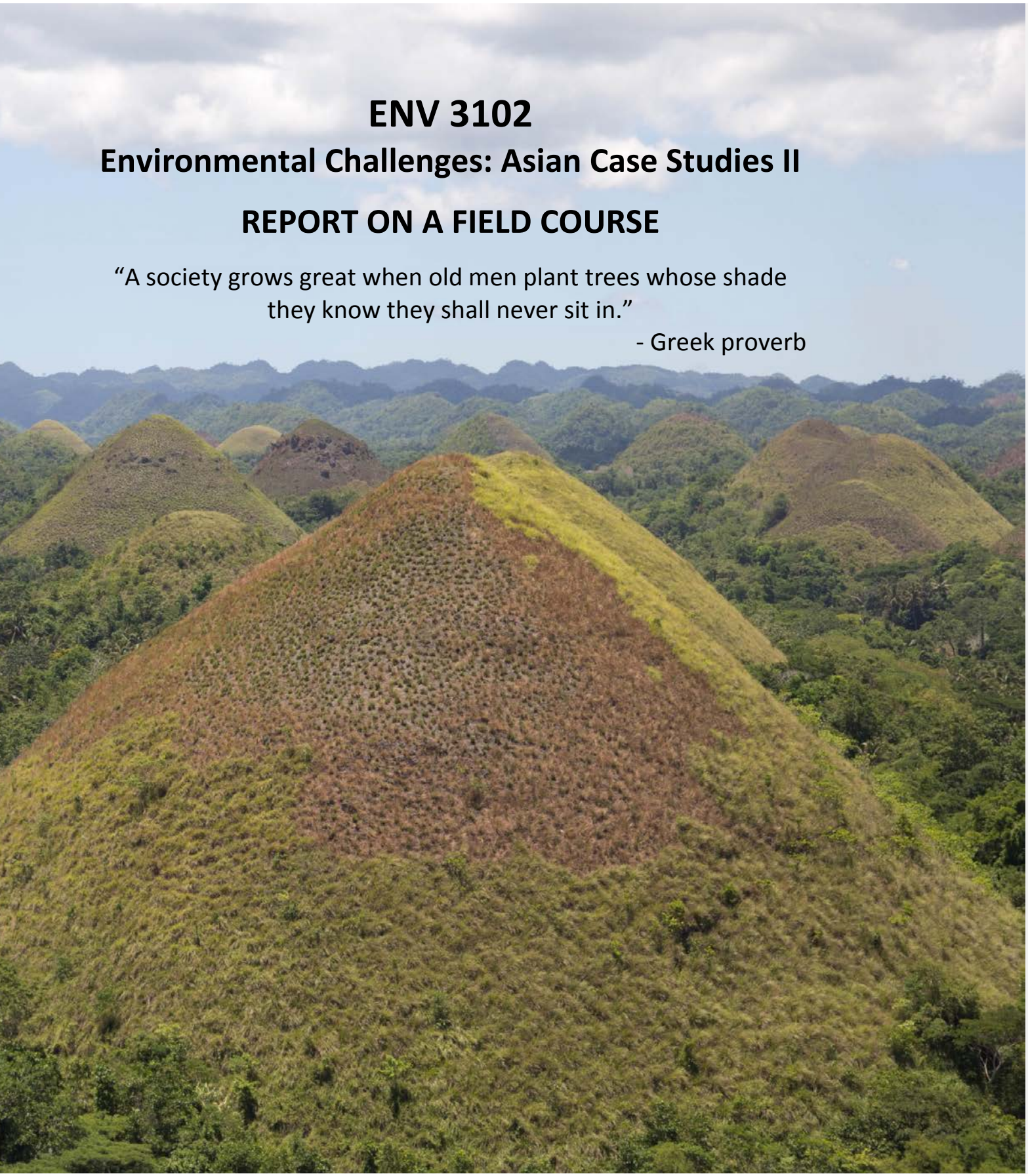
ENV 3102

Environmental Challenges: Asian Case Studies II

REPORT ON A FIELD COURSE

"A society grows great when old men plant trees whose shade
they know they shall never sit in."

- Greek proverb



1. INTRODUCTION: OBJECTIVES, LOCATION AND OVERALL APPROACH

The BES programme is designed to be highly interdisciplinary, mainly in recognition of the multifaceted nature of current environmental challenges. Throughout their degree programme, our students learn just how complex these challenges are, and that although solving them is therefore difficult, it is possible, given appropriately complex and appropriate solutions. Like the challenges themselves, the solutions naturally have socioeconomic, political and cultural ramifications, so locals often have immense useful knowledge and experience in this regard. After all, they are the ones who have been living with and adapting to the environmental challenges on the ground. Ultimately, we believe that by increasing our students' ability to understand these various perspectives, we are preparing them to get out there and make a difference.

Until the end of their third year, BES students mainly learn about these concepts in the classroom. Although they are therefore well-versed in theory, they have yet to get their hands dirty, so-to-speak. This is where ENV 3102 comes in. This fully experiential (and mandatory) course takes the BES programme out of the class and into the field, in order to bring all this theory to life. The three-step 'formula' is as follows. One: take students overseas, and expose them to real environmental challenges and facilitate their interactions with key players, i.e., locals who are affected by the problems and/or involved in their solutions. Two: assign challenging fieldwork tasks and projects, with provocative questions to answer, while giving students some freedom to decide how they will carry out their work, e.g., let them design their studies, yet planning things enough so everyone gets the chance to apply the various scientific and geographical techniques. At the same time, cultivate an environment in which various aspects of inquiry-based learning, i.e., discovery, questioning, skepticism, critical thinking and problem-solving, are highly encouraged. Three: expect the best from them in terms of what they will ultimately deliver, and hold them to that standard. Naturally, our students have to work hard for it, but the end result of this 'formula' is a class whose university experience has been tremendously enriched. The students come away with: (1) a much more in-depth understanding of how current research methods are applied to collect data and solve problems, (2) concrete ideas about how to ensure sustainable living, and (3) the ability to see past the rhetoric and consider how governments and communities contribute to environmental problems and their solutions. Ultimately, ENV 3102 aims to contribute to the ability of the BES programme to graduate qualified environmental professionals who can work competently in the field, consider environmental issues from different perspectives and propose creative, complex solutions

Given that AY 2013/2014 marked the third year since the BES programme was established, it also marked the inaugural offering of ENV 3102. Following a lengthy process of recce trips to various locations and subsequent decision-making about where to hold the field course, we settled on **the Visayas region of the Philippines**, which was suitable in the following ways, among others.

- The country epitomises many of the most pervasive of today's environmental challenges. It has experienced the worst deforestation in Asia and is among the world's most heavily deforested nations. Its marine environment is heavily degraded by many of the same threats found everywhere, particularly overfishing and destructive fishing. The Philippines has one of the world's highest rates of endemism, with biodiversity that is nearly unparalleled in Asia, but with a very high proportion of its terrestrial and aquatic species threatened by human activities. In addition, climate change is profoundly affecting the country in many ways.
- The Philippines, like all its neighbours in Southeast Asia (except Singapore), is a developing nation, and it exemplifies the common economic and political obstacles to environmental problem-solving in this region, namely poverty and tenure issues, lack (or misuse) of funding for environmental programmes, lack of political will and severe corruption.

- Strong and institutional partners were willing to work with us and, effectively, host us. These include Visayas State University (VSU), in Leyte and Holy Name University (HNU), in Bohol.
- Filipinos are not only extremely friendly, warm and hospitable, but also generally very competent in English (much more so than any of Singapore's other neighbours). Thus, this is a country in which visitors in general and NUS students in particular are bound to feel welcome and to be understood.
- The Visayas is generally a safe region to visit (notwithstanding the risk of natural disasters that is omnipresent throughout most of Southeast Asia and especially severe in the Philippines), because crime rates are quite low.
- The low cost of living makes the Philippines an affordable location for the course.

Given the fundamental belief that a country's greatest resource is its people, the point above about having strong institutional partners is very important. These newly formed associations not only facilitate the process of planning an overseas field course for a large group, but also offer an invaluable opportunity for cultural exchange between NUS students and their Filipino peers. Among the many potential rewards gained by the BES students who take this course, one of the greatest lies perhaps in the fact that they are joined by students and faculty from our partner institutions. The local students participate fully in ENV 3102, which they take for credit with their home university. The only difference is that the written assessments that NUS students submit for grades after their return to Singapore (assessments described later) may or may not be assigned to local students, whose overall grades are thus calculated differently. For logistical reasons, the ratio of NUS to local students is skewed (approximately 5:1). Still, both groups mingle well and, once they get past the initial awkwardness and language barrier, truly appreciate the value of this aspect of the course. When we ask how they feel about taking the course with students from another university, student feedback is overwhelmingly positive, as exemplified by the following comment from Ho Suhan Ezra, an NUS student:

HNU student, Camille Navarez, shows new friend and NUS student, Chang Junning, how to use improvised spoon to enjoy fresh coconut meat

> "From an academic standpoint, it was really interesting to perceive and experience the cultural and social differences between us. Personally, it taught me a lot about viewing life from different perspectives."

2. GENERAL LEARNING OUTCOMES AND COURSE THEMES

Within the overall course objectives outlined earlier, ENV 3102 has the following specific **learning outcomes**, so that by the end of the course, students are able to do all of the following:

- describe three of the primary threats to biodiversity in SE Asia,
- explain how the complex interplay among widespread poverty, land ownership, economics, corruption and an extraordinarily rich biota exacerbates threats to biodiversity,
- outline the history and extent of deforestation in the Philippines and the impacts it has on all of the nation's ecosystems,
- apply basic field techniques to assess the effectiveness of various conservation initiatives,
- think critically and creatively about approaches to environmental conservation,
- describe the main threats to wildlife in SE Asia and the importance of emblematic taxa,
- appreciate some of the practical and logistic challenges involved in conservation fieldwork,
- summarize and critically evaluate the primary literature,
- place their work in context,
- think creatively about the next questions in a line of inquiry,
- design a project,
- critique and receive criticism from their peers.

To achieve the above learning outcomes, ENV 3102 focuses on three core themes, chosen to represent what BES believes are key environmental challenges not just in Asia, but also in the world today (and alluded to earlier). First is the issue of **tropical deforestation**, with a restoration approach. In other words, having learned about the problem in prior coursework, students assess three **key methods that are used to restore degraded rainforests** in Southeast Asia: monoculture, assisted-natural regeneration and rainforestation. **Monoculture**, as the name implies, involves replanting a deforested landscape with one species, typically a non-native tree chosen for its ability to grow fast and/or provide valuable timber or other some forest product (e.g., fruit). **Assisted natural regeneration** (ANR) requires no planting. Instead, it aims to protect tree seedlings that occur naturally in a denuded site, but cannot establish themselves because they are covered by grasses, which are also prone to catch fire. The grasses and other ground cover are pressed down and/or removed, and growth of seedlings may be further aided by mulching and other techniques. ANR relies heavily on proximity to existing seed banks, i.e., natural forest patches, from which animals can disperse seeds into the site. Finally, **rainforestation** involves collecting native wildlings (very young saplings) in existing forests, and then cultivating them in specially-constructed growth chambers until they are large enough to be replanted in deforested sites. This method often emphasizes the restoration of dipterocarps, which dominate Southeast Asian rainforests, but are challenging to use in replantation schemes because their seeds are difficult to collect and store, they grow slowly and many species can only grow in shade. ANR and rainforestation can also work well with agroforestry models, whereby local communities are trained to perform the reforestation work while using the land to plant various non-timber forest products (e.g., root crops, coconuts, rattan, etc.) which provide income and/or shade until the desired trees grow bigger. Both regimes may also be used together, so that ANR promotes the establishment of faster-growing, pioneer species, which can then provide the shade that dipterocarp wildlings require. The choice of restoration regime is a complex process, with diverse considerations, such

as characteristics of the site, objective of the project (e.g., watershed protection, creation of wildlife habitat, income generation), funding, etc.

For the second theme, our students move from land to the ocean. With a solid theoretical knowledge of the **main threats to marine ecosystems**, notably overfishing and destructive fishing, our students can now explore one of the most common approaches to the protection of sea life, i.e., the use of **marine protected areas** (MPAs). Although all MPAs essentially consist of zones in which human exploitation of resources is restricted, they are quite variable in terms of: what types of human activities are prohibited and to what degree; the way in which they are established and regulated; and their effectiveness. For example, some MPAs are designated by governments and, thereby, potentially imposed on people whose livelihoods depend on the extraction of marine resources. Alternatively, they may be community-based, with those same people taking on the responsibility to protect the habitat in recognition of the fact that they must do so in order to maintain their way of life for future generations. In some MPAs, there is a total ban on all human incursions, except perhaps those used for monitoring and regulatory purposes. In others, non-extractive activities, such as recreational diving and snorkeling, are allowed, typically along with some sort of scheme to generate funding for the MPA through user fees. The effectiveness of MPAs depends on many factors, such as the extent to which local communities buy into the concept and participate in the approach, the amount of funding available, the ability to enforce regulations, etc. Thus, the study of MPAs provides a fantastic opportunity for students to examine exactly the sort of complex problem that the BES programme wants its graduates to be able to tackle.

Philippine tarsier – flagship species for conservation

Finally, ENV 3102 takes on the **conservation of terrestrial wildlife** as a theme. Although our students are certainly aware of the fact that wildlife in Asia, as elsewhere, is facing major threats, in this area, their theoretical background is perhaps less consistent among individuals. Many of the courses taken by our students before they take this one vary according to whether they specialise in environmental biology (NVB) or environmental geography (NVG), so they do not all have the same ecological knowledge. In particular, NVG students are usually not very familiar with wildlife species or their habitat requirements. For this reason, ENV 3102 tackles this theme from a more human perspective (as opposed to a biological one), focusing on the use of **ecotourism and of flagship species** as means to the end of wildlife conservation. Regarding ecotourism, most, if not all, of our students have engaged in some form of tourism before, so they already understand at least something about what tourists want. Now, they examine how those desires can somehow be directed toward the goal of wildlife conservation via ecotourism, by attempting to do any of the following, alone or in some combination: educating the public; generating funding for conservation; promoting ecologically responsible tourism, providing alternative livelihoods for locals; acting as a disincentive to the exploitation of wildlife and its habitats. As for the concept of flagship species, all our students have seen, for example, the logo of the World Wildlife Fund (WWF), which

features the giant panda. However, have they thought about why WWF chose this species? Have they considered the factors that make certain species well-suited to serve as flagships for conservation? What are the advantages and disadvantages to this approach? These are all questions that our students study, all while learning more about the natural and anthropogenic threats to wildlife in Southeast Asia and the world.

The above paragraphs describe the core themes of the course, but naturally, other topics are considered during the time in the Philippines, and these additional explorations may be planned or impromptu. Thus, our students may be exposed to issues that may include: geothermal energy as an alternative to traditional power generation, sustainable rice production, wildlife ecology methods, mangrove ecosystems (ecology, importance, threats and restoration), impacts of mining on agriculture and biodiversity, relationships between natural disasters and environmental degradation, vulnerability of people to natural disasters, community buy-in, and others.

3. ACTIVITIES

The specific activities and itinerary for ENV 3102 are not fixed, but instead are subject to vary among years depending on group size and logistical constraints. The amount of time spent overseas could also change as the BES programme matures. For the first iteration, the maximum duration was two weeks, because the course had to take place between the last day of final exams and the first day of ENV 3202 (the optional summer internship programme that some third-year students take). However, the course may be extended by as much as one week in the coming years – this being a desired change according to student feedback. In addition, even the specific location may change depending on various constraints. The initial plan was to spend the first week on the island of Leyte and the second on Bohol. However, in late 2013, the Visayas region was hit by two of the deadliest and most damaging natural disasters ever to affect the Philippines. First, on 15-October, Bohol was struck by a magnitude 7.2 earthquake. Then, just over three weeks later, the region was hit by the strongest tropical storm ever to make landfall, when Typhoon Yolanda devastated Leyte, particularly the Tacloban City area. By January 2014, it was clear that it would not be possible to visit Leyte and be hosted by (and include students from) VSU this time around. Thankfully, even though Bohol had suffered serious damage from the earthquake, it was still possible to be hosted by HNU, so this was the location for the inaugural offering of ENV 3102. Whether this will remain the status quo in AY 2014/2015 and beyond is not yet determined.

Regardless of itinerary, timing and location, the one constant is that activities revolve around the three central themes of the course. All ENV 3102 students explore MPAs, forests under different restoration regimes and wildlife ecotourism operations, from both scientific and social perspectives. What follows is a description of activities that students actually did in AY 2013/2014 and can serve as a general indication of what to expect in future.

As a reminder, the overall approach is to let students conduct their own research and hear what experts and other locals have to say about the various environmental challenges and solutions that they see. In addition, to facilitate this process and promote cultural exchange, NUS students are joined by local students and faculty, in this case, 10 students and three faculty members from HNU. One of these is the main contact at HNU, Dr Corazon (Cora) Batoy, whose research area is sea cucumbers – their taxonomy, biology, ecology and conservation, and the local students were final year biology students.

The course began with a two-day introductory session held on both the NUS and HNU campuses. Although additional issues and instructions were covered, lectures mainly focused on the following topics: (1) marine conservation, emphasizing the ecology of coral reefs and the MPA approach, (2) deforestation in the tropics in general and in the Philippines in particular, focusing on the three above-mentioned restorative regimes, and (3) wildlife conservation specifically as it pertains to the concept of flagship species. The format was fairly interactive, with considerable student engagement by means of questioning and activities. The goal was to prepare students (to the extent possible) for what they would do in the field. However, the NUS students also had some preparation in ENV 3101 – Environmental Challenges: Asian Case Studies II, the prerequisite to this course, in which they learned basic information about the Philippines and were initiated to the techniques they would use to conduct ecological and biodiversity surveys of marine and terrestrial habitats as well as social surveys.

MARINE CONSERVATION

Students approached the theme of **marine conservation** having familiarised themselves ahead of time with standard reef survey methods used by Reef Check and Coral Watch and completed an activity in which they designed their own MPAs (on paper) and presented them to the class. The entire group visited the municipality of Dauis, where students spent two full days evaluating two MPAs, i.e., Bingag and Tabalong Marine Sanctuaries, on days 1 and 2, respectively, with all services provided by Panglao Island Nature Resort (PINR). The group was divided in two so that each day, one half conducted in-water activities in the morning while the other conducted land-based activities, before switching places in the afternoon. Before the first in-water activity, each half received an introduction (in the PINR pool) to the proper techniques for entering the water from a boat and for using a mask and snorkel. Although this may seem like a minor point, it was quite important because at least half of the students had never snorkeled before and most had never jumped off a boat into the ocean.

Once students were prepared, they completed snorkeling surveys of coral reefs and stationary surveys (modified technique for non-swimmers) of fish abundance and diversity, inside and outside both MPAs to evaluate the ecological effectiveness of each one. The experience on day 1 proved both frustrating and highly educative. Even though they were supposed to have done the readings and settled on exactly how they would proceed, e.g., which buddy pairs would survey coral health, which ones would survey invertebrates, etc., the experience of actually doing these things, never mind being in the ocean seemed overwhelming for them. As a result, students had a hard time swimming along the transects and conducting the reef survey in an organised way. Those who were doing the fish survey fared no better. Even though they had fish identification cards and should have also prepared by looking at online photos of important reef fish, they had trouble just hanging onto the outriggers and using the mask and snorkel.

Foreground: NUS student Zhou Xuan showing her excitement to her classmate, Chua Xin Yi as they head to their first marine survey. Background (right): also shown are Ang Nicholas Teck Choon (with bandanna) and Xue Weijan (ball

Land-based activities on day 1 consisted first of a visit to two major caves. Students learned about their importance as: habitat for swifts and bats, sources of fresh water and recreational sites for locals, especially women. When they discovered that the caves are being developed as ecotourism

sites, students had the opportunity to reflect on what that means for the future ecological and cultural value of these caves. The following excerpt from Toh Xue Qin's reflective field diary (see section 4 for description of assessments) speaks to the impact of this activity.

> "This was my first time in a cave, and although the steps leading down to the entrance were really slippery, I was very excited to see stalagmites. Both the Cambagat Cave in PINR and the Hindaganan Cave are hugely important for the locals, acting as their source of fresh water, a leisure site and even as a war shelter. Being open access resources, I wonder if the freshwater pools and wildlife in the caves were exploited prior to the establishment of the MPA. Even as visitorship to the caves is regulated now, the impacts of high human traffic and the use of flash photography on the bats and swiftlets in the caves remain unknown. A group as large as us would surely have been extremely noisy and disruptive to the wildlife in the caves."

Students also interviewed locals who were somehow involved with both MPAs to learn why and how each sanctuary had been established and assess the level of acceptance and effectiveness from the perspective of locals. They spoke with shopkeepers selling tourist merchandise and various officials and fisherfolk. Because the students had complete freedom in designing their surveys, they learned about myriad aspects of MPAs, including the level of local awareness of them (which was very low), and some aspects that were unanticipated, as exemplified by this excerpt from the diary of Koh Sarah Yung An:

> "Contrary to popular belief, the economically poor are not completely at the mercy of natural disasters, corrupt systems, and exploitation. In fact, different groups adapt their own ways of coping and resisting. For instance, we learnt of the Badjao people who developed expert undercover fishing methods to avoid getting arrested. Even though they are regarded by the majority of Filipinos as foreign and undesirable, they have adapted a means for survival, and attest to the strength and intelligence of the poor. I personally find it a challenge to overcome this very strong stereotype that the poor are without agency and needy of help. Thus, this field course has helped in some ways to correct my erroneous perspective of the poor."

The MPA activity overall, despite its frustrations, yielded one of the most gratifying teaching/learning moments in this course. The level of ineptitude on day 1 caused the data collected to be of little use. Although groups who were tackling marine topics for their projects (see section 4) bemoaned the loss of valuable data, the bigger lesson for all was about the need to be well-coordinated as a class and for all individuals to be organised and efficient in the field. Following the first daily debriefing at the end of day 1, students then took it upon themselves to convene a town hall meeting later that night and hammer out a plan for the following day. The result was an astounding improvement in communication in the field and in the speed and effectiveness with which they collected field data. In their field diaries, most students commented this and on the tremendous sense of achievement they felt because of it. It seems that most, if not all students came away with a much deeper appreciation for the amount of preparation and coordination that is necessary for field research, no doubt a valuable insight as they prepare to begin their honours year projects.

Ultimately, students were able to appreciate how overfishing had affected the livelihoods of locals in Dauis. By interviewing fisher folk, MPA wardens and municipal officials, they also learned just how complicated things can get when a community-based MPA that is managed by local fisher folk suffers from a lack of financing, ultimately leading to difficulties in effective patrolling that may be further exacerbated by outsiders who enter to poach the resources. Although two-days were not enough to produce a class of proficient marine surveyors, all students (swimmers and non-swimmers alike) learned basic techniques for assessing marine biodiversity. For many of them, this was their first time seeing coral reefs, and most were blown away by just how beautiful the underwater world is. This is obvious from the number of students who wrote about how this activity made the entire concept of marine conservation come to life for them.

Pair of students conducting snorkeling survey of reef

Species of fan worm (centre) growing on live hard coral

Lim Audrey (left) and Chin Brenda after successful survey

DEFORESTATION

Armed with basic knowledge about how to conduct forest surveys and draw stand profile diagrams (and use these to make inferences about forest composition), and having watched videos describing ANR and rainforestation, students were ready to take on the theme of **deforestation**. In-forest activities took place over several days, and entailed self-directed ecological forest surveys (of vegetation and birds) in plots within each restorative regime. Although students had been taught the basics about two key approaches to forestry surveys (point-centred quarter method and line transect), they decided on a modified approach, a sort of hybrid between line transects and standard quadrat sampling. For bird surveys (used to get an indication of animal diversity), they opted for point counts. Students worked within their project groups but, as previously mentioned, they all had to share data with each other.

The first site was Bohol Manmade Forest. This forest was planted as part of the much larger Loboc Watershed Reforestation Project (LWRP), which was initiated in the 1950s to replant roughly 19,000 ha of deforested land and thereby ensure an adequate supply of water for the Loboc hydroelectric plant. At the time, thousands of exotic mahogany (*Swietenia* spp.) seedlings were planted, giving rise to a now towering forest. Before getting started, students received a brief introduction to the site from Mr Restituto Piollo, Forester-in-Charge at Bohol Biodiversity Complex (BBC), who also helped them identify trees, although in this respect, NUS students learned a great deal from their HNU peers. Students recorded variables such as tree diameter, tree height, tree species, canopy cover, etc. in their plots, all of which would also be useful for their stand profile diagrams.

Left: Bohol Manmade Forest
Right: Eng Delaney Kai Li (left) and Sim Siying (right) after survey

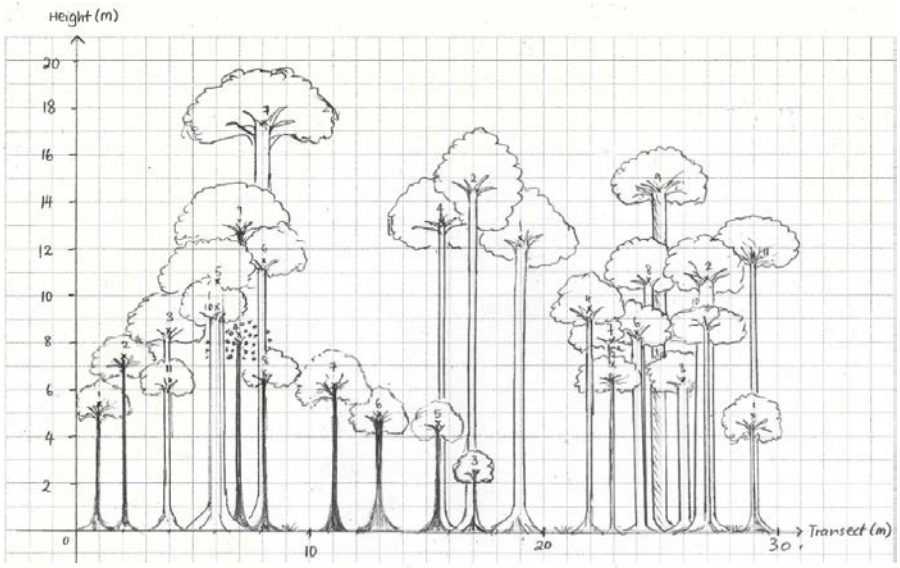
On the social science side, students could not help but notice that the Manmade Forest has become a fairly major tourist attraction. Of course, this was not part of the goal when the area was replanted, but because the forest straddles a major highway, creating quite a visual impression, people stop and take photos. Students clearly appreciated the beauty of the forest despite their awareness that monoculture planting is not well-suited to restoring biodiversity. They also learned from Mr Piollo that native trees are growing under the mature mahogany forest and that the Bohol government and Department of Environment and Natural Resources (DENR) are considering how to manage this land in future.

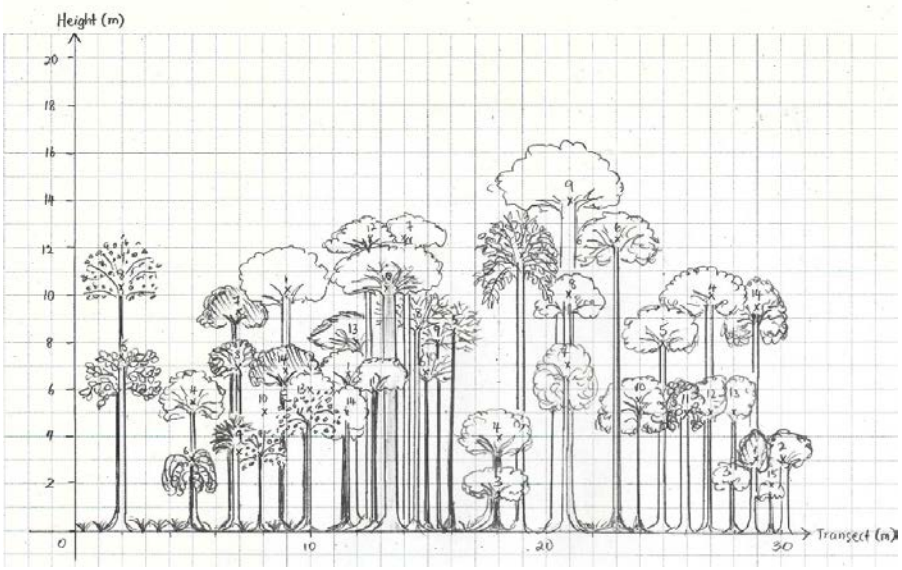
Here again, the highly independent nature of the activity and freedom involved (combined with a thorough debriefing at the end of the first forest survey) allowed students to learn from their mistakes in the Manmade Forest and have things go more smoothly thereafter. In this case, the group that was most reliant on forestry data for its project called a meeting to better organise everyone for subsequent days and correct problems that arose due to: (1) lack of communication among groups whose sample plots overlapped and (2) overlooking the need to standardise how some variables were measured.

The next restoration regime to be examined was ANR, but inclement weather unfortunately prevented students from doing the plot surveys. However, they still got to interact with Mr Pat Dugan, of Food and Agriculture Organisation of the UN, who pioneered the ANR method. Mr Dugan traveled to Bohol from his home in Manila to guide them in this activity. He started the day with an excellent talk, during which he impressed them tremendously, not only with the content, but also his overall approach, so that over the course of the day, he managed to impart a great deal of knowledge, regardless of the weather, and students were able to form connections between this new information and what they had learned in the Manmade Forest as well as their prior knowledge. This is very well-demonstrated by the following excerpt from the diary of Tan Hui Zhen:

> “Although I was a little disappointed that the forest survey had to be cancelled due to the heavy downpour, it was nonetheless a rewarding day to learn from Mr Dugan. Having learned about monoculture planting and ANR over these two days, I feel that ANR is definitely the more ideal option in restoring degraded lands. Even though ANR is sometimes combined with enrichment planting or agroforestry where fruit trees and non-forest timber crops are cultivated, it largely promotes the natural regrowth of native vegetation. This can positively boost the restoration of native biodiversity compared to a monoculture of exotic mahogany species which has no ecological linkages with the local environment. While the Man-made Bohol Forest was the result of a positive and commendable nationwide reforestation program in the 1960s, it is unfortunate that functional uses were the main consideration rather than biodiversity. This highlighted a general lack of awareness and appreciation of local natural heritage, a phenomenon which may also be observed back home in Singapore too. Education will definitely be a key tool to foster greater awareness and appreciation.”

The third and final restoration regime that students explored was rainforestation, in a plot at BBC. By this point, they had a much better understanding of things and surveys were very efficient. Ultimately, through the activities in the forests, students observed clear differences between the monoculture and rainforestation plots, in particular the much more complex vertical layering and higher diversity of trees and birds of the latter. In part, this was evident from the stand profile diagrams that students created and submitted within their reflective field diaries, like the two below, drawn by Seo Shu Lin Sarah (upper figure represents Bohol Manmade Forest; lower figure represents the Rainforestation Farm plot at BBC).





While these activities may not be prolonged or in-depth enough to produce professional competency, students come away with solid and applicable skills. They can conduct reasonably sound surveys of birds (including learning to identify birds by ear) and forest trees. To complement this ecological know-how, students consider the social side of ANR and rainforestation. In addition to interacting with Mr Dugan, they were given a seminar (and much guidance) by Mr Piollo. They asked tough questions and, thanks to candid and thoughtful answers from both experts, they learned about the political and social obstacles that have effectively prevented either alternate regime from becoming popular. Basically, through its National Greening Programme, the Philippines is reforesting huge tracts of land, mainly by planting exotic seedlings purchased from a few favoured, commercial nurseries rather than from communities that are growing native species. In other words, because neither regime makes anybody (besides local communities) any money, the government does not use them. Students also visited the village of Cabacnitan, where the Soil and Water Conservation Foundation and BBC helped set up a rainforestation plot and co-op to manage water resources, which were compromised by deforestation and soil erosion. Here, they saw how the cooperative works and forest restoration has helped restore the watershed.

Finally, during a two-day stay at BBC and a visit to the village of Janlod Batuan (the ANR site), students experienced the labour involved in forest restoration. They tried key ANR techniques, such as using a pressing board to tamp down grasses and a parang to slash weeds. They applied the rainforestation method from start to finish, by collecting native wildlings, preparing bags of soil and building a recovery chamber for them, and planting trees of their own. These activities were highly impactful – nearly all students said so in their diaries and, for many, they provoked deep feelings of connectedness with nature and their degree programme, as seen from the following diary excerpt written by Liu Anmeng:

> “This is was the first time for me to plant a tree, and more importantly the first time I really feel that I am contributing something to environmental conservation. This brings back memories of so many moments when I doubted about what I had been learning as an environmental studies student, and when I wondered if there really was any change I could make. However cliche this statement may sound, I still have to note down that I strongly feel that planting a tree is like planting a hope. I hope I can come back here to have a look at my tree, to see how it grows as the number 22 planted by me at the age of 22. I guess this is how I started to feel attached to Bohol. ”

Kuang Jin Yi, using pressing board; Mr Pat Dugan and peers look on

Sim Siying (left) and Cesyl Balahay (right) survey birds count

Walking stick insect – a great find in rainforestation plot

Ho Ning Li with the wildling (number 38) she planted at BBC

WILDLIFE CONSERVATION

Students interviewing Mr Carlito Pizarras (clockwise from left): Ray Marion Araco, Cesyl Balahay, Mary Ann Payayon, Tan Hui Zhen, Chua Yuan Cheng, Tay Yi Ling, Kuang Jin Yi

Students explored the **wildlife conservation** theme pre-armed with knowledge gained from readings about wildlife ecotourism and how to conduct tourist surveys as well as a basic understanding of flagship species from an activity in which they discussed the concept and the suitability of various animals as flagship species. In Bohol, they visited two main locations, where they got the standard tourist experience (which was necessary for them to evaluate each) before being able to interact with the staff and survey tourists. The first was Philippines Tarsier Foundation, Inc. (PTFI), where students also got to do some forest trekking and talk with PTFI's founder, Mr Carlito Pizarras, aka The Tarsier Man and possibly one of the country's most famous conservationists. Mr Pizarras shared not only his knowledge of and experience with tarsiers and their conservation, but also his story, i.e., how he used to hunt tarsiers for profit, but eventually turned toward conserving them. These human interactions made a huge impression on students, as evidenced by the following diary excerpt, by Tan Wen Ting:

> "Unexpectedly, the most memorable moment of the day was my interview with T.J., a 5th year university student from Manila who was currently an intern at PTFI. It was truly a personal achievement to be able to conduct a one-to-one interview with a local and learn about the person as well as issues concerning local conservation. T.J. shared that he feels that any animal is worth conserving for its own value. In the case of tarsiers, people did not think much of tarsiers and these animals only gained huge attention recently. This again reflects traditional mindsets towards the environment as people used to believe that resources were abundant and there was not much attention on conservation. It also mirrors Mr Pizzaras's personal story whereby he used to hunt tarsiers for a living when they could be found easily but he started to notice that tarsier populations were dwindling as he had to spend more effort to find a tarsier. He eventually decided to dedicate the rest of his life to saving tarsiers. I feel that most environmental conservation efforts have this reactionary nature whereby protection is offered to species already in dire circumstances. It is perhaps relevant today to consider a precautionary approach as well to prevent species from even reaching such precarious situations." ❞

Unfortunately, heavy rain stymied the day's activities somewhat, namely by reducing tourist traffic and preventing students from carrying out thorough surveys. Still, they managed to see the facilities, talk with staff and interview a few tourists, as well as do a short trek and view the tarsiers in the sanctuary. They learned that PTFI is really geared toward preserving tarsier habitat more than it is toward wildlife tourism, its main goal being to protect a sizeable piece of secondary rainforest for these animals.

Students also visited Habitat Bohol, whose raison d'être is fundamentally the conservation of butterflies and other insects but is much more geared toward tourists than PTFI is. Tourists get a 15-minute, guided tour of the facility, which has educational panels and an enclosed butterfly garden. What tourists do not see is the breeding facility, used to produce butterflies for release into the wild, for mounted souvenirs and for release at weddings. After taking the tour, students learned about these other activities. They also had a lot of tourists to interview because Habitat Bohol is on the standard tourist circuit, unlike PTFI, which is out of the way.

Zhang Yuchen (left) and Tan Hui Zhen (facing) interview tourist

Kieu Trang Nguyen holds a caterpillar

Liu Anmeng (left) and Ang Nicholas Teck Choon (right) at Habitat Bohol

Besides greatly increasing their knowledge about tarsiers and insects, both visits enabled students to think deeply about wildlife conservation, and many discussed the value of tarsiers and butterflies as flagship animals for conservation. Again, given total freedom to design their own surveys and write freely, students evidently formed a number of higher connections, and thought creatively about solutions and strategies for improvement, as evidenced by Quek Li Ting's thinking about PTFI:

> "Managed by six staff members, the 8.4-hectare sanctuary welcomes 50 to 100 tourists daily. A time limit of 15 minutes and restrictions on tour group sizes are efforts undertaken by the management to minimise disturbance created by tourists. Nevertheless, undesirable tourist behaviour occurs and these actions will definitely be a major source of stress to the tarsiers. For example, some visitors shook the plants to attract the tarsiers' attention. The guide explained that such behaviour may arise due to language barriers that prevent proper dissemination of instructions. Hence, the management could consider translating messages containing important information on the tarsiers such as their sensitivities to noise and light into other languages to facilitate information dissemination and reduce the occurrence of bad tourist behaviour."

One other activity related to wildlife conservation was a bat evening, held at BBC and led by a local expert, Ms Reizl Jose, who is studying bats for her PhD at Bohol Island State University. Ms Jose gave a fantastic seminar on the biology, ecology and conservation needs of bats, with a special emphasis on bats of the Philippines. She also shared her personal story, i.e., that although she did not want to study bats for her PhD, she had no choice, but ultimately came to love bats and to be passionate about their conservation. Ms Jose also set up mist nets while students observed and learned about the process, with the purpose of capturing bats that evening, so students could see them up close. The mist netting could have been more successful, but students did get to observe two bats. Ms Jose also spent a lot of time interacting with and being interviewed by students. They thought about very diverse aspects of this overall activity. Several talked about the ethical considerations involved in capturing live animals for research and other purposes and a few wrote in their diaries that they believed bats would make more effective flagship species than tarsiers or butterflies do. They seemed to have come to the conclusion that given the comparatively greater ecological importance of bats, namely in their roles as pollinators, seed dispersers, predators of insects, etc., conserving them was likely to have a more beneficial effect on ecosystems than conserving tarsiers or butterflies would. Educators never know what connections students will make, and learning and thinking such as this can be a lovely surprise.

OTHER ACTIVITIES

The trip included additional, somewhat tangential, activities, most notably a day spent touring the southern part of Bohol to appreciate the devastating effects of the recent earthquake and visiting Chocolate Hills, perhaps the Philippines' most iconic tourist destination. Students were clearly affected by the **earthquake tour**, which led them to think on a much deeper level than perhaps anyone anticipated, even forming connections between this disaster, religion and conservation, as in the following diary excerpt, written by Chin Brenda:

Students visit the site of one of many churches destroyed by the earthquake, but with one statue strangely (miraculously?) left standing

> "During the earthquake tour, I noticed that at each church ruin, regardless of the state of destruction of the church building, the statues of The Holy Mother Mary remained standing. While walking in one of the villages hit by the typhoon, I also saw this banner saying "The building might have fallen, we might have lost our houses, but our faith will stand strong." I was and still am very encouraged because of that banner. I felt that the statues remaining standing despite the typhoon lent great strength to the locals. To them, it is a sign that in the midst of calamities, God is still with them. This made me wonder about my own faith and what I would do in times of difficulty. It also made me realize how important religion is, towards galvanizing groups of people and bringing them through various crises. Conservation initiatives should definitely not ignore the power of religion and could even align itself to work together with religion towards a common goal of conservation. "

Students also thought deeply about how socioeconomics influence vulnerability to disasters, as was the case with Cheah Si Yan, Gwendolyn:

> “Firstly, I got the sense that a person’s social class largely affected their vulnerability to the effects of the earthquake. Through my interviews with people and tourists, I found out that many Boholanos were very afraid of another earthquake happening, and felt that the damage done by the earthquake was far more widespread than that of the seasonal typhoons. As such, there have been instances of people leaving Bohol to settle down elsewhere because they were afraid of aftershocks. Some people headed to Manila, leaving many lots up for sale in Tagbilaran city. However, I realized that only rich people can afford to uproot their entire lives to relocate to another part of the country, and I confirmed this through my talks with the HNU students. This means that the people remaining in Bohol may be more susceptible to the effects of the earthquake. I feel that the problem of social inequity is a major underlying factor in determining whether an earthquake is devastating, and if we can alleviate this problem, the population in Bohol will not be as vulnerable to future earthquakes. ”

Dr Batoy also gave a **talk on sea cucumbers**. Admittedly, most students were not exactly enthused about this prospect, but they quickly changed their minds. Enhanced by Dr Batoy’s highly engaging style, the content was very pertinent, with a strong focus on the conservation of sea cucumbers. NUS students were unaware that sea cucumbers in the Philippines are under serious threat due to overfishing, a trade primarily motivated by demand on the part of consumers in China and Singapore. In some cases, the talk provoked sophisticated thought on the part of students, as evidenced by the following passage written by Saw Le En, which shows an impressive level of synthesis and connecting the dots:

> “Dr. Batoy's talk about sea cucumbers today raised a highly salient point brought up by Junning's question. I was reminded of my NUS geography module (GE2202) which highlighted the inequity that existed in the value chain, where producers were often exploited by those in control of the higher value-added activities along the chain. While Fairtrade coffee is a successful example of ethical consumption, certifications have other limitations that will probably impede their success in our context of sea cucumbers here. The most crucial limitation is that certified products tend to be more expensive, and thus, consumers of ethical products tend to be those with high disposable income and who are concerned about ethical issues. However, given that the market for sea cucumber is mainly in China where low prices are more important than ethical considerations, it is unlikely that certifications can successfully shift the balance of power within the value chain of sea cucumber production. ”

Again, activities will, to some extent, change from year to year and certainly, the earthquake tour will not be repeated because over time the damage will be repaired and become less fresh in the minds of locals, who may be therefore less easy to interview. However, including activities opportunistically is evidently important because, as shown particularly well by Dr Batoy's seminar, it is never possible to predict what will spark the deep learning.

Overall, it may be that the opportunity to interact with world experts and locals had as much impact on students as the opportunity to conduct applied fieldwork – this was expressed by many, and is exemplified by the following excerpt from Cheong Delicia Ka Min's diary:

> "… More importantly, we had the opportunity to meet many inspiring people, from the passionate Tarsier Man, Mr. Pat Dugan, and Mr. Bill who hopes to give back to the environment and society to the Professors of HNU. Even the guides whom we have interviewed had something for us to learn- their passion for what they do and their positive outlook in life. This trip would not have been the same without everyone and it is indeed one of the most fulfilling experiences I have had in university. "

Students learn more about how reforestation has altered the lives of villagers in Janlod Batuan from Mr Restituto Piollo, Forester-in-Charge at BBC and tireless conservationist

4. ASSESSMENTS

Students are evaluated based on four assessments, all designed to reflect the experiential nature of ENV 3102 and in keeping with the philosophy that the best assessments are authentic. In other words, assigned activities and tasks allow students to demonstrate their ability to apply essential knowledge and skills, and are meaningful. Here, 'meaningful' means realistic, complex and representative of the actual contexts in which professionals are tested. As well, the assessments are varied so that all individuals can shine regardless of their learning styles (whether they learn best by observation, reading, doing, etc). Finally, these assessments are assigned in such a way that student accountability and ownership are reinforced. First, everything is done in the spirit of total transparency, with students given the rubrics that will be used to evaluate them ahead of time, so they know exactly what is expected. Second, students get a say in some of the rubrics themselves, by giving their input into the specific criteria that they include.

The **group project**, worth 25 % of the final grade in AY 2013/2014, is the first assessment that students complete. The project has all the essential elements of inquiry-based learning with some independent study, and gives students considerable autonomy. It is also authentic for several reasons. First, it allows students to practice one of the most critical of all workplace skills: teamwork. Second, they hone oral communication and public speaking skills, two key requirements in most jobs and professions. Third, the project gives them the chance to get creative and think outside the box, not to mention forces them to solve their problems. Finally, by incorporating two peer-review processes (each presentation is critiqued by the rest of the class and each team member is evaluated by each other member), this assessment replicates the giving and receiving of feedback – an essential skill in the workplace and in life.

Below: students working busily on their group projects. In foreground, clockwise from bottom left: Camille Navarez, Wong Shermaine, Chang Junning, Kieu Trang Nguyen and Jharyathri Thiagarajah. In background: Chin Brenda and her group.

The class is divided into groups of five or six (each with at least one local student). Each group conducts a research project that follows up on ideas and observations made on the trip, based on a guiding question. Questions are diverse and related to at least one of the central themes. Examples include:

- Come up with a working definition of eco-tourism, including criteria. Discuss the extent to which the various operations you have seen are meeting that definition and offer suggestions for improvement.
- How will deforestation affect the ability of wildlife to adapt to climate change in the Philippines?
- What is the biggest difference (to marine conservation) between approaches taken in setting up the MPAs that you visited? How can you tell whether either approach is working?

Although each group has a specific topic, the entire class participates in every aspect of the fieldwork. This means that every person helps collect data whether or not those data are specifically useful to his or her group project. While making the group project considerably more challenging, this scheme ensures that all students learn the same fieldwork techniques. It also forces students to rely on each other, and promotes cohesiveness. The whole class must organise itself properly in order for everybody to get the data they need, and it is when problems crop up that individuals and groups step up and take a leadership role to solve them. In this way, the assessment becomes even more authentic and representative of the workplace, i.e., the entire class may be reimagined as an organisation and each group as a team within the organisation, with everybody working toward a common goal.

Within the above framework, each group not only answers the guiding question, but also produces a unique deliverable. Students are highly encouraged to generate something of real value, in other words, an end product that could ultimately be used by people and organisations who are working toward environmental conservation in the Philippines. The last day of the course is devoted to group project presentations, and the work these students are motivated to do is impressive. Presentations are professional, and many deliverables are of such high quality that they may well be translated into reality. For example, students have produced a mapping tool to predict the vulnerability of different municipalities to earthquakes, while bearing in mind the usefulness to local officials who may not be highly computer literate. Students also created a beautifully-drawn and written children's' storybook (cover shown at right) that imparts the lesson of forest conservation and restoration, by using a highly charismatic bat as the protagonist to deliver the message.

Next, students are assessed on the basis of their **participation**, worth 20 % of the final grade in AY 2013/2014. Given the experiential nature of the course, it is critical that everyone participates, and although grading participation can be somewhat controversial in the classroom, it is fairly standard in a field course. It is an authentic assessment because in the real world, employees are evaluated on the basis of more than just tangibles and deliverables – work attitude and interpersonal skills are critical to success. Active participation helps develop students' critical-thinking skills, especially when it comes to

issues that are complicated and/or controversial. Sharing their thoughts forces them to articulate their ideas and submit them to critical examination, and actively listening to others exposes them to alternate ways of interpreting and using information. The current understanding in education is that students who participate are better able to recall and apply knowledge later on than those who do not participate.

The third assessment is a **reflective field diary**, worth 25 % of the final grade in AY 2013/2014 and submitted 10 days after returning to Singapore. This is where students record, comment on and critically examine their experiences, field observations and learning, thereby further developing their observation and writing skills and providing a thorough platform upon which to evaluate them. The authenticity of the assessment lies in the fact that it replicates the journals that researchers use to organize and document observations in the field. Reflective journals help develop higher-order skills, including self-reflection and critical-thinking, and allow students to make connections with wider theory and concepts to generate new knowledge.

Students write daily entries (1.5 - 2 pages each) in which they describe what they took away from the course, e.g., highlight new skills and knowledge, links with learning from previous coursework, thoughts about their careers and how this course fits in with their training, etc. There are no specific expectations as to the exact content, but it must be relevant, interesting and in-depth. They are also encouraged to experiment with different journaling styles. The diary includes answers to open-ended post-trip questions that test students' comprehension of key concepts, evaluate their thinking about their experiences and give an indication of where their newly acquired knowledge will take them. For example, they are asked to: (1) describe their best and worst experiences, (2) discuss whether the Philippines is a representative locale for a field course on environmental challenges in Asia, (3) propose a new strategy to secure local acceptance of a community-based conservation initiative that they think would work in Philippines, and (4) discuss whether this experience has caused them to form new opinions about conserving natural habitat and biodiversity in Singapore. The diary ends with a conclusion, in which students reflect on: (1) their achievements, (2) how their experiences and deliverables can fit in their resumés, (3) the feedback they received, (4) practical applications of their learning, (5) whether their experience meshes with knowledge from prior coursework, (6) future learning goals and (7) the main obstacles and challenges to their learning in this course.

To be sure, the reflective field diary is a lot of work, but at least some recognise the value of the exercise even as they are completing it, as evidenced by this excerpt, from the diary of Wong Zi Jin:

> "After writing about what I have learnt and felt and being pushed to think critically, instead of passively absorbing information, this field diary is possibly the most important learning aspect. Writing makes me more sensitive to my prejudices and unavoidable subjectivity in certain topics. This is helpful because I now realise the impact of these influences on the credibility of my research. This is especially so since I am a stranger in the land I am studying; if I cannot be objective, I cannot help the people the way I want to. Thinking and experiencing is one thing, writing about it is something else entirely. This is helping me articulate my thoughts, ideas and feelings and to develop a habit of constantly assessing myself. Such a method of self-review is advantageous and will hone me to be an asset in school and in the workplace. "

The last assessment, worth 30 % of the final grade in AY 2013/2014 and submitted roughly three and a half weeks after returning to Singapore, is a mock **grant proposal**. This proposal is designed to bring everything full circle, because it requires students to consider what they have done while they were in the field, and translate that into an actual, fundable project. In other words, they must think about their observations and experiences in terms of the kind of work that is needed, and begin to develop the skill to find the resources to carry out a project. This assessment is authentic quite simply because proposal-writing is one of the most sought-after skills in the workplace. Students showcase their research and writing skills, ability to synthesize information from the literature, organizational abilities and creativity. This exercise also initiates them to the process of finding available grants for which they could end up applying. Finally, by having them write a first draft for review by their peers and then a final draft, they get the chance to practice critiquing the written work of others with the goal of improving it and using feedback from others.

The proposal is a group assessment, with the following premise. Each group assumes it has the chance to compete for funding to do work in the Philippines. It may take on the role of (1) a researcher who wants to conduct an environmental (biology or geography) study, or (2) an NGO that wants to complete a project to address an environmental problem. Groups must identify a suitable grant opportunity and write a proposal convincing a review panel that their projects should be funded. They may base their proposals on their group projects and incorporate points from their diaries. The proposals are thorough and tailored to the specific requirements of the granting agencies that are being targeted. Thus, they include elements such as an executive summary, a project narrative, a budget, a timeline, etc.

Here again, the quality of work is generally very good and excellent in some cases. Finding the money (and successfully getting it!) is a very important part of conservation work, the projects that are proposed tend to be creative, unique, realistic and deserving of being funded. To illustrate this, below is the project summary drafted by one group of students.

> Despite current watershed rehabilitation efforts, the Loboc Watershed continues to experience significant degradation. Our team proposes a payment for watershed services (PWS) project in the Loboc Watershed to incentivise sustainable natural resource practices and promote rural development in the region. Thus, downstream beneficiaries of watershed ecosystem services (ES) will make payments to upstream land and water users for adopting sustainable land-use practices. As the ecological health of the watershed is safeguarded, it enhances ES provision to the beneficiaries. Concurrently, additional income streams for upstream landowners will promote community and infrastructural development, improving material well-being. To build local capacity, we will collaborate with the Central Visayas State College of Agriculture, Forestry and Technology (CVSCAFT) and a local non-governmental organisation (NGO), Participatory Research, Organization of Communities and Education towards Struggle for Self-reliance-Bohol (PROCESS-Bohol). Through participatory design, local collaborations and strategic planning, this PWS scheme will promote the long-term sustainability of local communities and ecosystems.

Comment [JC1]: Beauty – well-written, concise, thorough.