun, Gu Linling, Hu Ting, Ang Wee Sin
Project summary	<p>The objective of this project is to design and build a self-sustainable hydrogen generation system that produces and store hydrogen. Then in term use it as fuel source for cooking instead of gas or conventional electricity, therefore deemed as green and cleaning. The hydrogen generation system for the project is powered with batteries charged up by renewable energy, such as wind and solar energies. Normal multi-crystalline silicon solar panel and wind turbine (combination of Savonius and Darrieus) are used to harvest renewable energies from the environment. A Proton exchange membrane (PEM) electrolyser is used to split water in oxygen and hydrogen. Then the hydrogen is used as fuel for cooking, where the oxygen is release into the environment. It can either be used for cooking directly from the system or stored It for later usage.</p> <p>On the whole, the project uses clean and renewable energy, and is environmentally friendly, and does not include any combustion of fossil fuels.</p>		
Encouragement Award S\$200.00	Singapore Polytechnic	Water filter box	Chan Hui Yi, Go Rin See, Justin Tan Yong Li
Project summary	<p>This report presents the findings for the management of water bodies through processes which include conceive, design and operation. It also proposes the application of the water filter box in ponds and drains to provide water of good quality. The concept of using bio-swales and biotopes are also incorporated into the construction of the filter box.</p> <p>It has always been a dream for Singapore to have sparkling rivers with landscaped banks, kayakers padding in the streams, clean waterways flowing into picturesque lakes. This will soon be a dream come true for Singapore in its near future. Through the implementation of PUB ABC Waters Programme, Singapore's reservoirs and waterways will be transformed into beautiful and clean streams, rivers and lakes. The use of ABC Waters Design features such as cleansing biotopes and bio-swales will also help to keep the waterways and water bodies clean. At the same time, the features will also form ecological habitats that benefit from the proximity to water sources as well. Moreover, with the cooperation from the 3P (Public, Private, People) partners, it is believed to develop and enhance the ABC Waters Master Plan and the environment to a large extent.</p> <p>Operations of the water filter box were held for five weeks to test the efficiency of filtration on the pond water collected. Weekly results have shown that there is an improvement on the water quality. Therefore, it is shown that the filter box constructed is capable of treating water to better quality, it is suggested to be applied in ponds and drains. Together with the implementation of PUB ABC Waters Programme, the application of water filter box is hoped to achieve higher quality of life and environmental management of the water bodies.</p>		
Encouragement Award S\$200.00	Singapore Polytechnic	ECO CUBE (Prefabricated bathroom)	Ong Li Yen
Project summary	<p>The ECO CUBE is basically a prefabricated bathroom equipped with sustainable design features and environment considerations. In this cube, water harvesting and hydro generator systems are incorporated to save water and electricity costs respectively. The bathroom will be ready made and then transported to site and can be placed in any building – residential and commercial. Besides that, there is planter box in the cube, this green façade can enhance the façade of the building that eco cube is plugged into. In addition, it can also be an icon that promote green to public.</p>		