

Chapter 1 : Introduction

1.1 Research Background

This research is based on my cooperation with Rewilding Earth (RE) whose mission is to provide visionary and leadership trainings for international talents to address global issues.

We hope to design a serious game with a purpose to change the world. The “purpose” is to advocate and practice “Wild Perennial Crops” (WPCs) for fighting against climate change and for food security. For RE, the solution could be approached by educational trainings with the subject of WPCs and they decided two directions to follow up.

Firstly, through the design and deployment of "Rewilding Earth Academy 2012" (REA 12), which is a series of training programs. RE recruited learners from university and enterprise to learn the generic knowledge of WPCs among global issues. REA adopts experiential learnings to establish learners' "Whole System Thinking" toward WPCs and uses gaming as the strategy to engage and motivate them.

Secondly, combination of co-founders' expertise¹ from WPCs, ICT4D² innovations and community education, RE uses design, development and deployment process (DDD) to integrate gaming in every activity of REA 12 and will propose a "WPC game prototype" after the training program.

1.2 A Location-based Game Prototype of WPC Check-in Game

This game prototype will be designed as a Location-based Game (LBG), using GPS capable smart phones to record players' tracking and check-ins for WPCs. It will be played in rural areas, adding layers of fictional scenarios to create a playing experience of cross physical world and virtual space; thus it is not just only a Location-Based Game, it will also use the game play of Alternate Reality Game (ARG) and Role Playing Game (RPG), according to the learning purpose and focus.

The place where we could find most WPCs in Taiwan is in the indigenous tribes. They have built up their livelihood based on WPCs for several generations, took WPCs as food source and embed that in their culture like ritual, cooking, language, etc. Our plan is to choose an indigenous tribe as the WPC classroom and design a LBG prototype base on the tribe's natural environment, artifacts, landscape and history to connect the meaning of the game and this specific location. The indigenous tribe that we have cooperated with is Mekarang³, Meihua Village, Jianshi Township, Hsinchu County.

The check-in idea is referenced from "Foursquare", a location-based social networking website for mobile devices like smartphones. Its registered users use smart phones to check in at venues to get user points and sometimes rewards like virtual badges. Besides, users will also add comments and upload pictures while checking in at venues. Once players check in, the application will share updates with friends who were added by players. Another check-in

1 The professional background of Rewilding Earth co-founders is shown as Appendix 1.

2 Information and Communication Technologies for Development.

3 Mekarang's mandarin name is "梅嘎漢" that tribal people use to communicate with each other and with outsiders. Its official name is "Meihua Village"(梅花村).

application that is known by most people is the check-in application on Facebook.

RE's idea is to encourage players to experience WPCs and value its relation to indigenous culture with modern technologies and gaming, namely that learners / players will learn to differentiate WPCs, share WPCs' geo-position for other players to explore in different time, update WPC living conditions, e.g. growing up taller, blooming, fruiting, being sick or been cut down, and also tell stories on explorations through collective check-ins and mappings in rural areas.



Illustration 1: Using a GPS smart phone to do tracking, way points and photo taking of WPCs in rural areas.

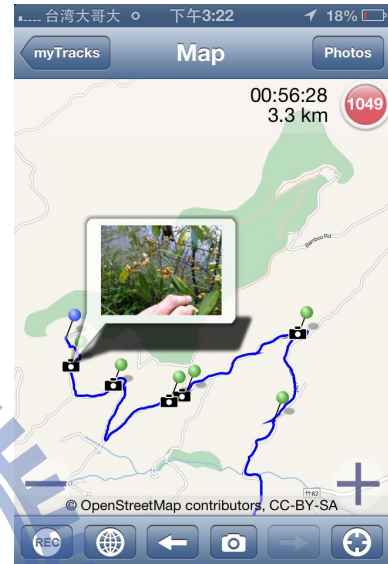


Illustration 2: Using an iPhone app, myTracks, to do tracking, add way points and take photos of WPCs.



Illustration 3: A learner was doing WPC check-ins in a raining day at the entrance of the Kaway Path.



Illustration 4: Learners were doing WPC check-ins on the Kaway Path in Hands-on 1.

1.3 Problem Statement

Here, I would like to address problems in traditional education setting that I had experienced in my personal learning history while studying in school and observed from my work experiences to train university students for international volunteering in order to highlight what role gaming could play for conventional education and the reason why I cooperate with the RE is based on the same purpose to find out the possible solutions for fundamental issues of education in Taiwan.

1.3.1 Old Paradigm of Education Can't Cope with a Changing World

The imbalanced situation between human resource and employee market needs has been a serious issue in Taiwan; the economy depression and the low employee salary urge national talents to go abroad for better job opportunities, the so called “brain drain” issue. And our university students, after graduation, will probably face the situation of unemployment, not because they don't want to work but their training can't meet the need of market, even though every year the graduation population is so high.

In the past, the school credit means the guarantee of job opportunities. However, the world that we live now is in the big waves of change and no one can anticipate how our economy will become or how the climate change and global warming will impact our life in the next 50 years. If it is impossible to anticipate, how can we incubate human resources that meet the needs for the future? Everyone thinks that we need to transform Taiwan as an OEM society to an innovation oriented society for a high profit of production and service, but it is not possible to be achieved in a short time. If something we need to change for the unknown future, it must start from the education.

1.3.2 Traditional Education Ruins Students' Appetite to Learn

I have been doing observations on problems of traditional education from my personal learning history in school and from my work experiences in training university students for international volunteering since 2007 until now. I think the biggest problem of conventional education system is that we use an industrial factory model to manage “human” work; it uses the single standard to evaluate learners just like quality control; it uses tests and exams to train learners to answer questions as fast and correct as possible; it requires learners to follow steps to finish designed curriculums in order to get credits regardless that learners have different capacities at different levels; the teaching is full of facts and information but lacking activities for students to experience, just to name a few.

This factory model of education system has caused our learners to feel bored and exhausted in school learning. You could see how it has impacted our learners by the following observations,

1. **They have lost the passion to learning.** They are so exhausted to deal with endless tests and exams in school, so when there is something new, interesting and worthy of knowing, their automatic reaction to learning is stress. It shows us how our education has ruined learners' appetite to learn. If you tell learners to explore topics which are irrelevant to tests or exams, they usually don't show much interest and don't want to spend time on it either.
2. **Their learning motivation is irrelevant or indirect to the future targeted service**

- group.** Learners' motivation to learn always suffers from pressure of family's expectation, to compete with peers or simply not to be kicked out from school. For example, nowadays many learners join volunteering not because they want to contribute something nor they really care about who their service receivers are but they need the volunteer certificate as the reference to apply for better schools or jobs.
3. **They have poor capacity to deal with complicated scenarios in the real world.**
After learners enter universities, the subject they choose to study will lead them to go into a more difficult and isolated domain of academic knowledge. Learners can hardly have multidisciplinary learning to understand different and complicated scenarios in the real world and not to mention they can have different perspectives or solutions out of the question. The competition in schools doesn't encourage learners to collaborate on studying or problem solving, even when they are given group assignments, it happens that learners with high achievement take over the whole work to save time for better performance and the ones with low achievement take a free ride; thus within the process, very limited collaboration or communication skills that are needed for problem solving can be developed and learned.
 4. **They are afraid of making mistakes, asking questions and expressing themselves.**
The school education encourages learners to give correct answer or one explanation to a question. Learners are afraid of making mistakes to avoid punishments or ridicule from teachers and peers. So we can see that many learners prefer to pretend they understand the exercise rather than to pose questions that many learners think will expose their ignorance to others. Learners receive a lot of information and facts in the classroom but can hardly digest them into deep thoughts and hardly have any confidence to express themselves.
 5. **Learners have few chances to learn “from Gown to Town”.** This is the idea I had when I worked in the Community University. Take universities in Hsinchu city, Taiwan for example. It has 5 universities and 2 of them are the strong engine to incubate professionals for Hsinchu Science Park. The university controls students to learn hard inside of campus. After graduation, they continue to work in Science Park, without having much connection or engagement with local communities and ignore the fact that local communities sacrifice their living environment and health quality to support the semi-conduct or industry of Taiwan. If engineers' mission is to design innovative technologies serving humanity, how come they don't care about the needs of targeted service group or what impact technologies will bring to their customers? Is "designing for the dump"⁴ the only design process of our industries? Or can we design innovative, responsible and sustainable technologies for our future?

To conclude from my observations on the old paradigm of education system and its impact on learners' attitudes, RE and I decided to collaborate on the design of REA for the learners to practice “Whole System Thinking” through gaming on the subject of WPCs to reach two goals,

Firstly, to stimulate learners' reflections on “**What Is the Purpose of Learning?**” and “**Why Should We Consider Targeted Service Group in Education?**”

4 It was proposed by Annie Leonard who is an American advocate of sustainability and critic of excessive consumerism. From her short film, "The Story of Electronics", she says "designing for the dump is the key strategy of the companies that make our electronics." The more crap we have to throw away because it breaks or we have to upgrade, the more crap they can sell us.

Because the old paradigm of education no longer meets the need for a changing world and what it taught us is the methodology of unlimited development and construction that has put human beings in a disastrous and highly risky future. We need to "**Rewild**" learners through "**Unlearning and Undevelopment**" to approach "Whole System Thinking".

To prevent us from seeing WPCs in a human centered position, learners need to see things without assumptions and prejudices as traditional learners have, namely to see things with a pure heart, in order to really "learn" WPCs in a whole system way and to see things with different perspectives. The mindset of "unlearning and undevelopment" could be achieved through gaming, for example role playing could help learners to forget themselves but to simulate behaviors and emotions of other characters.

Secondly, gaming helps learners experience "**Play life before you live life**". In our design, we will use modern technologies like GPS capable smart phones to enact fictional game scenarios and rules within physical locations. Through this hyper reality game, it will connect places and stories in education and bring learners authentic experiences.

Players must play this game with a good purpose to promote and advocate WPCs not only for entertainment. To transform this purpose into game design, the learners as players will stimulate lives in the post-disaster Taiwan, learn indigenous knowledge that is an advanced understanding to local environment, and search for WPCs for surviving. In the gaming, learners could simulate what possible consequences they will have dependent on different decision makings and learn skills that are needed for problem solving; these are things that learners have few chances to learn in school.

1.3.3 Challenges of Location-based Games development in Rural Areas

LBGs use networked technologies like mobile phones, Wi-Fi, bluetooth and GPS tracking to enact fictional game scenarios and rules within physical locations, like in the streets, museums, school campus and urban areas. There are some massive and multiplayer LBGs requiring servers to process information transferring among players' mobile devices to immerse players in an interactive playing environment.

However, after testing and searching related research papers, we found out that there are some challenges to develop LBG in rural areas, not only in Taiwan but also in many places around the world.

Firstly, **most online map systems support limited information in rural areas**. Most Android and Apple mobile devices support Google Maps and its satellite photos, however Google has invested a lot of effort in urban areas for its users to do the navigation while driving or moving in the cities. Some map information on Google Maps in rural areas is missing and even incorrect. Illustration 5 shows that the map edited by Rewilding Earth in OpenStreetMap has more details and correct information in the area of Mekarang compared with Google Maps.

What if we use smart phones with Google Maps in satellite photo view? Here comes the second challenge, **the incomplete 3G coverage in rural areas**. Without 3G signal, most users can't view map or satellite photos from the internet to do the navigation and the only thing working in an offline environment is the GPS device. In Taiwan, most telephone companies have invested intensively in 3G base stations in urban areas, and 3G mobile users have reached 20,860,000, 72.3% of all users in Taiwan (Institute for Information Industry, 2011 Q4). In Places like Mekarang, located in the mountainous area at the average elevation

of 500m, only mobile users contracted with Chunghwa Telecom (中華電信) and Far EasTone Telecommunication (遠傳電信) can make phone calls but can hardly use their 3G service to surf the internet. For mobile users contracted with Taiwan Mobile (台灣大哥大) and Asia Pacific Telecom (亞太電信) and VIBO Telecom (威寶電信), they can't make phone calls nor use 3G service in Mekarang according to our testing.

Even in some remote areas where 3G services is not reachable, mobile users prefer not to use 2G services to surf the internet, because 2G internet fee is much more expensive than 3G's and 2G mobile users has not been the mainstream market in Taiwan since 2009 (Institute for Information Industry FIND, 2012).

The third problem is a **philosophic** one; **most of the maps are using a human centered perspective**. Map is a representation of human perspective. Take Taiwan maps in Japanese colonial era during 1895-1945 for example, we can see that the colonial government spent lots of time and effort to develop measurement methods for mapping and to name places with their perspective for the purpose of control and governance. Also, current web map services are designed with purposes to locate artifacts, like public infrastructures, all kinds of man-made places and venues. If we want players to play this game to value WPCs, players should not use old perspectives to explore the game space.

RE has done a lot of field observations and cultural surveys on Mekarang, even though this is the pilot program for game design, we still can grasp the spirit and practice of Atayal culture and traditional knowledge from Mekarang and the close relation between indigenous culture and WPCs. For example, the naming for an indigenous place always preserves WPCs' features and reflects WPCs' growing environment, e.g. Naro (那羅) means the place growing wild persimmons in Atayal. From the above, we can see that the way indigenous people see "place" is more respectful and truthful to WPCs and their growing environment, namely to Nature.

So RE uses a WPC centered perspective which is also an indigenous perspective to represent the game space and hopefully it will promote the name of rectification⁵ for indigenous peoples in Taiwan.

Due to the challenges mentioned above, RE decided to test and develop a LBG prototype played in an offline environment, namely that players will not have internet like Wi-Fi to support navigations or fancy and interactive interface to exchange information with each other but only use GPS and offline maps while playing. Besides, RE chose OpenStreetMap which supports collaboration on map making for different websites and navigation apps to design a game space with perspectives from WPCs and indigenous peoples.

5 原住民正名運動

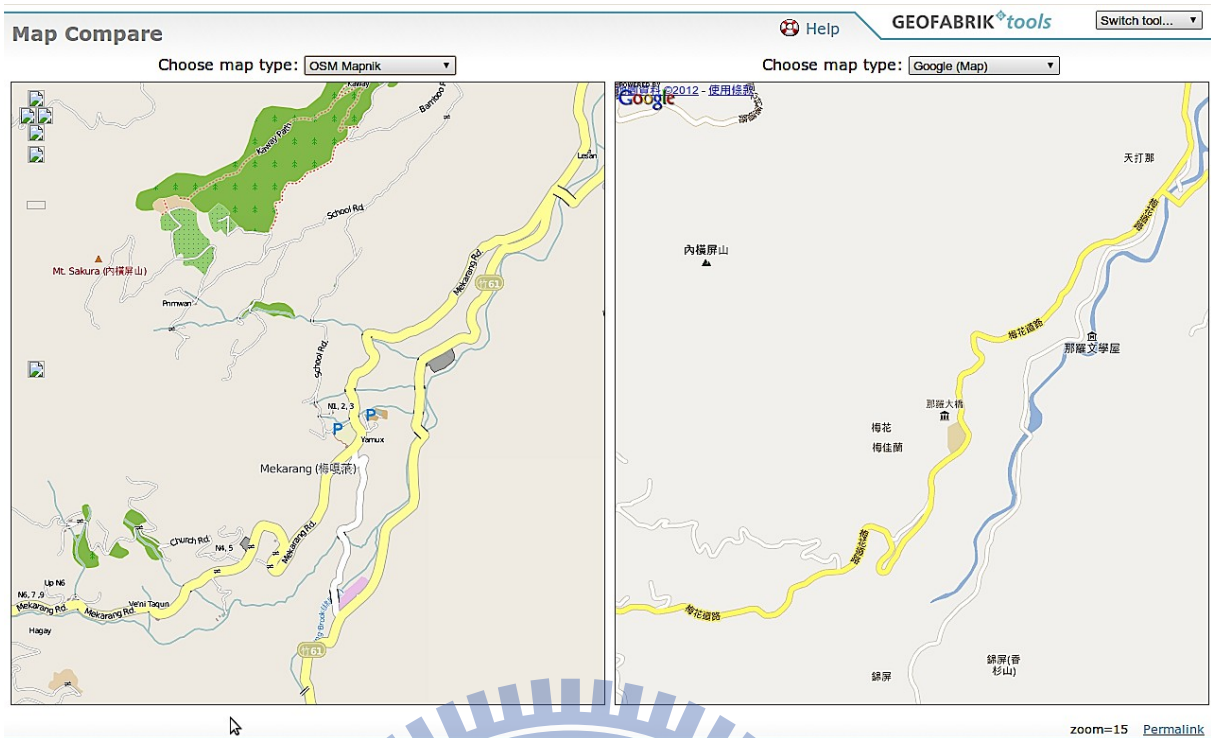


Illustration 5: The comparison between OpenStreetMap and Google Maps in the area of Mekarang.

1.4 Research Questions

To conclude from my observations that the traditional education paradigm does not teach us to think from different perspectives and the importance of future targeted service group, and also the learning process with no fun can hardly motivate and engage learners, here comes the 1st research question,

1. What is the content of Whole System Thinking toward WPC, how does RE integrate game design into their teaching and what is the game result?

RE designed Rewilding Earth Academy for university learners to join and I, as a game co-designer, teaching assistant and researcher at the same time, need to observe how does a series of game design, a leveling-up quests for players, make impacts on the learners / players in the process. Here comes the 2nd research question,

2. How does the integration of gaming in a series of educational programs impact on learners' attitudes and performance?

RE will propose a game prototype after a series of training programs and, according to their tests and experiments, there are some challenges needed to overcome for a LBG played in rural areas. It follows my 3rd research question,

3. Through Rewilding Earth Academy deployment, what is the "WPC game prototype" generated from the process and what is the solution to explore WPCs with GPS mobile phones in rural areas?

1.5 Research Goals

My research goals are based on the research questions,

1. Cooperate with Rewilding Earth to design and to deploy “Rewilding Earth Academy”
2. Propose a “Wild Perennial Crops” game prototype after the deployment of “Rewilding Earth Academy”
3. Answer the research questions



Chapter 2 : Literature Review

2.1 Location-Based Game

Location-based Games (LBGs) are new emerging games that originate from urban gaming and street game culture. In 2006, Pennsylvania State University founded Urban Gaming Club that aims to promote Alternate Reality Games (ARGs) and Location Based Games (LBGs), and in recent years we could witness these games implementing technologies for players to break boundaries of physical and virtual worlds.

This game culture is still not a common phenomenon in Taiwan yet, but with the influence of Japanese culture, Taiwanese audience can have a rough picture of this game style through a TV program called "全員逃走中"⁶. "全員逃走中" is like a more complicated version of the kid's game "hide and seek" (捉迷藏). Its game space is usually a grand play ground like school campus, theme parks, stadiums or shopping streets where everyone inside like tourists, students or workers are natural actors and actresses. The game moderator will design a fictional game scenario and players will be divided into groups to finish quests given by the moderator. Quests are to reach a place or find a hidden object at a certain location in a limited time and at the same time to escape from the hunters. Once touched by the hunter, the player will be arrested in the cage waiting for a chance to get back to the game. The winner will be the team that successfully survive until the game is over and will get a big price. Most team members will be equipped with devices, such as cellphones for typing text messages to update location and information with team members, a print-out map with details on the game space and a countdown watch showing remaining time for gaming. In 2011, "全員逃走中" became a phenomenon in Taiwan and there were hundreds of students from universities and high schools recruiting friends to play this game inside of their campus (蘋果日報, 2011).



Illustration 6: "Savannah" is an educational game for children to simulate lions' behaviors in savannah. Players navigate the augmented environments with mobile handheld devices.



Illustration 7: "Uncle Roy All Around You" is a city touring game. Players use handheld computers with the map and incoming messages to explore the city and search for Uncle Roy.

Source: Retrieved December 15, 2012, from
<http://www.girardin.org/fabien/catchbob/pervasive/>

⁶ The English name is "Run for Money" and Japanese name is "ランフォーマネーとうそうちゅう".



Illustration 8: Snapshots of Japanese TV program "全員逃走中".

Source: Retrieved December 15, 2012,
 from <http://tvboxnow.com/viewthread.php?tid=1900560>

Lehmann (2012) defined LBG as "a form of play that is designed to be played on a device in motion and changes the game experience based on the location." He further categorized several LBGs into 4 game patterns, including,

1. Search-and-Find: the core concept is to reach a destination, and the destination is in a fixed location.
2. Follow-the-Path: it is played similarly to "Search-and-Find" for reaching a destination. The destination is not important but the path to get to the destination matters. Another gameplay is with a special device where players could see themselves and other players' recorded tracks on the mobile device in order to find the best path between two points.
3. Chase-and-Catch: the core concept is to chase an object in motion, so it is important to know the location of the chased object. It can be played by a single player, multiplayers or group members to chase each other at the same time.
4. Change-of-Distance: the goal is to move closer or further away from a geolocation. Neither the location of the object nor the moving direction is important but only the movement matters. For example, the player could read the next part of the story after moving a certain distance.

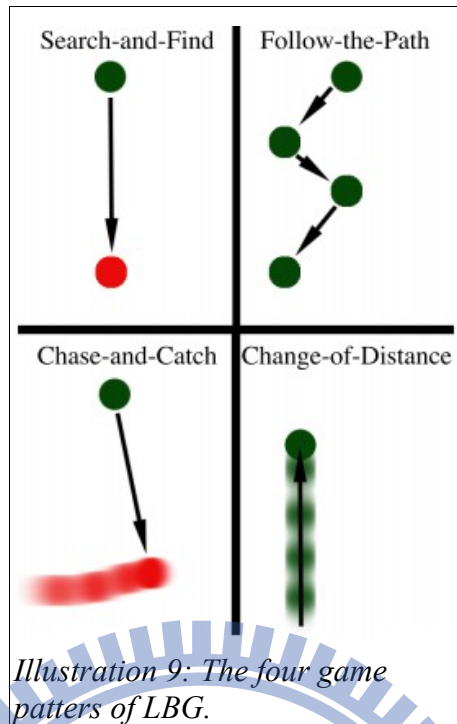


Illustration 9: The four game patterns of LBG.

Source: Lehmann (2012)

He described 5 usage possibilities for LBG, including,

1. Entertainment: almost every game has the purpose to entertain players.
2. Education: it could connect places and stories in education. Compared with a video game that tells the same story within a virtual world, a LBG that can lead players to visit places in the real world will make the story more authentic. However, it is very difficult to learn knowledge in more abstracted areas like math.
3. Physical Activity: its core idea is to promote exercising while playing a game, like the faster runner is the winner to improve players' performance. But for now there is no LBG showing that it can be used as a dedicated physical activity like Kinect or Wii.
4. Advertising: incorporating advertising in gaming, like to show up products in games or to influence the real world movement of customers, e.g. providing product coupons or discounts to encourage customers to play games as rewards.
5. Data Acquisition: by engaging players to do data acquisition for the real world, we could have more accurate and detailed maps and meanwhile players could give a geo-location of a context or tourist attractions. Still, game designers must avoid to make the game play a boring task for players.

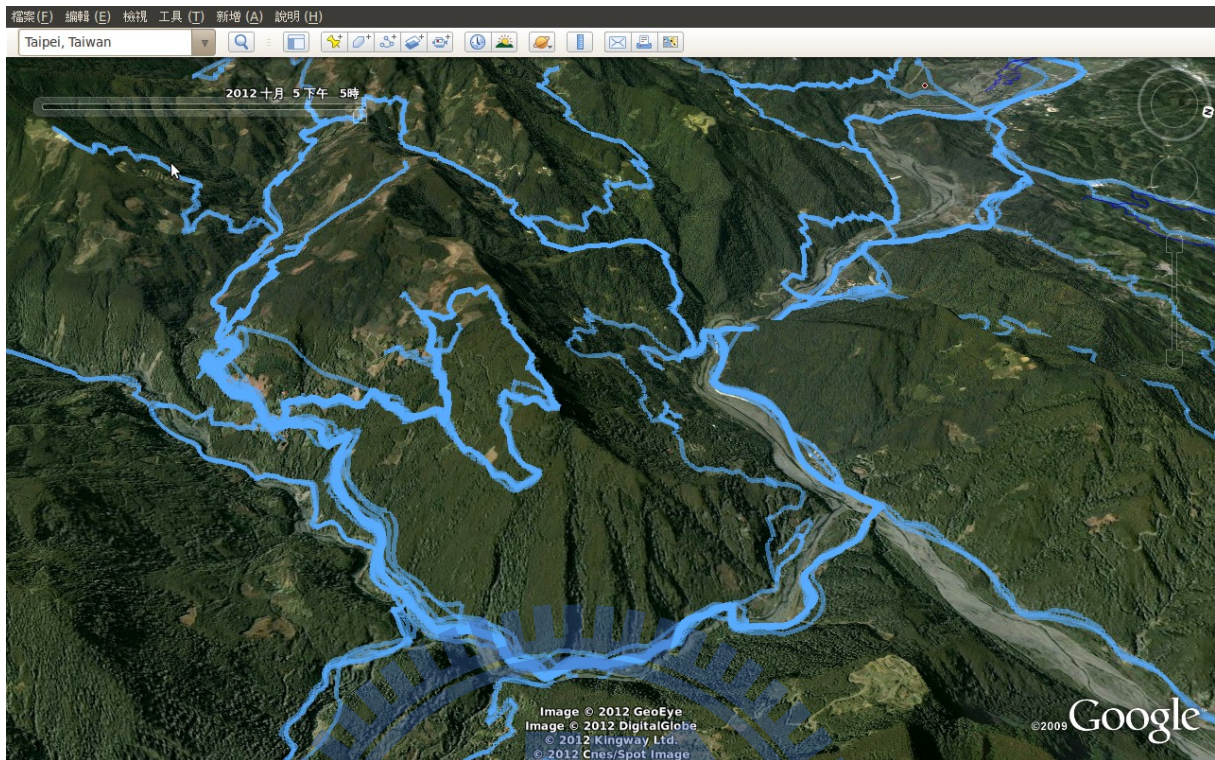


Illustration 10: The GPS track that RE recorded was the data acquisition for the game maps of REA 12.

LBG is a game that evolves playing based on players' location. Lehmann (2012) further described that the most used models to determine players' location are GPS, Cell-ID, Cell Tower Triangulation, Wi-Fi, IP address, RFID, Bluetooth server, QR-Code and Self-reported position with different advantages, disadvantages and suggested use in games.

LBG can be potentially beneficial to learning. According to De Souza & Delacruz (2006), they analyzed design elements of existing Hyper Reality Games (HRGs), such as mobility and location awareness, collaboration/sociability, and the configuration of the game space (bridging physical and digital spaces) could be potentially beneficial to education via social, experiential, and situated means.

In a recent research of LBG, Avouris & Yiannoutsou (2012) classified LBG into 3 traditions, through their literature review of the most cited publications of this field, and among them, LBGs with pedagogic tradition are powerful but less developed,

1. the ludic tradition that is designed for the purpose of entertainment or amusement, e.g. treasure hunts action games and role playing games.
2. the pedagogic tradition that is created mainly for learning, e.g. educational action games.
3. the hybrid tradition that games are with mixed objectives, e.g. museum games and mobile fiction.

2.2 Wild Perennial Crops

"Wild Perennial Crops" (WPCs) is the term defined by Arne Garvi (Arne) from his work experiences in Niger for 25 years, He established a field station to restore indigenous trees in

Tanout, south of the Sahara Desert. Most people live around the field site are farmers.

"Perennial Crops" is the term that is known by most people and searching this term in Google search engine will get a lot of articles and reports about it. American Scientist (2011) has reported it as one of World-Changing ideas, and may even fight climate change. It has many advantages over monoculture crops; its agricultural practice needs no tilling to release atmospheric carbon into carbon sink and its deep root could prevent erosion and preserve water to keep more minerals in the soil; farmers do not need high investment in fertilizer and pesticide for planting.

RE promotes "Wild Perennial Crops" to differentiate from "Perennial Crops", because there are plant geneticists working on the development of a perennial version of annual crops, e.g. corn, that is also using a form of Genetically Modified Organism (GMO) to manipulate genetic traits of plants for human consumption. Besides, most ways to plant perennial crops are monoculture. It is an agricultural practice that plants a single crop on a large scale of land and has promised farmers big harvests with limitation of labors. Palm oil trees which is a perennial crop but planted as a monoculture crop have caused serious degradation of rainforest and destruction of ecosystem in Malaysia and Indonesia.

WPCs preserve most advantages that perennial crops have and also preserve its genetic diversity and resistance to pests and diseases. The major difference between them is that WPCs are not modified plants, nor practiced as monoculture crops. Any perennial and annual crops are planted by cuttings and having the same gene with their mother trees, just like a form of clone that will do harm to the environment and have low resistance to diseases, pests and weeds.

According to Altieri (2000),

unfortunately, a number of "ecological diseases" have been associated with the intensification of food production. They may be grouped into two categories: diseases of the ecotope, which include erosion, loss of soil fertility, depletion of nutrient reserves, salinization and alkalization, pollution of water systems, loss of fertile croplands to urban development, and diseases of the biocoenosis, which include loss of crop, wild plant, and animal genetic resources, elimination of natural enemies, pest resurgence and genetic resistance to pesticides, chemical contamination, and destruction of natural control mechanisms. (p. 16-17)

WPCs are also nutritious and some of them have high economic value, examples like Hanza in Niger (Garvi-Bode & Garvi) and Jackfruit (Crops for The Future, 2003) throughout the Pacific are the strong proof for the statement.

Indigenous knowledge is entering into the mainstream of sustainable development and biodiversity conservation discourse. Article 8(j) of the Convention of Biological Diversity (Rio, 1992) has contributed to this process by requiring signatories to: "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional life-styles relevant for the conservation and sustainable use of biological diversity".

Most important of all is that we can promote WPCs for food security and to conserve genetic diversities of plants. WWF's (2006) report found the following,

according to the U.N. Food and Agriculture Organization, 75 percent of the genetic diversity of agricultural crops has been lost in the last century due to the

abandonment of genetically diverse traditional crop landraces in favor of genetically uniform modern crop varieties. (p. 15)

Take edible bananas that we can purchase from supermarket as an example, they have been modified by people's favored traits and have been sterile, seedless mutant, for hundred years. Pearce (2008) pointed out,

And that is why some scientists believe that the banana could be doomed. It lacks the genes to fight off the pests and diseases that are invading the banana plantations of Central America and the small holdings of Africa and Asia.

So, preserving seeds from WPCs and to change our modern food culture since Taiwan's food self-sufficiency ratio is only 33.49% (農委會, 2011) become urgent actions for us to take to stop genetic diversity loss of crops in Taiwan.

Still, there are many challenges to promote the idea of WPCs, prejudices like people take WPC as “famine” food without much protein and economy value and intuitively as human beings, we are able to reflect our empathy to animals, but for plants or trees, we appear insensitive to their silent suffering and endangered situation.

2.3 Rewilding Earth Academy

Rewilding Earth Academy (REA) is an integrated and annual program preparing individuals to engage in global learning and sustainable development. REA engineers cross-sectoral collaboration cultivates interdisciplinary professionals and stimulates innovation to address earth challenges.

In partnership with Service Learning projects of National Chiao Tung University (NTHU) and Chung Hua University (CHU), ASUS Global Citizenship Volunteer Program of ASUS Foundation and APEC Digital Opportunity Center 2.0 (ADOC 2.0), RE recruited 25 learners from university and enterprise to join in Rewilding Earth Academy 2012.

2.4 Whole System Thinking

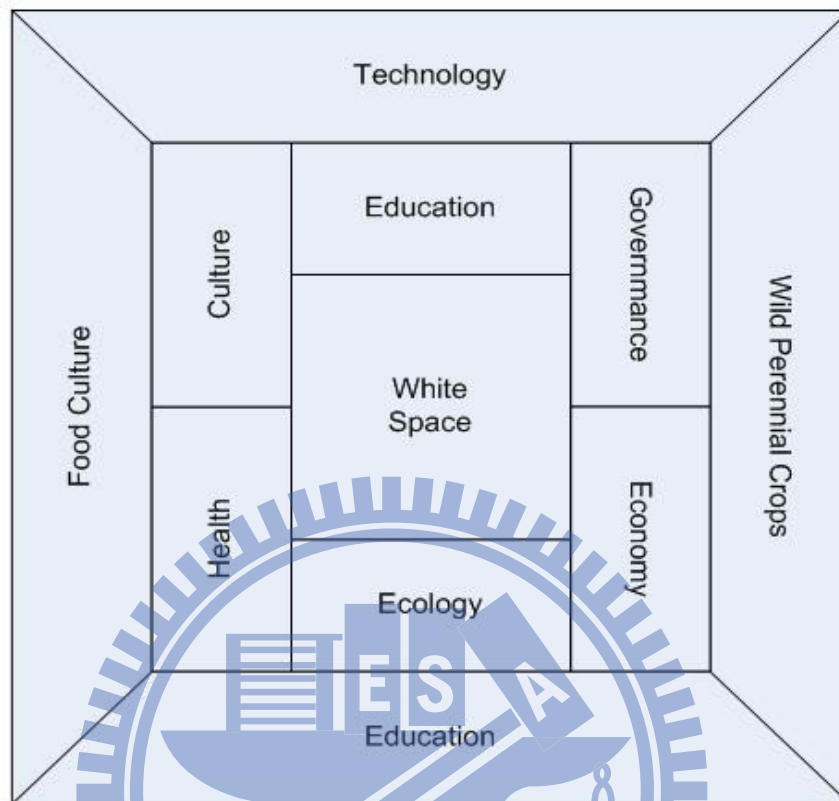


Illustration 11: White Space, the six domains and the customization of Whole System Thinking toward WPCs.

Whole System Thinking consists of the **invisible reality** of White Space and the **generic visibility** of the six domains.

The core of Whole System Thinking is "White Space" that represents the invisible reality. It was designed by Arne Garvi for people to use the mindset of "Unlearning and Undevelopment" to build up capacity of viewing things with different perspectives. "Unlearning and Undevelopment" is not "**against**" learning and development but "**for**" learning the critical thinking and developing sustainably, people must let go off their prejudices and assumptions which are most shaped by the school education toward seeing the invisible reality behind the visible.

The rectangles surrounding the core are the six domains of "Whole System Thinking" that have been developed by Joy Tang (Joy) from her work experiences of over 20 years in Silicon Valley and Africa. When one person or organization initiates a product or program, they should consider issues in the six domains, including,

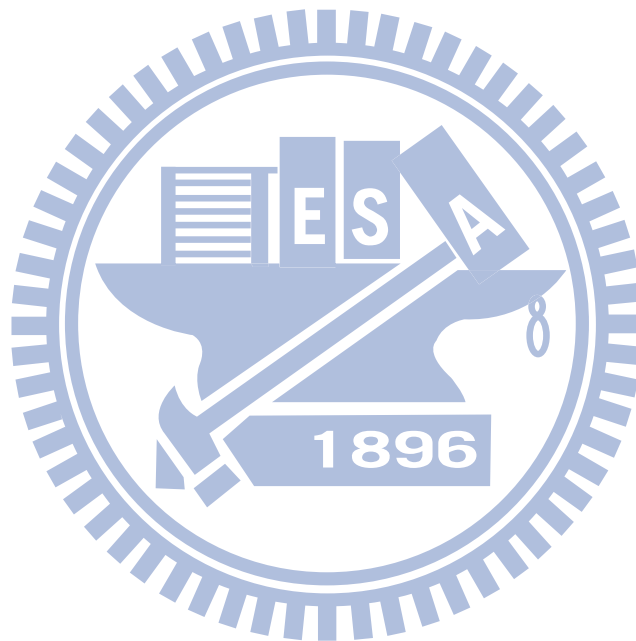
1. Governance
2. Economy

3. Ecology
4. Health
5. Culture
6. Education

in different levels and their relations. Take WPC as an example, if we want learners to appreciate its value and even practice it, learners can use the six domains to understand that it is not restricted to conservation, it is also related to issues in other domains such as the modern food culture, world economy development, indigenous knowledge, land issues and so forth.

The trapezoids in the outer shell of Illustration 1 show the four approaches for the learners to build up Whole System Thinking toward Wild Perennial Crops and this is the **customization** made by RE for Rewilding Earth Academy 2012. The four approaches are,

1. WPC
2. Technology
3. Culture
4. Education



Chapter 3 : Research Method

3.1 Introduction

I have collaborated with Rewilding Earth (RE) in the design and deploy of Rewilding Earth Academy (REA) which is a series of teaching programs with action research method. The field station for game design and teaching programs is in an Atayal⁷ Tribe, Mekarang. Program designers found the generic knowledge between indigenous knowledge and WPCs through local senior interviews and field learning from which to design teaching and gaming materials. RE recruited 25 learners from universities and enterprise. During the program, I used participatory observation method to make records and collect data and further analyzed them in order to answer my research questions.

In this chapter, I will address,

1. qualitative methods used in different stages of my research and research process.
2. "Passive Transfer" that RE uses to engage with Mekarang tribe as a novel method to increase their motivation to join our program and game design.
3. a basic introduction of Mekarang in which RE developed REA and the game prototype.

3.2 Selected Methods and Research Process

We had made video records on the process of REA 12 and the video records list is shown as Appendix 2. Interview record list and selected interview records are shown as Appendix 3.

Table 1: The research methods

Research Steps	Descriptions	Methods Used	Time Period
Setting research questions and goals	discussed with RE co-founders to decide research questions and goals	group discussion	2012/2/1-2/28
Engagement with Mekarang	used "Passive Transfer Engagement" to build up trust relationship and collaboration with Mekarang seniors and young people	action research	2012/3/1
Mekarang and neighborhood area survey	<ol style="list-style-type: none">1. interviewed to the local seniors on their knowledge and their daily practice of WPC2. surveyed Mekarang and neighborhood tribes like Nahuy, Mrgwan, Zihing, Matuy, Slaq, Piling and Naro on their history, geography and living status3. tested GPS mobile phones	group meetings, action research, literature review	2012/3/8-5/29
REA program preparation	<ol style="list-style-type: none">1. did the GPS tracking and edit maps on OpenStreetMap	group discussion,	2012/3/11-5/29

⁷ Atayal is the indigenous name of "泰雅族". Most tribal people lives in Mekarang are Atayal.

	<ol style="list-style-type: none"> 2. did the program students registration 3. designed keynotes and game episodes for the program 	action research	
REA program deployment	1-7 salon. Every salon was held fortnightly on Sundays, 9:00-18:00	action research	2012/3/25-6/20
Data collection	<ol style="list-style-type: none"> 1. interviews <ol style="list-style-type: none"> 1. interviewed to Atayal seniors: audio files 2. interviewed to RE co-founders on the gaming design: Skype chat records and audio files 3. program documentation <ol style="list-style-type: none"> 1. program teaching materials: wiki pages 2. filming the training courses: video Clips 3. gaming result: print-out maps, GPS tracks, learners reflection posters, evaluation and scoring tables 	data collection	2012/3/8-6/20
Data analysis and discussions	<ol style="list-style-type: none"> 1. reviewed the interviews and program documentation 2. wrote the analysis reports on the gaming result 3. answered the research questions 	explorative research	2012/6/8-7/27

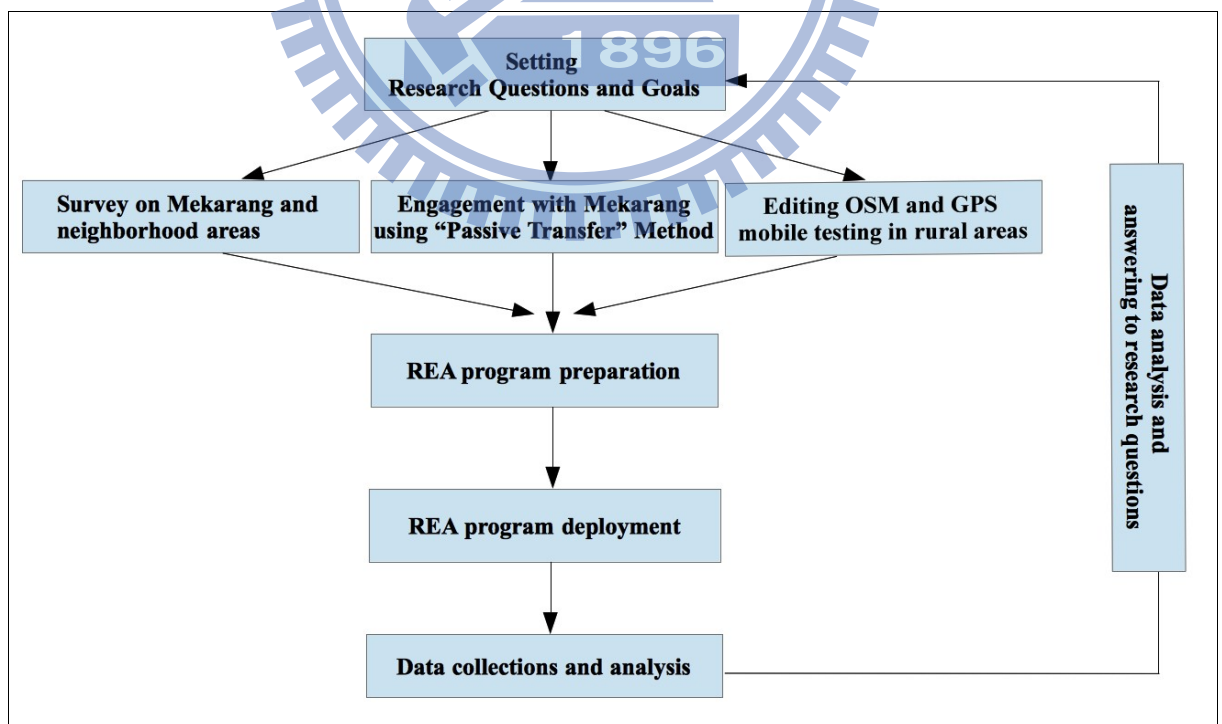


Illustration 12: The research process

3.3 Passive Transfer Method

"Passive Transfer"⁸ that RE uses to engage with Mekarang is generated from Arne's work experiences in Niger for 25 years; he established a field station to restore indigenous trees in Tanout, south of the Sahara Desert. Most people live around the field site are farmers. This field site shows that If his service is good enough, farmers will approach him for the service, but if it is not good enough, the service provider needs to review and adjust their service accordingly.

"Passive Transfer" transfers knowledge / service that fulfills targeted service group's goal rather than service provider's. Arne used trees as an efficient mean to fulfill farmers' goals in different dominions of culture, economy, education, health, ecology and so forth. This is "Goalistic Thinking" of "Passive Transfer" method and it echoes to "Whole System Thinking" of Joy Tang.

In "Goalistic Thinking", a service provider should always consider goals of targeted service group, namely to think from their perspective. "White Space" is an essential design for people to go into for putting aside what they have learned in school to think from their heart without prejudices and assumptions. Going into White Space and leaving from it is a practice of changing mindset and with continuing practice, people will be more improvise to what is thrown at them and more able to think from different perspectives.

Here are principals of "Passive Transfer" that I observed from RE's work experiences in Mekarang,

1. **To engage with the local people as a neutral power:** From the beginning, RE insisted not to be introduced by any academic institute, NGO or local acquaintance, even though its members have cooperation with the community in the past, to prevent the wrong assumption and expectation of the local people to our program.
2. **To share the generic knowledge of WPCs:** RE shared the generic knowledge of WPCs in a whole system way in terms of addressing the similar problems that local and global agriculture have to help Mekarang value their indigenous knowledge system. For example, RE used local WPCs like wild bananas, Ma'aw and Tana, all indigenous plants, to introduce them what WPCs are and their value and demonstrated with the real case of how over-production of domesticated crops has caused the poverty and pollution problems in Mekarang and in other places around the world.
3. **To see and being seen:** RE cooperated with Mekarang to develop an innovation lab as an interface for RE's program members "to see" local people's life style and value system and, at the same time, the innovative experiments of the lab could "be seen" by the local people to raise their curiosity and increase their motivation to RE's experiments. For example, RE joined in community activities to learn the local plant knowledge from the seniors and got support from them to hold the gaming activities on the Kaway Path which is a precious and secret hunter path managed by the tribe.
4. **Mutual investment of social capital:** As a way of mutual investment of social capital on the collaboration, RE co-founders contribute their time and expertise to the locals and Mekarang Tribe provides local knowledge and logistics that are needed for the collaboration. Compared to the traditional aid model, the service provider use grants and sponsorship to tempt the targeted service group to buy in that will only meet the

8 Garvi, A. V. (1999). Passive Transfer. In D. Pasternak & A. Schlissel (Eds.), *Combating Desertification with Plants* (pp. 383-393). New York, NY: Plenum Publishing Corporation.

needs of sponsors and put the targeted service group in a lower position of gift receiver. So the mutual investment cooperation is based on trust and is a more healthy and sustainable relationship.

3.4 The Wild Perennial Crops Classroom - Mekarang

The indigenous tribes is the place where we could find the most WPCs in Taiwan; they have built up their livelihood based on WPC for several generations, took WPC as food source and embed it in their culture like ritual, cooking, language, etc.

The indigenous tribe that we have cooperated with is Mekarang whose location is in Meihua Village, Jianshi Township, Hsinchu County. It is around one hour distance by car from Hsinchu City and is convenient for Rewilding Earth members to visit. Mekarang Village's location is shown as Illustration 13, Illustration 14 and Illustration 15 and its background information is shown as Table 2.

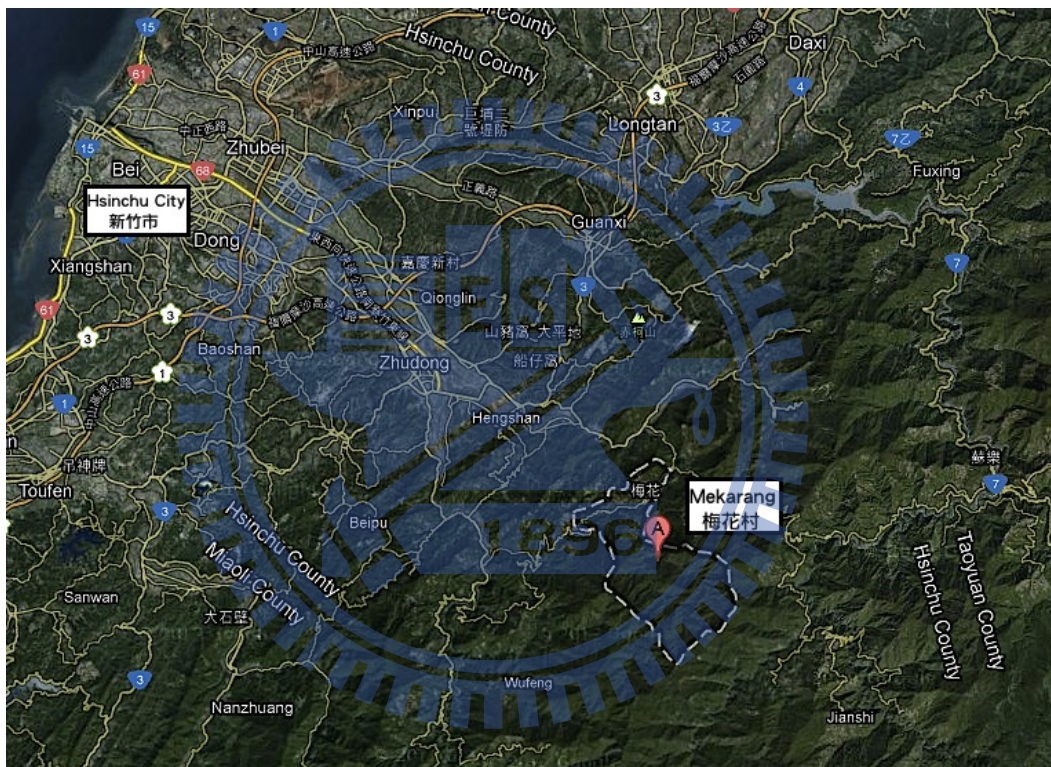


Illustration 13: Mekarang Village and Hsinchu City's satellite map in Google Maps.

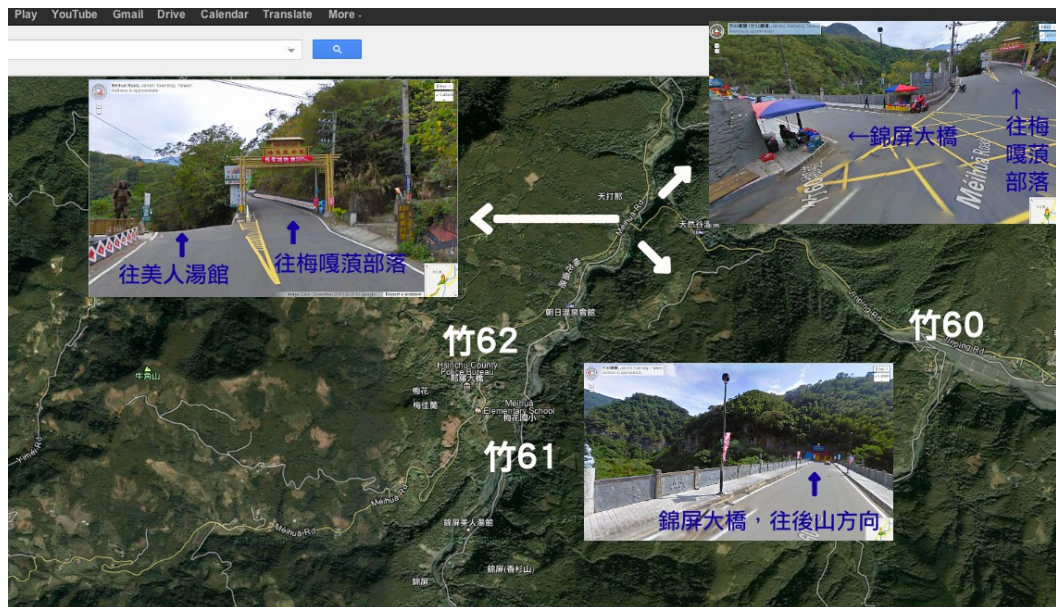


Illustration 14: Mekarang is in 竹62, many hot spring hotels are constructing along 竹61 and the road stretches to the higher mountainous tribes such as Cinsbu (鎮西堡) and Smangus (司馬庫斯) is 竹60.

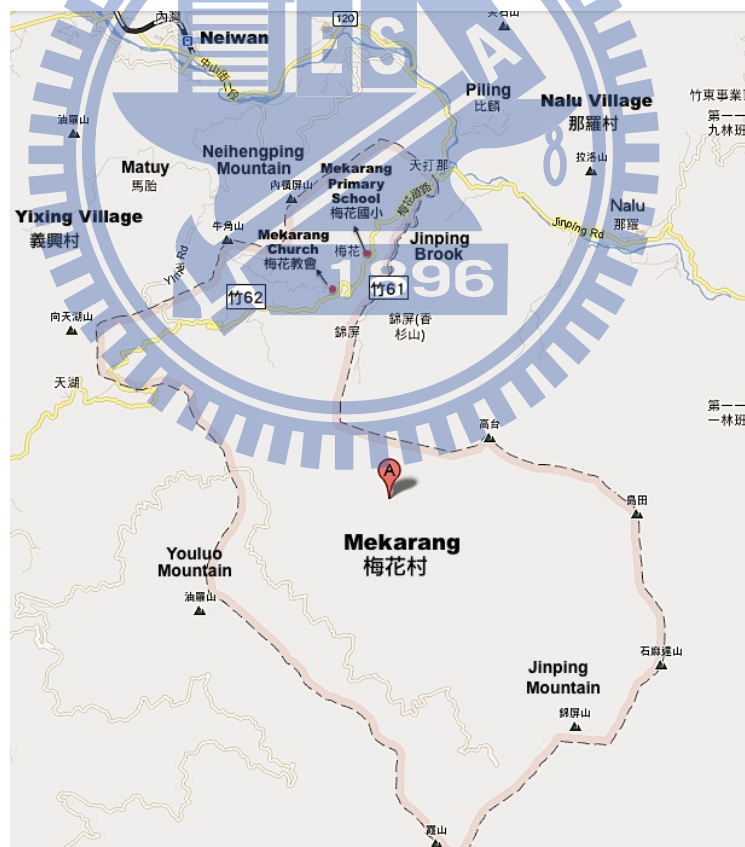


Illustration 15: Brooks, mountains, villages, roads and important places around and inside of Mekarang Village in Google Maps.

Table 2: Basic Information of Mekarang Tribe

Category	Description
Basic Information	<p>1.Population: 237 households, 728 people⁹ 2.Ethnic group: Atayal 3.Language: ts'ole' (澤敖利群泰雅語) 4.Religion: Christian</p>
Natural geographical features	<p>This village is in mountainous area and its average elevation is 500m to 700m. Tribal houses are mainly built by the tertiary roads, 竹 61 and 竹 62 and other service roads. Mekarang Brook (梅花溪) and Jinping Brook (錦屏溪) are the main brooks of village intersecting with many streams. Famous mountains like Mt. Neihengping (內橫屏山) is standing at the north side, Jinping Mountain (錦屏山) is at the east side and Youluo Mountain (油羅山) is at the west side of Mekarang village.</p>
Weather	<p>During spring, fall and winter seasons, it is very misty and rainy. In summer, the temperature is about 2-3 degree lower than plain areas and afternoon thunder showers are common here.</p>
Amenity	<p>Mekarang Primary School is located in 竹 62 (tertiary road) and Mekarang Police Station is just next to the school. Mekarang Church¹⁰ is around 2 km away from Mekarang Primary School.</p>
Brief History	<p>During Japanese colonial era in 1895-1945, Japanese colonial government built Neiwan railway and train station to transport precious timber from mountainous areas to other places and hired indigenous people as timber labors.</p> <p>The Kaway Path is on the ridge of Mt. Neihengping (內橫屏山) at the height of 927m and an important route to the outside area. Japanese colonial government built bunkers with powerful weapons and former Mekarang Primary School as the governance and education center on the Kaway Path to control Mekarang and neighboring tribes. There is an old saying that a Japanese royal prince once visited the Kaway Path and he was so impressed by the beautiful scene of native cheery trees blooming in Mt. Neihengping.</p> <p>In Mekarang, the soil is very fertile and suitable to plant sticky rice but Japanese government asked Atayal people to plant paddy rice to raise the staple production.</p> <p>After KMT Government retreated from Mainland China to Taiwan in the 1950s, Mekarang was forced to change its name to "Meihua Village". "Meihua" is the mandarin name for "plum blossom" and is the important symbol of KMT.</p> <p>Compared with "Meihua" which is not indigenous species and can hardly represent the feature of their tribe, tribal people prefer to use "Mekarang",</p>

9 台灣原住民族學院促進會(民 99 年)。新竹縣部落調查。未出版。

10 Mekarang Church was established in 28, December, 1946 and is the first church of Atayal tribes in Taiwan.

	which means the good taste of sticky rice, to represent their tribe.
Economy Activities	<p>Most of senior residents are farmers and most young people leave hometown for study and job opportunities in big cities. Some farmers, supported by World Vision Taiwan, have been practicing organic farming while most farmers still practice conventional farming. Most farmers plant fruits like persimmons, plums and peaches and vegetables like bamboo shoots, cabbages and pumpkins. People can also find many wild and indigenous trees like Ma'aw¹¹, Singut¹² and Tana¹³ in mountainous areas.</p> <p>In the recently years, there are many hot spring hotel constructions emerging in Jianshi Township, especially by Jinping Brook (錦屏溪). The hotel owners, almost are non-indigenous, bought lands from indigenous people and hire local people to do laboring work.</p>
Challenges	<p>The big crisis of indigenous culture preservation is language disappearing. Nowadays, most tribal young people are leaving hometown for study and job opportunities in big cities where they can hardly learn from tribal seniors and practice indigenous language in their daily life.</p> <p>Mekarang also faces the dilemma between agriculture development and conservation. The great scale of plantation in the mountains has caused serious erosion; thus every time when typhoons strike, land slide follows and stops routes to outside areas and regular activities.</p> <p>The construction plan of Piling Dam (比麟水庫) which purpose is to supply water for Hsinchu Science Park (新竹科學園區) is a serious threat to the tribe. According to the government plan, after construction, places at elevation lower than 520m like Jinping Village (錦屏村) and Mekarang Village (梅花村) will be flooded and mountains, soil, ecosystem and historical assets of this area will be damaged enormously¹⁴.</p>

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- 11 Its mandarin name is "山胡椒" or "馬告". Ma'aw trees' fruits and leaves are with strong aroma. Atayal people use its fruit as a spice to cook with pork, chicken or bamboo shoots.
- 12 Its mandarin name is "樹豆" or "黑豆". It is a popular bean in high protein and vitamins and indigenous people cook it with pork in the soup and sometimes they eat it as a staple food.
- 13 Its mandarin name is "食茱萸" or "刺蔥". Indigenous people take its new leaves which taste like lemon grass as a spice to cook with soup or fry with eggs.
- 14 See reference [18], [28] and [34]



Chapter 4 : Rewilding Earth Academy 2012

4.1 REA 12 Schedule and Operation Process

RE held REA Salons from 9:00 to 18:00, on Sunday in Mekarang Church for three months. With a time interval of 2 weeks, the facilitators who are also RE co-founders and I surveyed local knowledge, did mapping tests, interviews and field observations and integrated these resources into teaching materials and game design.

Table 3: Salon scheme, date, keynote speaker; DDD on gaming and mission on mapping area of REA 12

Salon No.	Salon Scheme	Date	Keynote Speaker	DDD on Gaming	Mission on Mapping Area
1	Rewilding WPC	Mar 25 (Sun)	Arne Garvi	Episode 1. Macaque Food Map	Mekarang Church neighborhood
2	Rewilding Technologies	Apr 8 (Sun)	Joy Tang	Episode 2. Wild PC	School Road
3	Rewilding Food Culture	Apr 22 (Sun)	Joy Tang	Episode 3. Indigenous Food Map	Mekarang Road
4	Rewilding Education Through Unlearning	May 6 (Sun)	Apple Jia	Episode 4. Colonial Taiwan, 1895-1945	Neiwan to Mekarang Village
			Apple Jia	Episode 5. Industrial Taiwan, 1945-2012	Piling Tribe to Mekarang
5	Rewilding Education Through Undevelopment	May 20 (Sun)	Apple Jia	Episode 6. Post-Disaster Taiwan, 2012-2100	Church Road
6	Hands-on 1	Jun 3 (Sun)	Apple Jia	Coming of Age Test in Mekarang	The Kaway Path on the ridge of Mt. Neihengping
7	Hands-on 2	Jun 10 (Sun)	Apple Jia	Journey into the Unknown	Zihing, Nahuy, Naro and Slaq

In every Salon, the operation process followed a similar order shown in Table 4. For hands-on activities, we skipped the keynote speech to spare more time for playing outdoor games.

Table 4: Salon Operation Process

Process	Time	Description
Keynote speech	9:00-11:30, 2.5 hrs	Keynote speeches were given by the facilitators from RE
Lunch	12:00-13:00, 1 hr	Invited the learners to join church sermons and to eat lunch with tribal people to experience "to see and to be seen" and

		WPC food culture as well
Gaming activities	13:00-16:00, 3 hrs	<ol style="list-style-type: none"> 1. The facilitators explained the game rules 2. The facilitators regrouped and mixed the learners to recognize the dependency among themselves while fostering independent expression
Group presentation	16:00-17:00, 1 hr	<ol style="list-style-type: none"> 1. Groups presented on their game results with materials like print-out maps, posters or MS PowerPoint files. 2. All group members were required to collaborate on presentation 3. To eliminate mutual interference, group presentation were reviewed separately by the facilitators only
Group review	17:00-18:00, 1 hr	<p>The facilitators reflected on the learners' oral presentation in relation to,</p> <ol style="list-style-type: none"> 1. keynote speech in the morning session 2. game results 3. learners' reflections

4.2 The Game Space

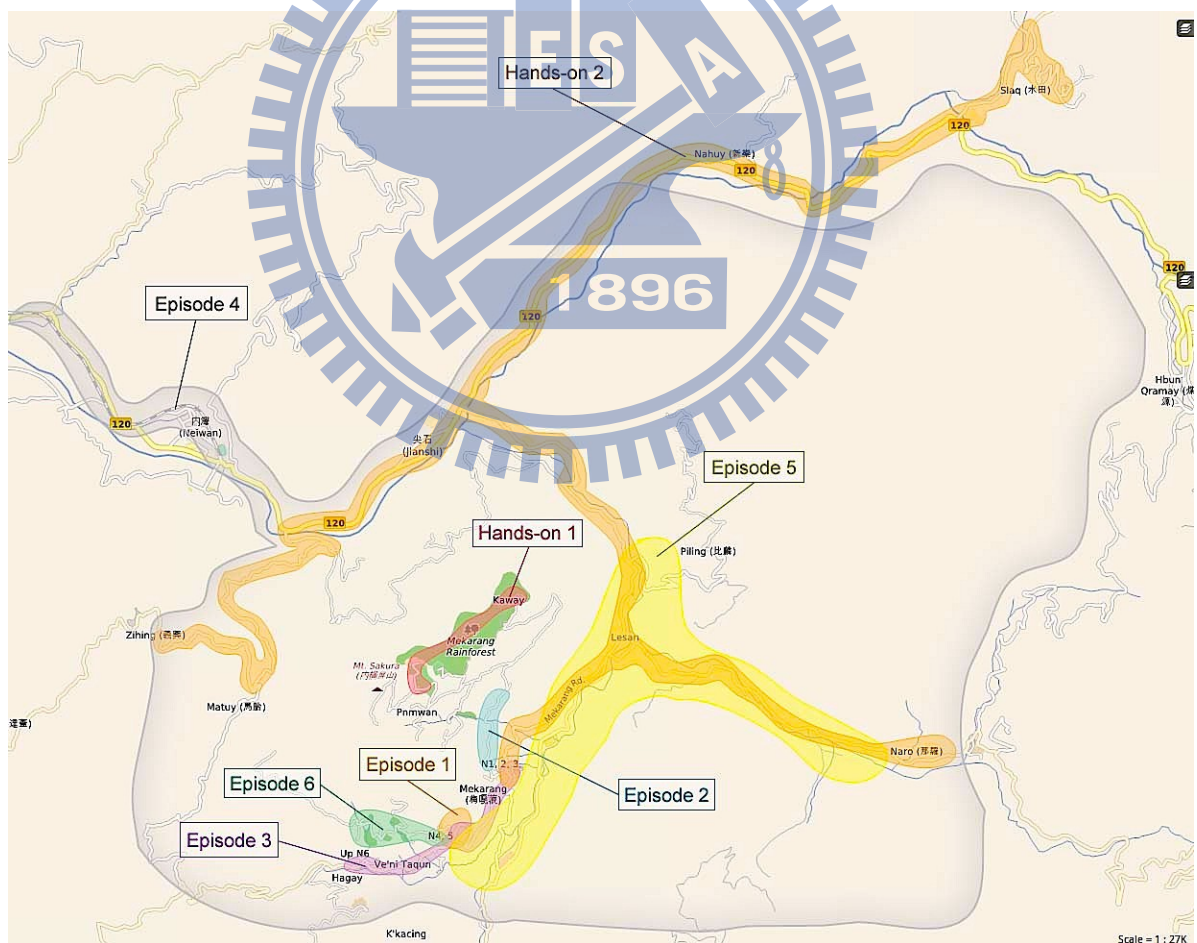


Illustration 16: The overlook of game space of REA 12.

4.3 An English Speaking Environment

One of the purpose of REA 2012 is to raise the awareness of university youth and build up their capabilities to solve urgent issues of global society. Therefore the training is all-English-speaking environment. Mandarin was only used to support in situations when critical points were not understood. .

Before the learners formally joined in REA, RE had gone through selection process to review their English capacity. In addition to language skill, the learner's motivation is also a deciding factor to be accepted into the program.

After the training program, RE filtered further qualified learners according to their performance and then the learners would be endorsed by RE as formal international volunteers to get financial supports from the universities to apply their services abroad.

4.4 Learner Source and Background

25 participants joined in REA 2012; 11 are male and 14 are female; 2 are engineers from ASUS Company of Taiwan Headquarter, 2 are staffs and 21 are students from 4 different universities; among university students, 1 is PHD candidate and 20 are undergraduate students. Almost all NCTU students are from engineering departments and CHU students are mainly from tourism, foreign language and computer science departments. For more details about learners' background, please check Table 5.

Table 5: Name, sex and department of the learners

No.	English Name	Sex (M or F)	Organization- Department	Note
1	Elton	M	NCTU- Service Learning assistant	University Staff
2	Daniel	M	NCTU- Service Learning part-time assistant	
3	Victor	M	NCTU- Computer Engineering	PHD Candidate
4	Crack	M	NCTU- Computer Engineering	
5	Sam	M	NCTU- Electrophysics	
6	Josh	M	NCTU- Electronics Engineering	
7	Marco	M	NCTU- Civil Engineering	
8	Willy	M	NCTU- Computer Engineering	
9	Allen	M	NCTU- Computer Engineering	
10	Ivy	F	NCTU- Communication & Technology	
11	B. Bella	F	CHU- Students Affairs Office Assistant	University Staff
12	S. Bella	F	CHU- Computer Science	
13	Tabi	F	CHU- Tourism	
14	Krystal	F	CHU- Computer Science	

15	S. Apple	F	CHU- Tourism	
16	Joyce	F	CHU- Computer Science	
17	James	M	CHU- Computer Science	
18	Cielo	F	CHU- Foreign Language	
19	Summer	F	CHU- Foreign Language	
20	Rita	F	CHU- Computer Science	
21	Winny	F	CHU- Industrial Management	
22	Meilani	F	ASUS Engineer from Global Citizenship Program	ASUS Company staff
23	Angie	F	ASUS Engineer from Global Citizenship Program	ASUS Company staff
24	Vanessa	F	ASUS Campus CEO from NCHU	
25	Sheng	M	ASUS Campus CEO from NCU	

4.4.1 Learner Attendance

For the learners' attendance, the average attendance of Salon 2 to Salon 6 is 17 persons. The attendance of Salon 1 and Salon 7 is low, because many learners didn't finish registration before Salon 1 and the purpose of Salon 7 is for the learners whose attendance is lower than 4 out of 6 times to make up for their absence. For more details of learners' attendance, please check Appendix 4.

4.4.2 Learner Competence

NCTU students have higher learning competence compared with CHU students in general. To develop each learner's potential, REA strategically regrouped the learners in each activity throughout.

4.5 Four Approaches, White Space and Game Design

4.5.1 WPC

Human beings nowadays are less literate to plants, not to mention if we could identify what WPC is. According to our observation, the learners are consumers of mass produced food culture and have little opportunities to approach to real foods, plants and Nature. For example, their understanding to cherry is the cherries on the supermarket shelf imported from foreign countries. They have no knowledge of Taiwan cherry trees (台灣山櫻花) that are popularly planted along the roads or in the park. They yield cherry fruits for eating and processing into wine and vinegar.

RE's understanding to Atayal WPCs is from the local seniors' oral history and storytelling and field observations on WPCs' features. From the above, RE found WPCs' relation to the traditional knowledge of Atayal people and further designed the finding into the games of 4 approaches toward Whole System Thinking of WPCs.

The game idea of "Episode 1. Macaque Food Map" was inspired by the interview with Pastor

Sangas¹⁵ that "what monkey¹⁶ can eat, we can eat". This traditional knowledge of Atayal people shows us their principal of picking up wild fruits and as a good reference to identify WPCs.

The learners who played the role as macaque had to think like macaques and used their sensibilities of sight, hearing, smell, taste and touch to explore the local environment and develop their food map.



Illustration 17: The learners were playing as macaques to find food in the wild.



Illustration 18: A learner mimicked macaque behavior.

Table 6 shows RE's findings in the relation between WPCs and the traditional knowledge of Atayal people, field observations on WPCs and the integration of the above into games of REA 12.

It also shows that the approach of WPCs is not self-restricted but also related to the approaches of,

1. Food Culture: indigenous people use WPCs as food and utensils
2. Technology: through searching for WPCs, people can learn the knowledge of local ecology and land-use
3. Education: indigenous people have an advanced knowledge of WPCs which is attributing to the sustainability of human beings

See Chapter 6 for the game rules and game results of Episode 1.

Table 6: RE's findings in the relation between WPCs and the traditional knowledge of Atayal people, field observations on WPCs and the integration of the above into games of REA 12

Atayal WPCs	Traditional Knowledge and Field Observations	Identification Features	Games
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15 Pastor Sangas Tahos (陳光松牧師) was born in Japanese colonial era, now is in his 80s. He was the former pastor of Mekarang Presbyterian Church (梅花基督長老教會). He played an important role in the early missionary work in Atayal society of Taiwan. During 1955 to 1982, he collaborated with Canadian missionaries, Dr. Clare Elliot McGill, and his wife, Mary Grace Theobald, to translate "The TAYAL BIBLE in Today's Taiwan Tayal version", the first bilingual Bible in Atayal and in Mandarin, later becomes an important material for learning Atayal language. Pastor Sangas still engages very actively in the Atayal culture preservation and missionary work in Taiwan and abroad.

16 The monkey that Pastor Sangas mentioned was "Formosan rock macaque" (台灣獼猴).

Wild banana tree ¹⁷	<ol style="list-style-type: none"> 1. Our games start to hunt wild banana trees because it is easy to find indigenous seniors who know how to identify wild and domestic banana trees. (Arne Garvi) 2. Local Atayal people use many parts of the wild banana tree, such as leaves, trunk heart, fruits and root fibers. (Pastor Sangas) 3. Local Atayal people do not cut down wild banana trees to preserve water in the soil and to reduce erosion. (Pastor Sangas) 4. Through searching for wild banana trees, players will learn the knowledge of local ecology and land use. (Apple Jia) 	The height of the wild ones is lower, body is smaller in size, leaf shape is more complete and the underside of leaf is more smooth compared with the domesticated ones. (Pastor Sagas)	<ol style="list-style-type: none"> 1. Episode 1 2. Episode 2 3. Hands-on 2
Common Tree Fern	<ol style="list-style-type: none"> 1. Atayal people take young leaves of Common Tree Fern to cook. (古屏生、祝文君, 2011) 2. The re-entrant (山凹)¹⁸ of Mekarang Village collects a lot of water and its high humidity supports Common Tree Fern, wild banana trees and Giant Elephant's Ear(姑婆芋) to grow (Apple Jia & Sync Wu). See Illustration 19 and Illustration 20 for the pictures of the re-entrant. 	<ol style="list-style-type: none"> 1. Its trunk patten is like the snake skin and its young leaves are curving like question marks. 2. It looks like the jurassic period plants and the misty weather in Mekarang gives it a more mysterious look. (Sync Wu) 	Episode 2
Taiwan cherry tree	<ol style="list-style-type: none"> 1. It is commonly planted along roads and plantations. 2. Its fruits can be fermented to wine and vinegar. 3. It is a good trigger to tell stories about Taiwan cherry tree that Mekarang has been famous for it since Japanese colonial era of Taiwan. 	Female trees yield fruits in spring; bark texture is similar to the kimono fiber (Sync Wu)	Hands-on 1
Ma'aw tree	<ol style="list-style-type: none"> 1. Ma'aw fruit is a popular spice in Atayal 2. Atayal people cook its fruits with meat and soup 	Fruitful yields in June; strong aroma of leaves and fruits; small white spots on the bark (Sync Wu)	<ol style="list-style-type: none"> 1. Episode 3 2. Hands-on. 1
Tana	<ol style="list-style-type: none"> 1. Tana leaf is a popular spice in Atayal 	Strong aroma of	<ol style="list-style-type: none"> 1. Episode

17 The academic name of the wild banana trees found in Mekarang is "Musa formosana (Warb.) Hayata"

18 Williams, H. What is a "Reentrant"?. Retrieved December 15, 2012, from http://web.williams.edu/Biology/Faculty_Staff/hwilliams/Orienteering/reentrant.html

tree	2. Atayal people fry Tana leaves with eggs or cook leaves with meat and soup	leaves; bark thorns are like drawing pins (Synic Wu)	e. 3 2. Hands-on. 1
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Note: the person's name in parentheses is the idea contributor.




Illustration 19: The cement wall beside the green car and the power pole was designed to stop the flooding from the re-entrant.



Illustration 20: The location where the green car parked is the re-entrant and its high humidity supports wild banana trees, Common Tree Fern and Giant Elephant's Ear to grow.

Table 7: Atayal WPCs, identification features and pictures

Atayal WPCs	Picture
<p>Wild banana tree</p>	 <p>(Left) The surface and underside of the wild banana leaf are smooth. (Right) The color of the underside of the wild banana leaf is purple.</p>
<p>Domesticated banana tree</p>	 <p>(Left) The underside of the domesticated banana leaf is covering with white powders. (Right) Banana trees that grow along plantations are mostly the domesticated ones.</p>
<p>Common Tree Fern</p>	 <p>(Middle) The bark pattern is like snake skin. (Right) The young leaf of Common Tree Fern is curving like a question mark or music notation.</p>

Taiwan cherry tree



(Right) The bark is with the horizontal string pattern.

Ma'aw



(Lower left) Ma'aw leaves and fruits.

(Lower right) The small white spots on the bark.

Tana



(Right) The bark thorns are like drawing pins.

Note: pictures are retrieved from "植物面面觀網站", "花蓮縣花蓮市中原國小網站-校園植物" and Rewilding Earth.

4.5.2 Technology

WPC is an innovative technology given by Nature and indigenous people are so good at using this technology in a sustainable way. WPCs can transfer carbon dioxide and sun light into energy for growing and many parts of them can be used by human beings; Atayal people take WPCs as food, medicine, handcraft, house building, cloth fiber, color dyeing and so forth.

Atayal people know Nature is a treasure and they keep a balanced relationship with it. From the interviews with Pastor Sangas, Atayal people go to mountains for hunting and they follow the traditional knowledge: **"take what you need, don't just take what you want"** and **"only hunt in the blooming season and don't kill pregnant and young prey that will decrease their number next year"**.

Can we design a technology that is sustainable to the environment, smart and convenient to use and designed for problem solving? A news that I watched from Taiwan Indigenous TV is the best case of incorporating modern technology and traditional knowledge for problem solving; a village head of some indigenous tribe used his iPhone to check the weather report and at the same time consulted local seniors with their observation to the macro weather to anticipate if the raining amount will reach the standard of evaluation.

RE gave a definition to Technology, *"Technology can broadly be defined as the development and application of tools, machines, materials, and processes that help to solve human problems"*. According to International Telecommunication Union (2011), *"One third of the world's population is online, 45% of Internet users below the age of 25"*, RE proposes that this 1/3 population like young people in Taiwan are obligated to use and design technologies with a purpose, especially with a **"good"** purpose. However, learners from universities are slavery but not designer nor innovator of technologies. Taiwan as an OEM society, our talents are good at the **"development"** and **"deployment"** process of technology production, but have poor performance in the **"design"** process.

"Episode 2. Wild PC" aims to stimulate learners' imagination to design new process or use different tools for problem solving out of a good purpose. In a virtual scenario of post disaster Taiwan, for the sake of survival, the learners had to locate Points of Interests (POIs), such as shelters, WPCs and water resources on School Road with technology resources in hand. Through this process, the learners can simulate **"play life of post disaster before they really**

live life" and learn from Atayal people's traditional knowledge which is an advanced understanding to the local environment to reduce risks of disasters (UNEP, 2006).

To free the learners from modern technology's constrains, they were not allowed to use papers and pens but could use mobile phones and 3C products in hand for map drawing. That was the reason why we called this game "Wild PC". It did not mean personal computers but the smart and proper technology or process designed for problem solving.

See Chapter 6 for the game rules and game results of Episode 2.



Illustration 21: The learners were checking devices in hand



Illustration 22: The learners played the game in the raining day



Illustration 23: A learner used a brick as the pen to draw the map on the stone.



Illustration 24: A learner used Giant Elephant's Ear as the shelter.

4.5.3 Food Culture

Food culture is the best way for learners to immerse themselves in WPCs. It is a better way to introduce WPCs to the learners through tasting local cuisine made out of WPCs than just to tell them the advantages, values and features of WPCs.

The way that Atayal people in Mekarang uses wild banana trees is a good representation of food culture. From the interview with Pastor Sangas, he said: "**Atayal people take wild banana trees as the food and tools, such as using the core of tree trunk to cook with soup, fiber of root as fire source and leaves to wrap food**".



Illustration 25: Mekarang people used rice to ferment raw pork.



Illustration 26: Ikea sells the basket made of banana leaves.

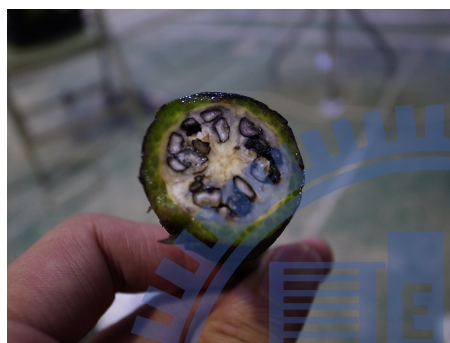


Illustration 27: The wild banana fruit has seeds inside.

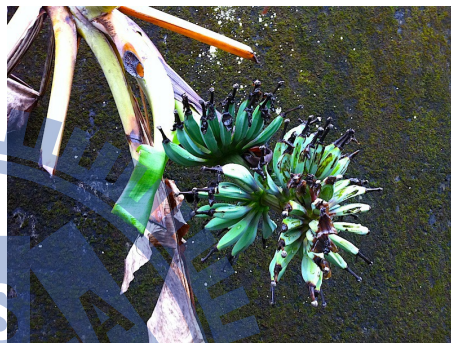


Illustration 28: The wild banana fruits.

RE argues that WPCs adapt to the local environment supporting different conditions and nutrients for them to grow and indigenous peoples develop food culture accordingly. For example, there are many wild banana trees growing around Taiwan and indigenous peoples in different places cook and use them in a similar way. Amis people (阿美族), who mainly live in the eastern coast of Taiwan, are good at fishing and picking up wild vegetables as food but Atayal people (泰雅族), who mainly live in mountainous areas from northern to middle Taiwan, are good at hunting in the mountain forests.

However, our local food culture has been changed enormously by the western food culture leading to urgent issues such as the low food self-sufficiency ratio and the loss of crop diversities. Real cases of Taiwan DEHP scandal 2011 and US beef import event 2012 showed people in Taiwan that the invasion of cheap food blinded our eyes to see the high cost of environment, health and society behind it.

RE designed "Episode 3. Indigenous Food Map" for the learners to visit to the Atayal farmers' houses and learn the species, selling price, recipes, food storage of WPCs in Mekarang.

The approach of food culture was integrated in Hands-on 1 that the learners picked up Ma'aw fruits and Tana leaves for their lunch while exploring WPCs on the Kaway Path.

See Chapter 6 for the game rules and game results of Episode 3.

4.5.4 Education and White Space

RE designed 3 episodes for the approach of education. In Episode 4 and 5, the learners played

the role of "the rulers" and used the unlimited developing methodology to destroy WPCs and people's livelihood. RE adopted the game idea from the construction and management simulation game "SimCity"¹⁹ that players use a mayor's perspective to develop a city while maintaining satisfaction of the citizens and balancing the budget. In Episode 6, The learners reformed the value of WPCs by using an "Atayal Earth Citizen" perspective to simulate people's new life in a post disaster scenario.



Illustration 29: Suburbs of SimCity.



Illustration 30: Wind Farm of SimCity.

Source: Retrieved December 15, 2012, from

http://www.simcity.com/en_US/media/screenshot/SimCity_Creator_Seaside_City

In "Episode 4. Colonial Taiwan (1895-1945)", the learners were assigned to play the role of 8 different experts from the ruling class of Japanese colonial era. The role of 8 experts were developed from the 6 domains of "Whole System Thinking". RE added 2 more roles to education domain, principals and volunteer groups from universities, to trigger the learners' deeper reflections and different perspectives to their role as the international volunteers and school learners in the real world. Their mission was to map out "Mekarang Timber Harvesting Plan" which was a real case that had happened in Mekarang 60 years ago²⁰.

The game play of "Episode 5. Industrial Taiwan (1945-2012)" is similar to Episode 4. The learners played the role of experts from the period of rapid industrialization and economic growth of Taiwan and their mission was to map out "Piling Water Dam Project". The dam project which aims to supply water for Hsinchu Science Park has been assessed by the government since 2007. Local people and experts warned that a devastating impact would bring to the livelihood of communities nearby Mekarang if the dam project would be put into practice.

¹⁹ Please refer to SimCity Web site:<http://www.simcity.com/>

²⁰ See 3.4 The Wild Perennial Crops Classroom - Mekarang, Chapter 3.



Illustration 31: The learners did the mapping plan outside of Mekarang Church to image what impact will bring to the local environment.

To urge the learners' understanding to the importance of "**unlearning and undevelopment**", after one team presented their mapping plan, RE asked the opponent team to play Atayal people who were "the ruled" to imagine the situation. Through the "**reverse role-playing**", the learners could realize if they implemented the unlimited developing methodology that was taught by conventional education without considering the targeted service group, they were just playing the puppets to serve the rulers.

Transitioning from using the old perspective, the learners used the new perspective of "unlearning and undevelopment" in Episode 6. They played the role of "Atayal Earth Citizens" from 8 expert fields and their mission was to map out "Church Road Undevelopment Plan" for the evacuation of Han people to Mekarang after the nuclear disaster.

After the disaster, there is no power, oil and tap water any more. RE asked the learners to imagine how to use WPCs to solve the education, leisure, health care and transportation problems while maintaining satisfaction of different ethnic groups living here.



Illustration 32: The learners were grouped to investigate WPCs on Church Road in Episode 6.



Illustration 33: The learners were marking WPCs on Church Road in Episode 6.



Illustration 34: The learners were discussing "Church Road Undevelopment Plan" in Episode 6.

Episode 1 to 6 are a leveling-up system of game design and within it the repeating of role-playing is a process for learners to go into "White Space" to put aside what they have learned in school to think from their hearts without prejudices and assumptions. After continuing practice of going into White Space and leaving from it, the learners' mindset was more improvised to what was thrown at them and more able to think from other perspectives.

See Table 8 and Table 9 for the comparison of game setting and role-playing of Episode 4, 5 and 6.

See Chapter 7 for the game rules and game results of Episode 4, 5 and 6.

Table 8: The comparison of game setting of Episode 4, 5 and 6

Episode	4	5	6
Theme	East Asia Co-Prosperity	High-Tech Island	Read the Book by God
Mission	Mekarang Timber Harvesting Plan	Piling Water Dam Project	Church Road Undevelopment Plan
Whole System Thinking	Red space	Blue space	White space
Era	Colonial Taiwan (1895-1945)	Industrial Taiwan (1945-2012)	Post-Disaster Taiwan (2012-2100)
Culture	Japanese culture	Han culture	Atayal culture
Mindset	Colonialist	Industrialist	Earth citizen
University	Tokyo Imperial University / Taihoku Imperial University	NCTU / NTHU / CHU	Rewilding Earth Academy
Volunteering	Japanese college students	Han college students from mountain people service clubs	International volunteers

Table 9: The comparison of role-playing in 6 domains of Episode 4, 5 and 6

6 Domains	8 Roles in Episode 4	8 Roles in Episode 5	8 Roles in Episode 6
1. Governance	1. Japanese police captain	1. Han local governor	1. Atayal seniors
2. Economy	2. Japanese timber industrialist	2. Han water dam engineers	2. Atayal farmers
3. Ecology	3. Japanese botanist	3. Han biotech scientists	3. Atayal farmers
4. Health	4. Japanese medical doctor	4. Han medical doctors	4. Atayal medical doctors
5. Culture	5. Japanese anthropologist	5. Han social scholars	5. Atayal church pastors
6. Education	6. Japanese school teacher	6. Han school teachers	6. Atayal school teachers
	7. Principals of Tokyo Imperial University (now 東大) and Taihoku Imperial University (now 台大)	7. Principals of NCTU and CHU	7. Principals of Atayal Tribal University
	8. Service Learning Programs for Japanese university students	8. Service Learning Programs for Han college students from mountain people service clubs	8. Service Learning Programs for Atayal college students

4.5.5 Hands-on Activities

Episode 1 to 6 are a leveling-up system of game design to build up the learners' Whole System Thinking toward WPCs and hands-on activities are at higher level over episodes; thus it was suggested that the learners should join the previous episodes to equip themselves with the basic knowledge to be qualified to join in hands-on activities. For game designers, hands-on activities were designed to test a WPC check-in game with a "learning by doing" method.

In the beginning, RE only designed "Hands-on 1. Coming of Age Test in Mekarang", however some learners' attendance was lower than 4 out of 6 times, RE designed "Hands-on 2. Journey into the Unknown" for them to compensate their attendance.

See Chapter 8 for the game rules and game results of Hands-on 1 and 2.

4.5.5.1 Hands-on 1. Coming of Age Test in Mekarang



Illustration 35: The learners were using the GPS cellphone and print-out map to find the entrance of the Kaway Path.



Illustration 36: The learners were approaching to the entrance of the Kaway Path.

In Hands-on 1, players had to explore the Kaway Path, a secret hunter trail in Mekarang, to check in WPCs with GPS smart phones and integrate their learning on WPCs into the playing as a test to become qualified Atayal youths. Our game idea is from an Atayal traditional saying that "**hunters can survive in high mountains for a long time with a knife and a little salt**".

Compared with the game space like Mekarang Rd., Church Rd., and School Rd. which are service roads, the Kaway Path is part of an ancient hunter trail with historical remains and stories, WPCs and plantations along the trail. Mekarang Village has planned to develop this trail as a feature of community tourism currently. To pass the trail, the hikers must be approved by the village people and the village seniors will be assigned to remove wild weeds and hunters' traps on the trail for people to pass. The trail, with no obvious entrance and exit and many steep slopes, is not very long by distance though. However it is dangerous to pass without local people's guidance.

People could see many farmers' plantations along the trail, planting persimmons, gingers, bamboo shoots, plum trees and tree bean bushes. In Mekarang rainforest, there are many pine trees, ma'aw trees and tana trees; pine trees were planted to preserve the water in the soil and ma'aw and tana trees are mostly wild species. On the Kaway Path, there are some small coffee and persimmon plantations scattering around, and 3 sign boards reminding people that during Japanese colonial era, the Japanese government built up the former Mekarang Primary School and bunkers on the path to control neighboring areas like Zhudong and Naro tribe. Maps of Mekarang forest and the Kaway Path are shown as Illustration 48 and Illustration 49.

Before this activity, RE was approved by Mekarang village to pass the trail and investigated this trail for 3 times for mapping. The facilitators played the role of Atayal seniors to teach the learners how to identify WPCs and introduce them geographic features of Mt. Neihengping and history of the Kaway Path.

RE gathered the learners in Pnmwan. The learners used mobile apps to collect OSM data for offline use. Later, they used the mobile apps that support GPS tracking and offline maps to find the entrance of the path, pass through the Mekarang rainforest, arrive at the Kaway Path

for lunch and approach to the exit without following the original trail.

During the exploration, they must identify and do check-ins for WPCs with the mobile phones, taste WPCs like tana leaves and ma'aw fruits with their lunch on the Kaway Path, and learn the land-use of Mt. Neihengping. This activity was the integration of 4 approaches of WPCs and the learners could have an authentic experience to explore WPCs on the steep slopes, feel like real Atayal youths learning hunting skills from seniors and even imagine the conditions that Japanese colonists had 60 years ago.



Illustration 37: The learners were discussing the map drawing.



Illustration 38: The group presentation and reflection.

4.5.5.2 Hands-on 2. Journey into the Unknown

The core concept is **to promote the name rectification of indigenous people by assigning players to explore places with indigenous names and do the storytelling on their journey.** As we know that many places have indigenous names however they were renamed by the rulers in different era. Mekarang means the place that is good for planting sticky rice in Atayal, but after KMT retreated from Mainland China to Taiwan, it was renamed as "Meihua Village" that has strong political connotation.

RE designed this game based on a popular Japanese TV program "田舎に泊まる" (來去鄉下住一晚) and RE expected that the players could develop interesting stories with the people they encountered and know more about indigenous context and geography features of these places through the exploration, e.g. Zihing (now is 義興村) means termite's home, Naro (now is 錦屏村) refers to the place with many wild persimmons, Nahuy (now is 嘉樂村) refers to the place with flames, and Slaq (now is 新樂村) means the mud in the paddy rice fields.

RE grouped 2 persons in each team and they had to locate presbyterian church and primary school within the target place and add the waypoints of WPCs in their journey with GPS smart phones. The game space was on the largest scale ever more than previous games, so the players not only had to prepare at least 1 GPS smart phone but also a motorcycle for them to search for WPCs and target locations.



Illustration 39: Locations of villages in Jianshi Township.

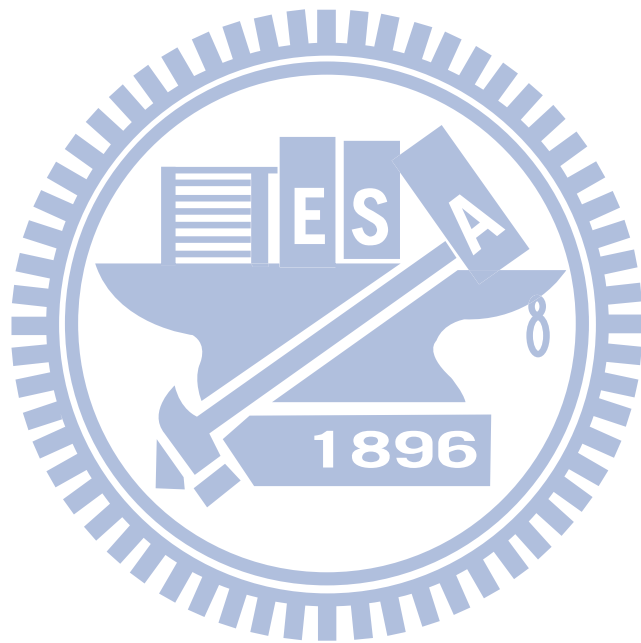
Source: 尖石鄉公所觀光導覽地圖



Illustration 40: A learner asked the local people about the target place's location.



Illustration 41: A learner asked Senior Dali about Naro's location.



Chapter 5 : Mapping in the REA 12

5.1 Using OpenStreetMap as Map Data Source for Gaming

OpenStreetMap (OSM) is a non-commercial and collaborative project to create a free editable map of the world supported by OpenStreetMap Foundation. Its driving force is the availability of map information around the world released from governmental and commercial sectors and the popularity of inexpensive portable satellite navigation devices. OSM's registered users is about 1,010,000 in January 2013²¹.

OSM was inspired by Wikipedia that the system will save all editing histories contributed by users from the world. All registered users could log in to update GPS tracks and edit the vector data using OSM editor which background is the satellite photos of Bing Maps developed by Microsoft. OSM licenses its data with Open Database License (ODbL) to promote free use and re-distribution of data, both commercial and non-commercial.

Due to its data license, OSM is used as a data source for numerous other sites, which choose to highlight or remove specific features of the data, and provide features like higher performance and different aesthetics. Famous web services, like Foursquare and Wikipedia have adopted OSM as their map data source.

Google has a similar project called "Google Map Maker", however it has been criticized by requiring its contributors to accept to grant a licensing agreement that will mostly be beneficial to Google. According to Fitzpatrick (2012), "Google provides a form for the contributors to submit data but it is not available for easy reuse by the public". Its user community consisting of over 25,000 persons collaborates on map sharing and improvement.

5.2 To develop the Indigenous Knowledge Maps with OSM

OSM welcomes contributors to edit their maps with local knowledge; students can draw campus buildings with details like gardens, restaurants and car parks; bikers can draw cycle paths from their homes to work places and notify the dangerous routes for commuters to watch out for; community people can plot historical houses, temples, streams and bridges that are meaningful to them for culture preservation, etc.

There are two major ways that RE tried to develop the indigenous knowledge maps in an experimental way,

1. **Draw objects in a WPC centered way:** objects like "natural", "water", "agriculture" objects and so forth were highlighted on OSM for easy access to WPCs. Even artifacts such as roads or amenities were seen as coordinates for players to locate target WPCs.
2. **Name object tags with an Atayal perspective:** the key principal for place naming was to use indigenous names. When creating objects, their names were named in English and Atayal, with the Mandarin name in parentheses. The purpose was to meet most users' needs, including global, indigenous and Chinese users. For example, "Slaq Elementary School (新樂國小)" is located in the Slaq tribe, but its Mandarin name was named by its administrative district "新樂村" which is at a village level. We didn't use "Xingle Elementary School" as the English name, but used "Slaq" to keep its indigenous context.

²¹ OpenStreetMap Statistics, retrieved December 15, 2012, from http://www.openstreetmap.org/stats/data_stats.html

5.3 Mapping Steps

Our mapping work lasted from March 11 to May 29. The steps of mapping with OSM are as follows,

1. **Tracking with GPS mobile phones:** iPhone 4 and HTC Desire S were used to download GPS trail apps for recording track and pinpointing plants and artifacts while driving in the country roads of Mekarang. Because the mobile phones were not able to receive 3G signal in Mekarang, the background map or satellite photos did not show but only GPS arrow moving around on the screen while driving.
2. **Basic editing with Potlatch 2 editor:** after logging in OSM, users used its editor "Potlatch 2" to update .gpx files of recorded track and edit the maps. Potlatch 2's background layer is the aerial imagery supported by Bing Maps of Microsoft. If the aerial imagery was not clear enough, we used satellite photos of Google Maps to improve the mapping.
3. **Creating elements for and tagging objects:** node, way and relationship were the basic "element" for an "object" such as road, path, stream or forest. After creating an object, "tagging" was the next step. For example, "School Road" was composed of node and way elements and tagged as "tertiary road".
4. **Saving changes and waiting for OSM to verify and update:** After saving changes of the map editing, it would take about 2 days for OSM to update the website.

5.4 Mapping Outputs

Table 10 shows objects and their tag names that RE edited on OSM. Code no. 1-3 are rivers and brooks, no. 4 is the secondary road (縣道) and no. 5-12 are the tertiary roads (鄉道). Code no. X.X. are unknown service roads (未知名便道) branching from tertiary roads and Code no. X.XX. are unknown service roads branching from unknown road of X.X. Tags without code number are objects drawn along or nearby a road with the number, e.g. "Nahuy (新樂)" is an object nearby "no. 4 竹 120".

Table 10: Creation of object tags for REA 12 on OSM

Code No.	Tag Name	Note
1	Youluo River (油羅溪)	
2	Mekarang Brook (梅花溪)	
3	Naro Brook (那羅溪)	
4	竹 120	the secondary road (縣道) from Neiwan to Lavender Cottage
	Nahuy (新樂)	"Nahuy" means the place with flames in Atayal however after KMT retreated to Taiwan, it has been under the jurisdiction of 新樂 Village. We put the Mandarin name "新樂" in parentheses for Chinese users to search for this place
	Jianshi Junior High School (尖石國中)	

	Lavender Cottage (薰衣草森林)	the famous tourist site in Jianshi County
	八五山	
4.1	Unknown service road	the service road branching from 竹 120 to Hbun Qramay (竹 120 岔出未知名便道至煤源)
	Hbun Qramay (煤源)	
5	竹 58 / 水田道路	the tertiary road (鄉道)
	Slaq Elementary School (新樂國小)	
5.1	unknown service road	the service road branching from 竹 58 to Slaq Church (竹 58 岔出未知名路至水田長老教會)
	Slaq (水田)	
	Salq Church (水田長老教會)	
	Ptlaman Digital Opportunity Center (北得拉曼數位機會中心)	
6	竹 59	the tertiary road (鄉道)
	Zihing (義興)	
	Takay (達蓋)	
	Matuy (馬胎)	
7	竹 60	the tertiary road (鄉道)
	Nahuy Church (尖石長老教會)	
	Jiaxing Elementary School (嘉興國小)	
	嘉興大橋(舊橋)	
	嘉興二號橋	
	Jingping Community Center (錦屏村集會所)	
	Lesan (天打那)	
	錦屏大橋	
	Naro (那羅)	tags in Naro: entrance shop, bridges, roads
	Naro Elementary School (錦屏國小)	
	Naro Church (那羅長老教會)	
	Yulao (宇老)	
	宇老派出所	
	Qalang Smangus (司馬庫斯)	
7.1	unknown service road	the service road branching from 竹 60 to the

		direction of Piling (竹 60 與比麟大橋交叉口岔出未知名便道至比麟方向)
	比麟大橋	
	Piling (比麟)	
	Piling Church (比麟真耶穌教會)	
8	竹 60-1	the tertiary road branching from 竹 60 to Mrqwang (鄉道)
	Yufeng Elementary School (玉峰國小)	
	Mrqwang (馬里光)	
	Mrqwang E-learning Center (馬里光數位機會中心)	
9	竹 61	the tertiary road (鄉道)
	Shanglin Church (上林教會)	
	Beauty Hot Spring (美人湯館)	
9.1	unknown service road	the service road branching from 竹 61 to 竹 62 (未知名便道自竹 61 分岔與竹 62 相通)
10	Mekarang Road (竹 62 / 梅花道路)	tags on Mekarang Road: power poles, bridges, streams, Hsinchū Bus stops and bridges
	Mekarang Elementary School (梅花國小)	
	Mekarang Police Station (梅花派出所)	
	Mekarang shop	
	Shanqing Farm House (山清休閒農場)	
	Arakan Watch Tower	An Atayal watch tower between Mekarang Village Head's house and the entrance of Shanqing Farm House
	Yamux	
	Bamboo hut	nearby the big turn between Mekarang Elementary School and Mekarang Church
	Mekarang Presbyterian Church (梅花基督長老教會)	
	Ve'ni Taqun	
	Up N6 of Mekarang Village	alternative name: 梅嘎蒨上 6 鄰部落
	N6, N7 and N9 of Mekarang Village	alternative name: 梅嘎蒨 6 鄰、7 鄰、9 鄰部落

	天湖社區	
	Rae'era (天湖)	
	Mayhoman Elementary School (花園國小)	
	Mayhoman (花園部落)	
10.1	School Road	<ol style="list-style-type: none"> 1. service road branching from 竹 62 and stretching from the campus wall of Mekarang School to the higher mountains (未知名便道自竹 62 沿梅花國小圍牆往山上方向延伸) 2. tags on School Road: power poles, bridges, streams, houses
	N 1, 2, 3 of Mekarang Village	alternative name: 梅嘎蕩 1 鄰、2 鄰、3 鄰部落
	Pnmwan	
	Mekarang Rainforest	
	The Kaway Path (太子古道)	tags on the Kaway Path: 3 sign boards notifying historical sites for tourists
10.11	Bamboo Road	the service road branching from the School Road to Mekarang Rainforest (便道)
10.12	unknown service road	the service road branching from the School Road to Mt. Sakura (便道)
	Mt. Sakura (內橫屏山)	
10.2	Church Road	<ol style="list-style-type: none"> 1. the service road branching from 竹 62 along Mekarang Church and stretching to Meihua Guest House (未知名便道自竹 62 沿梅花教會至梅花山莊) 2. tags on Church Road: power poles, bridges, streams, houses
	N4 and N5 of Mekarang Village	alternative name: 梅嘎蕩 4 鄰、5 鄰部落
	Water Tank	a big water tank by a curved road
	513 Farm House (513 農莊)	Han People property
	Meihua Guest House (梅花山莊)	
	Church Rd. Wood 1 to 3	3 woods by Church Road where many wild banana trees, Common Tree Fern, Taiwan Tree Fern and Giant Elephant's Ear grow
10.3	unknown service road	the unknown service road branching from 竹 62 to Mekarang Co-op Farm (未知名便道自竹 62 至梅嘎蕩共同耕作農場)
	Ha'gay	
	Mekarang Co-op Farm (梅嘎蕩)	

	共同耕作農場)	
10.4	unknown service road	the unknown service road branching from 竹 62 to Matuy (未知名便道自竹 62 至馬胎)
11	竹 33	the tertiary road (鄉道)
12	竹 35	the tertiary road (鄉道)

5.5 Usage of Maps Supported by OSM

OSM is a street map, but also used as a data source for numerous other sites, which choose to highlight or remove specific features of the data and provide features like higher performance and different aesthetics. Some websites and applications are found that overlay OSM data to get hybrid maps which are suitable for teaching and gaming.

1. **OpenStreetMap**²²: it has 4 base layers; "Standard", "Cycle Map", "Transport Map" and "MapQuest Open" and users can choose one of them to get the map with different features. Users can browse other contributors' work in the page of "GPS track uploads" and "History" on OSM. "Standard" layer is shown as Illustration 42 and Illustration 43 and "Cycle Map" layer is the same as OpenCycleMap.
2. **OpenCycleMap**²³: it was designed for cyclists at first but was found to be the best map for terrain rendering. Users have 3 choices for base layer, "OpenCycleMap", "Transport" and "Landscape", and each one of them can overlay with OSM data to highlight different features. In Episode 4 and 5, RE selected "OpenCycleMap" as the base layer that shows contour lines of a target place and printed it with the zoom-out view to get a 3 dimensional effect, shown as Illustration 44; thus if using a zoom-in view, the map will look flatter than the zoom-out view, shown as Illustration 47.
3. **OpenStreetMap in Google Earth**²⁴: the functions of Google Earth, especially the 3 dimensional view and the map data of OSM can be combined. A KML network link can display 5 different OpenStreetMap overlays in Google Earth. Users must download a .kmz file and open it in Google Earth to get the result shown as Illustration 45.
4. **Transparent Map Comparisons**²⁵: In Episode 6, Transparent Map Comparisons was used to choose the base layer of "Google Aerial" and overlays of "OpenStreetMap Mapnik" and "Hillshading" and the scrolling bar moved right and left to decide the transparent effect of the base layer and overlays. The hybrid map is shown as Illustration 46.
5. **Mobile Apps supporting OSM offline map**²⁶: In Hands-on 1 and 2, the learners first used the internet to download apps and used them to collect OSM data for offline use. See Table 11 for apps used in Hands-on1 and 2.

Table 11: Map mission area and map materials used in REA 12

Game	Mapping	Map Usage
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22 Please refer to OpenStreetMap Web site: <http://www.openstreetmap.org/>

23 Please refer to OpenCycleMap Web site: <http://www.opencyclemap.org/>

24 Please refer to OpenStreetMap in Google Earth Web site: <http://ge-map-overlays.appspot.com/openstreetmap>

25 Please refer to Transparent Map Comparisons Web site: <http://sautter.com/map/>

26 For Android mobile device, please refer to OsmAnd (<http://osmand.net/>) and MyTracks (<http://www.google.com/mobile/mytracks/>) and for iOS mobile device, please refer to myTracks (<https://itunes.apple.com/en/app/mytracks-the-gps-logger/id358697908?mt=8>) and OpenMaps (<http://izeize.com/openmaps/>)

	Mission Area	
Episode 1. Macaque Food Map	Mekarang Church neighborhood	Projection of OpenStreetMap is shown as Illustration 42
Episode 2. Wild PC	School Road	Projection of OpenStreetMap is shown as Illustration 43 (School Road is in white color with many black dots which are power poles)
Episode 3. Indigenous Food Map	Mekarang Road	Projection of OpenStreetMap is shown as Illustration 42 (Mekarang Road is in yellow color with many black dots which are power poles)
Episode 4. Colonial Taiwan, 1895-1945	Neiwan to Mekarang Village	Print-out map of OpenCycleMap in A3 size is shown as Illustration 44
Episode 5. Industrial Taiwan, 1945-2012	Piling Tribe to Mekarang	Print-out map of OpenCycleMap in A3 size is shown as Illustration 44
Episode 6. Post-Disaster Taiwan, 2012-2100	Church Road	<ol style="list-style-type: none"> 1. Print-out map of OpenStreetMap in Google Earth in A3 size is shown as Illustration 45 2. Print-out map of Transparent Map Comparisons in A3 size is shown as Illustration 46 3. Print-out map of OpenCycleMap in A3 size is shown as Illustration 47
Hands-on 1. Coming of Age Test in Mekarang	The Kaway Path in Mt. Neihengping	<ol style="list-style-type: none"> 1. Projection of OpenStreetMap is shown as Illustration 48 1. The learners first used the internet to download apps and used them to collect OSM data for offline use 2. Print-out map of OpenStreetMap in A1 size is shown as Illustration 49 2. Mobile Apps: <ol style="list-style-type: none"> 1. OsmAnd and MyTracks for Android mobile device with GPS 2. myTracks and OpenMaps for iOS mobile device with GPS
Hands-on 2. Journey to the Unknown	Nahuy, Naro, Zihing and Slaq	<ol style="list-style-type: none"> 1. OpenStreetMap <ol style="list-style-type: none"> 1. Learners first used the internet to download apps and used them to collect OSM data for offline use 2. Mobile Apps: <ol style="list-style-type: none"> 1. OsmAnd and MyTracks for Android mobile device with GPS 2. myTracks and OpenMaps for iOS mobile device with GPS

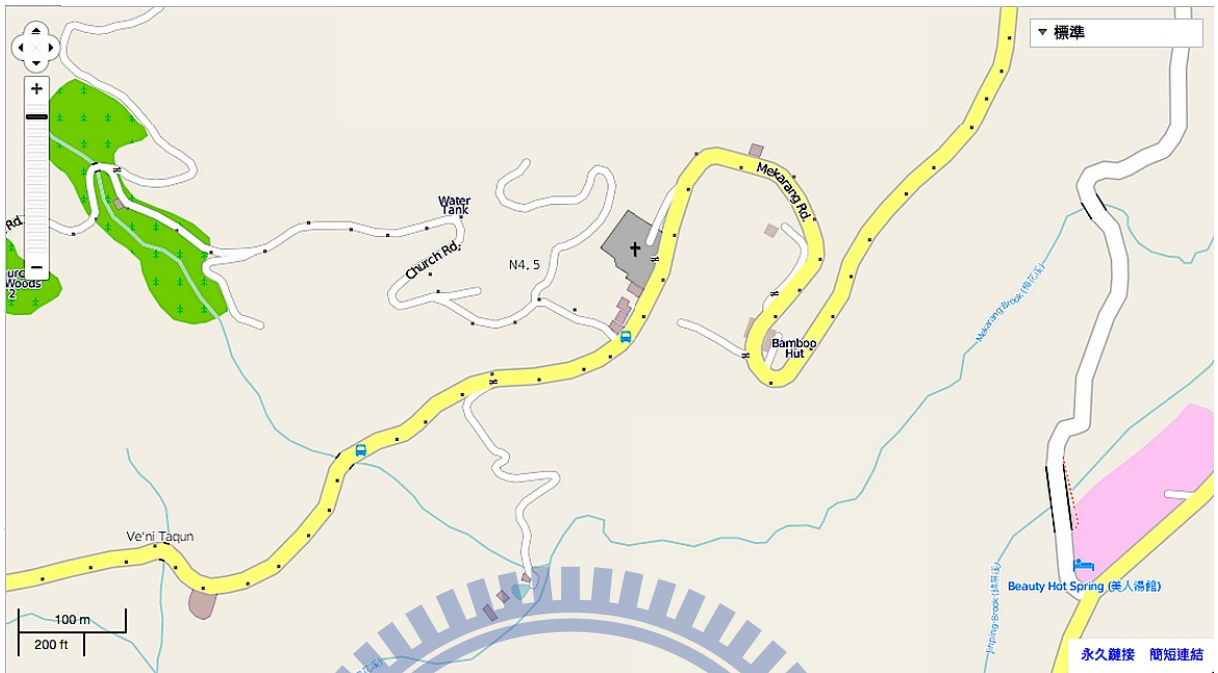


Illustration 42: The zoom-in area of Mekarang Road, OpenStreetMap used in Episode 1 and 3.

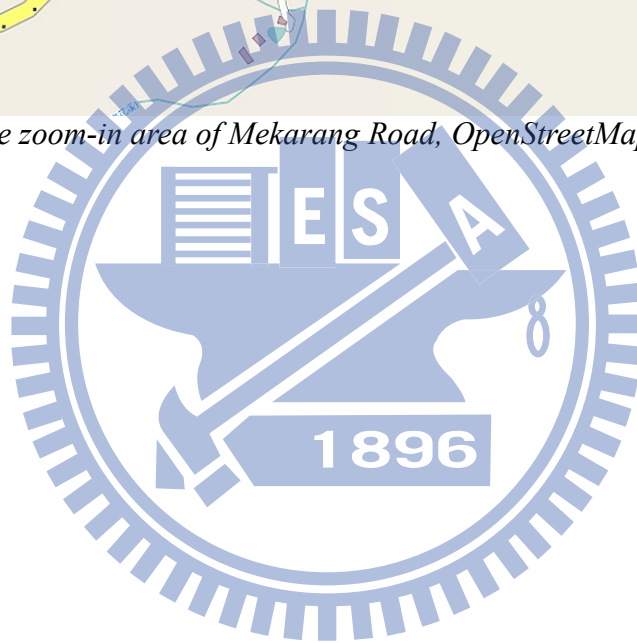




Illustration 43: The zoom-in area of School Road, OpenStreetMap used in Episode 2.

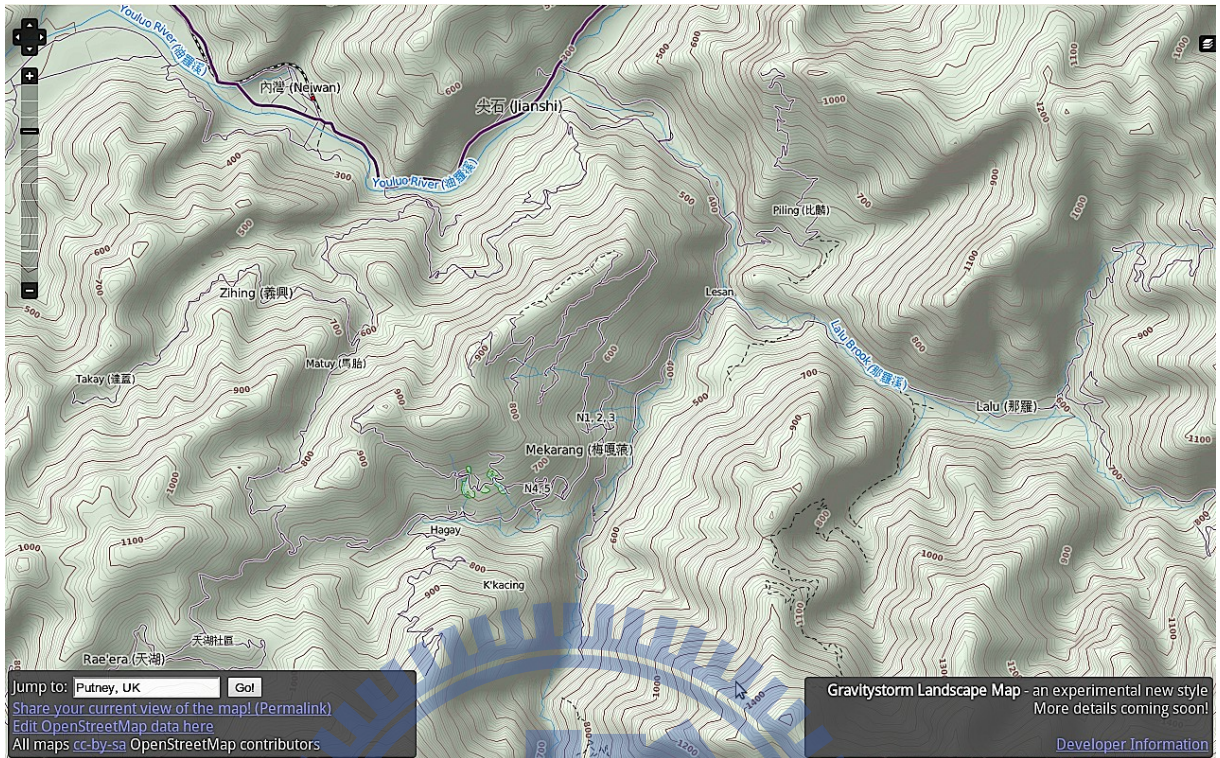


Illustration 44: The print-out map in A3 size, OpenCycleMap, used in Episode 4-5.

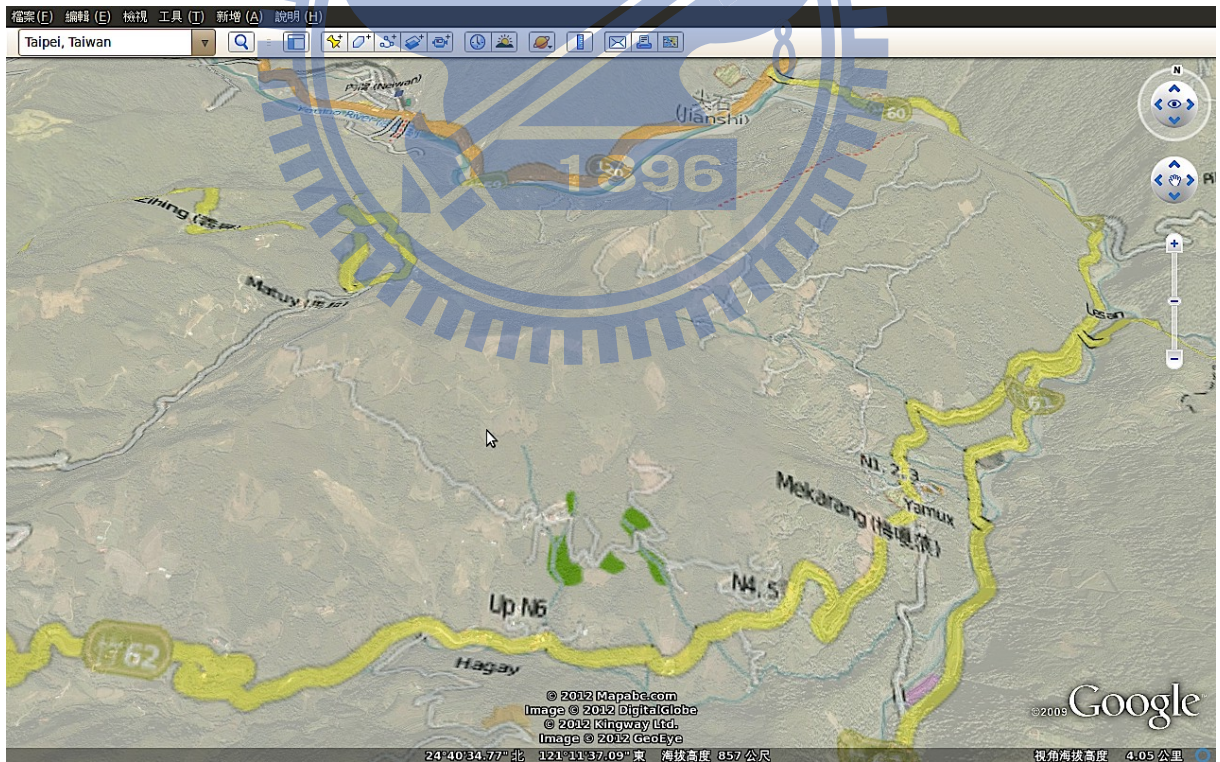


Illustration 45: The print-out map in A3 size, OpenStreetMap Mapnik in Google Earth, used in Episode 6.



Illustration 46: The print-out map in A3 size, "Google Aerial" Base Layer, "OpenStreetMap Mapnik" and "Hillshading" Overlays, Transparent Map Comparisons, used in Episode 6.

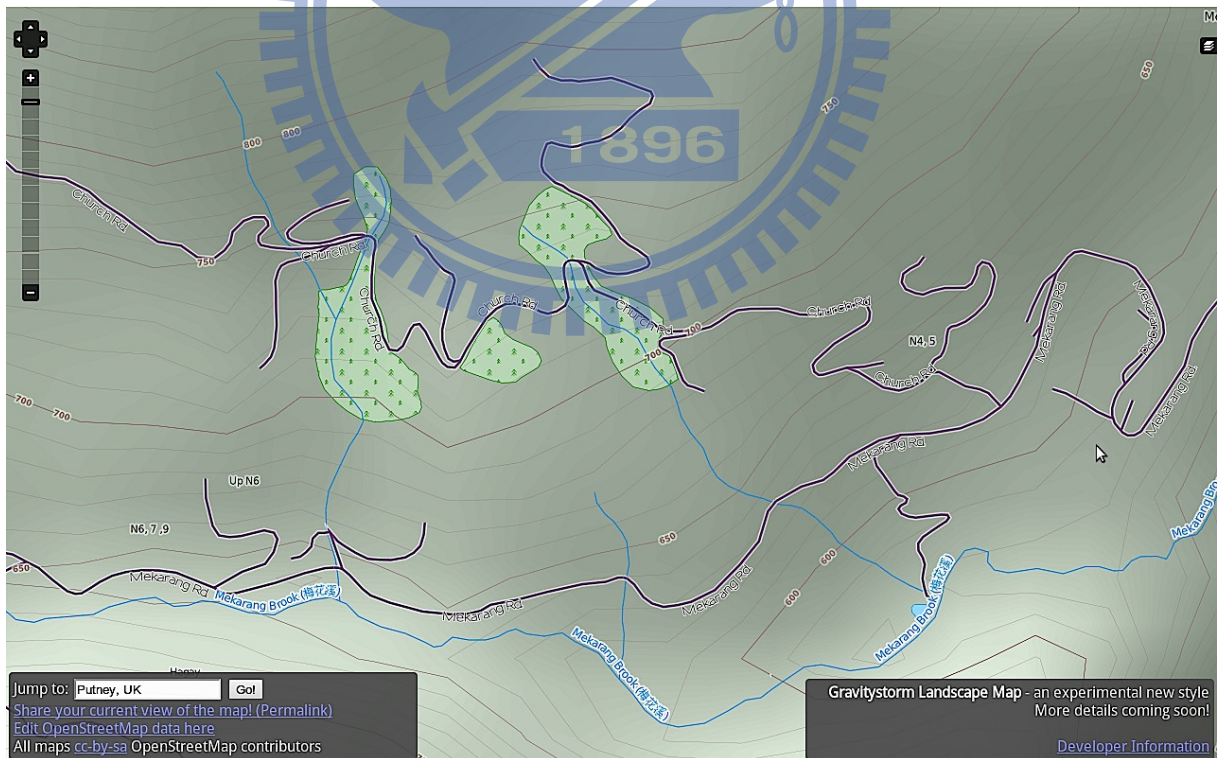


Illustration 47: The print-out map in A3 size, "Landscape" Base Layer, OpenCycleMap, used in Episode 6.

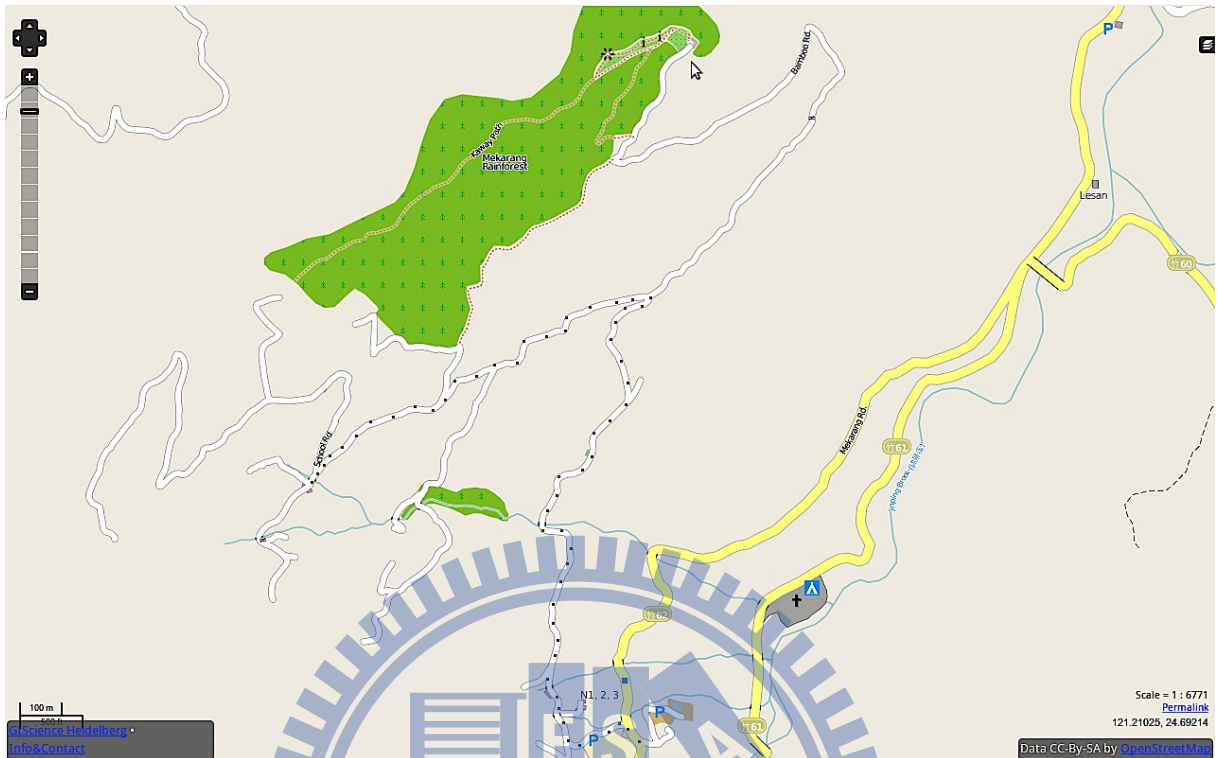


Illustration 48: The zoom-out area of the Kaway Path, OpenStreetMap used in Hands-on 1.

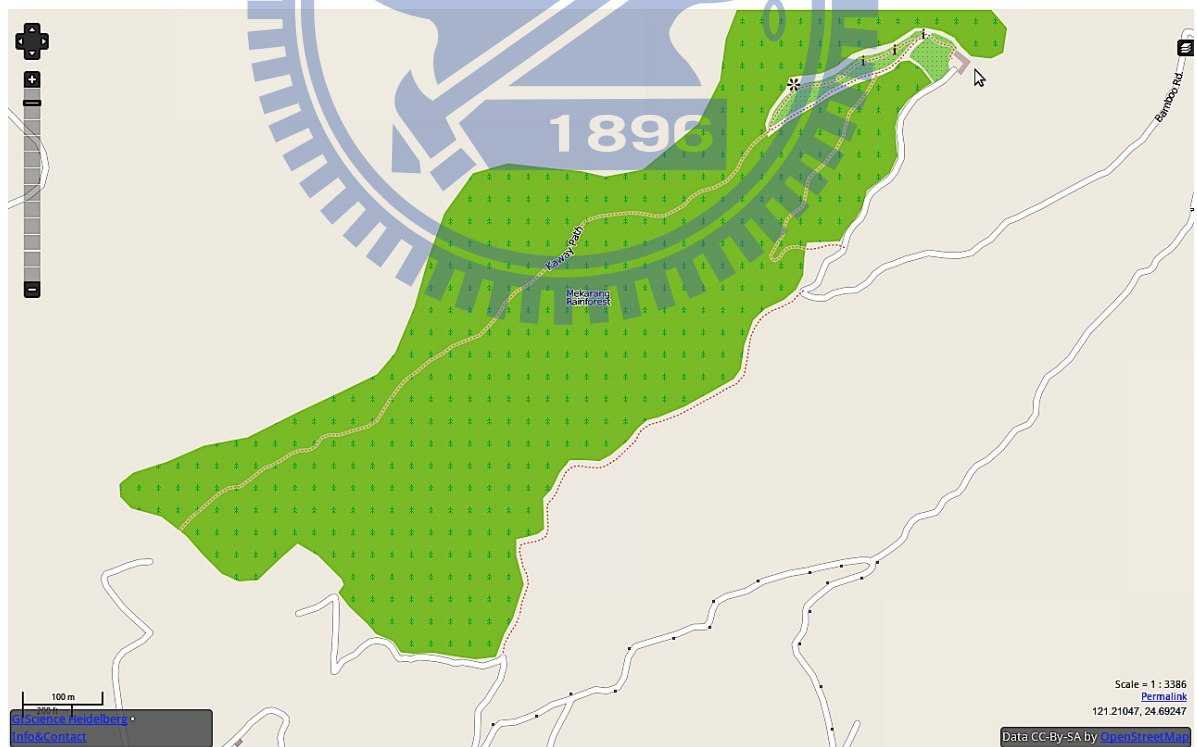


Illustration 49: The zoom-in area of the Kaway Path, print-out map in A1 size, OpenStreetMap used in Hands-on 1.