

ProSPER.Net Young Researchers' School Field Trip: The Royal Projects for Sustainable Development in Petchaburi Province, Thailand

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Participants of the 2013 ProSPER.Net Young Researchers' School, along with Prof. Mario T. Tabucanon and Dr. Christopher Doll from the United Nations University Institute of Advanced Studies (UNU-IAS) and resource persons from Chulalongkorn University, visited the Royal Projects in Petchaburi Province, Thailand on 16 September 2013. The field trip included a visit to the Sirindhorn International Environmental Park (SIEP) and the Laem Phak Bia Environmental Study, Research and Development (LERD) Project. These places are located in the coastal areas of the southern part of Bangkok, facing the Gulf of Thailand Sea. The trip was a part of ProSPER.Net's Young Researchers' School, a regional workshop on sustainable development for PhD students in the Asia-Pacific region; this year's theme was 'Partnership in Water and Biodiversity for Sustainable Development'.



YRS'13 Participants with Prof Mario, Dr Christopher and officials at LERD project area

On arrival we received a warm welcome with refreshments from officials at SIEP. They spoke to us about SIEP's history, objectives and activities, including the establishment of SIEP, which was in honour of HRH Princess Maha Chakri Sirindhorn, and its successful operation to pay respect to her ingenuity for conservation of natural resources, environment, its historical values and social cultures. The mission of SIEP is to provide knowledge for biodiversity conservation promoting eco-tourism and to enjoy ecologic rich sightseeing. Such initiatives work in synergy to promote innovation for alternative energy sources with environmental protections.



SIEP official delivering lecture about Princess Maha Chakri Sirindhorn initiatives and establishment of the SIEP project centre

The park also has technical and scientific exhibitions that promote sustainability by imparting education for environment, energy, and the economy. SIEP representatives guided us through the exhibition centre and explained its theme and objectives. The exhibition acts as a learning centre for local people, students, and professionals to help them better understand sustainability in practice, such as the promotion of renewable energies, the renewal of natural resources, low cost energy efficient solid waste management, waste water treatments, and coastal erosion protection. Some initiatives could be seen on its campus, like the use of solar cells and windmills to trap energy for small scale usage and conservation of biodiversity by protecting flora (mangrove forest, beach forest) and fauna (crab, mud skipper, birds, etc.) found there.



Participants at the beach and exhibition centre in SIEP project centre



Participants with Prof. Mario Tabucanon and Dr. Christopher Doll on the hanging bridge in LERD project area

In the afternoon session, after enjoying a lunch organized by SIEP, the next destination was the LERD project area. Officials and researchers at LERD demonstrated their on-going projects through audio-visual aids. The project carried out in LERD focused on solving wastewater and solid waste management problems through the adoption of natural treatments. There are four technologies concerning waste water treatment: oxidation pond treatment, grass filtration, constructed wetlands, and mangrove forest filtration systems. There is a single solid waste disposal technology practiced: the concrete box system (amalgamation of composting and sanitary landfill methods). In addition, research projects also include assessment of environmental impacts in the project area utilizing wastewater to grow plants (like assessment of sludge from oxidation ponds for growing plants), fish farming in oxidation ponds, and paper pulp from emergent plants. Importantly, the technologies used here are based on natural remediation that does not have side effects like chemical treatments. Briefly, LERD initiates green growth and sustainable development with an economy-efficient philosophy.

Besides conducting studies and research, the LERD project serves as a learning centre for wastewater management and mangrove forest conservation. It regularly accommodates educational field visits from schools, academic institutes and for the general public too. The scenic location next to the mangrove forest and the sea has helped establish the LERD Project as a famous eco-tourist attraction and an ideal destination for bird watching activities. Also, LERD plays an important role to educate and prepare youths for sustainable living through the dissemination of knowledge on how to use natural resources efficiently by reducing environmental pollution, also generating revenues to households and the communities at large.

The officials also guided through a visit to the mangrove on an eco-friendly vehicle where we were given on-site demonstrations of working mechanisms to treat wastewater and solid waste through natural remediation techniques.



Participants taking a tour to LERD park in an eco-friendly vehicle

The oxidation pond for municipal wastewater treatment is designed to treat about 20,000 cubic meters of water per day and with an efficacy of about 50-70%. The life cycle is 10-15 years and uses three species of fish namely, *Puntius gonionotus* Bleeker, *Labeo rohita* Boche, and *Oreochromis niloticus* Linnaeus. Sludge is used as soil enriched for vegetable plantation. Grass filtration used as a function of natural wetlands for wastewater treatment that uses *Cynodon plectostachyus*, *Leptochloa fusca*, *Sporobolus virginiscus* (first group) and *Vetiveria zizanioides*, *Cyperus corymbosus*, and *Typha angustifolia* (second group) has an efficacy of 53% and 51% for first and second groups, respectively. These grasses are able to remove biochemical oxygen demand (BOD), chemical oxygen demand (COD), heavy metals, pathogenic bacteria, phosphorus, and other toxicants, which can be a sustainable solution as compared to conventional wastewater treatment. The system also has a constraint of re-plantation every 4-5 years.



The oxidation pond in LERD Project area.

On the other hand, the mangrove forest plantation has major species of *Rhizophora apiculata*, *Bruguiera cylindrical*, *Avicennia spp*, and *Ceriopstagal*. The mangrove forest has a unique feature of flourishing in both saline and fresh water, which is a beneficial characteristic of these mangroves in reducing BOD, COD, and increasing dissolved oxygen (DO) by 97.5%, 74.7%, and 83.9% respectively in two weeks. LERD also has an interesting treatment technique for municipal solid waste. Municipal solid waste disposal is practiced in a concrete box that scales down sanitary land-filling spatially and temporally. The distinction of this system is the utilization of reddy soil as an electron acceptor to enhance microbial activities. Two tonnes of waste and 840 kilograms of soil are put as alternate layers in the concrete box. Within 60 days, the waste volume is reduced by approximately 60% and weighs about 600 kilograms resulting in compost. Unlike other systems, waste turning is not required. Interestingly, levels of heavy metals and nutrients are found within the standards. Research is underway to finally utilize the mixture of compost, cement and soil in solving the loss and deterioration of mangrove areas in Petchaburi Province.

Besides natural remediation grounds, this area is also a bird migration sanctuary for birds from all over the world. Mangrove ecosystems provide an abundance of habitats and foods for migrated birds. Dr. Philip D. Round, one of the founder members of the Oriental Bird Club, visits Laem Phak Bia every month to study the migrated bird using the leg banding technique. Among several significant successes was the rediscovery of the Large-billed Warbler, which was assumed to be extinct. The highlight for bird watching is between October and December when birds migrate from America, Europe and China during the winter period.



Researchers at LERD conducting banding in birds¹

The LERD project area, despite its success, has also faced difficulties like seeking consent and cooperation of local people initially. While this challenge has since been solved, the initial challenge was due to the negative perception of wastewater treatment, which was thought to hamper livelihood earnings if implemented.



Mud skipper fish (A) and Sesarmamederi crab (B) significant species of mangrove forest

¹ Source: Round Philip D., Kongthong Wichian., Narungsri Wicha., Sutibut Smith., 2009. Birds of Laem Phak Bia, The Chai Pattana Foundation, Bangkok, 288 pp.



Participants exploring the mangrove forest along boardwalk in LERD area.

Participants also enjoyed the natural beauty of the mangrove forest on a boardwalk that led to the sea.



Gateway to the ocean (A) and participants at the long pier (B)

Overall, the trip was intended to help YRS participants learn about two living laboratories under royal patronage for natural resource conservation, environmental protection and sustainable development in Thailand. Covering sustainable activities, students were benefitted with learnings on water, wastewater, solid waste, energy and biodiversity issues. SIEP and LERD projects are “natural classrooms” for natural resource conversation, environmental protection and sustainable development, where students, officials from

governmental and non-governmental agencies and from private and public sectors, and also Thais and foreign visitors can study and research projects. Now YRS'13 participants are also imbued with such knowledge and practices to widen their sustainable networks.

THANK YOU ALL



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