# Reducing the Ecological Footprint of a Nature Resort

## Supplemental Materials

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Sponsor:
River Kwai Park & Resort


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## Thailand’s Environmental Laws and Policies

Starting in 2007, Thailand created National Environmental Health Strategic Plans for the next few years. Thailand’s Ministry of Public Health and Ministry of Natural Resources and Environment had most recently completed the Third National Environmental Health Strategic Plan for 2017 - 2021. This plan outlines existing laws and policies for environmental protection, the impact of the Second Plan, and plans and goals for future programs and policies.[1] Helping the River Kwai Park & Resort reduce their ecological footprint will help them adapt to the government's changes to protect the environment.

The Twenty-Year National Strategy for 2017 - 2036 is a significant part of the future programs and policies that Thailand aims to implement. The Thai government wants Thailand to become a more developed country with “Stability, Prosperity and Sustainability” in mind. Pollution-free economic growth is something the Thai government wants to achieve by promoting environmentally friendly production, implementing the Sufficiency Economy Philosophy, and getting support from the public and all levels of government. In order to know how to approach this, the Thai government wants to raise awareness of the negative impacts on the environment and be able to monitor environmental health.[1]

These policies and plans would help the team suggest solid waste management plans that correlate with Thailand’s move towards environmental sustainability. For the River Kwai Park & Resort, or any rural community, to transition from unsustainable to sustainable waste management practices, government support is essential. Structured programs and resources from the government make this transition possible.

## Waste Management in Thailand

In Thailand, the government has formally decentralized civil functions and regulations from the central to local officials since 1999. A renewed national waste initiative was established in 2015 to support more well-managed waste disposal practices.[2] The Royal Thai Government hierarchizes national and local waste management into three subdivisions:

1. Central government formulates national waste policies, guidelines, programs, standards, and regulations that underpin local governmental units,
2. Provincial government who coordinates between the central and local governments,
3. The local government refers to the district, subdistrict, and minor governors who directly handle local waste management and perform waste implementation plans.[3]

In Kanchanaburi, the amount of generated waste was reported to be approximately 822.49 tons per day in 2018, but only 107.97 tons of it, accounted for 13.13%, were appropriately eradicated, only 470.14 tons or 57.16% were reused and recycled per day, and only the sheer number of 244.37 tons or 29.71% were inappropriately managed.[4]

Municipal solid waste is classified into four categories:

1. Recyclable waste; plastic bags, plastic, glass water bottles, drink cans, metals, tires, and drink cartons
2. Compostable or organic waste; food waste, animal excrement, and green waste
3. Hazardous waste; explosives, flammables, toxins, oxidizing agents, corrosives, irritants
4. General waste or non-compostable, non-recyclable, and non-hazardous waste; paper scraps, broken glass, and ceramics

Both the Subdistrict Administrative Organization and Kanchanaburi Provincial Administrative Organization encourage separating before being collected to minimize the amount going to landfills.[2] Residents separate waste according to the colored trash bins provided by the government; green for compost, yellow for recyclables, red for hazardous waste, and blue for general waste.[5] These practices enable the officials to work more effectively and comprehensively.

Garbage trucks from the municipality collect waste from the household, commercial, and industrial areas based on an adjustable routine. Certain service fees are collected per household or organizational unit in different municipal areas. The waste collectors on the truck then segregate collected waste.[5] Private waste collection trucks are also available for service based on more flexible operating time and collected waste types than governmental trucks. The service fees range from hundreds to thousands of baht per single route or per ton of waste. Private waste exchange businesses value the waste and turn waste into tangible worth. Individuals that sell their acceptable waste earn money in return.

## Household Dumping and Burning

Open dumping and burning contribute to health, environmental, and economic issues. To begin with, midden and waste scavenging are environments for disease vectors such as insects and rodents. This results in the contamination of solid waste and leachate in the environment. Leachate is wastewater rich in germs, heavy metals, and toxic chemicals. Conjointly, open burning emits pollutants into the atmosphere, including greenhouse gases, and releases unpleasant odors to the local community.[6]

The Royal Thai Government has enunciated that open waste dumping and open burning are not allowed anymore.[2] Household burning and dumping still occur where there are inadequate facilities. Another cause is poor communication between authorities and the general public.[2] To alter the attitudes of individuals to be more sensible, public access to information is necessary. Thai information distribution is not incentive enough in encouraging the public to act upon an abrupt change, especially in rural areas. Since people are familiar with waste disposal methods such as open dumping and burning, community participation and awareness are solutions for changing waste management habits.

## Landfills in Kanchanaburi

Landfills are the destination of waste when other waste disposal methods are not available. Living near a landfill can increase the risk of developing many different cancers. Landfills also can cause odor, flies, smoke, noise, air pollution, and affect water quality.[7]

There are 37 landfill sites in Kanchanaburi, with no waste transfer stations within the province.[8] Refuse-derived fuel (RDF) is only utilized at Kanchanaburi Provincial Administrative Organization landfill and Tha Muang Subdistrict Municipality landfill.

RDF converts waste into renewable energy sources used to generate electricity or heat, superseding fossil fuels in power plants.[9] It mostly consists of intensely combustible components such as plastics and biodegradable waste.[10] However, these two excavated lands also perform open waste dumping and burning, which negatively impact the environment.[8]

## Method Types and Sampling Techniques

Between December 2021 and February 2022, the team conducted 31 face-to-face and semi-structured interviews with the resort owner, administrators, staff, and an organization related to the waste management of River Kwai Park & Resort. Thirty interviews were completed in person during the site observation at River Kwai Park & Resort. Only one interview with the resort owner in February 2022 was held via Zoom.

Three different nonprobability sampling types were used to select interviewees:

1. Convenience sampling: Selects the most conveniently available samples from the population. The samples may not represent the entire population, and the bias and data cannot be controlled or generalized.
2. Snowball sampling: Utilizes the network between each sample when the investigator knows little information about the population. The selected sample will direct the investigator to the other group of samples within the population. Biases are prominent in this method because the sample selections are made upon the decision of the directing sample.
3. Purposive or judgmental sampling: Selects the samples based on the judgment of the investigator, who views the samples as the providers for the most attainable information. Consequently, the predetermined notion of the investigator can influence the results.

Interviews took between 10-50 minutes per person. The time differences resulted from each interviewee's different background knowledge and understanding of waste management.

The team selected participants based on varying situational approaches as follows:

1. River Kwai Park & Resort owner (2 interviews, 6% of interviews)
   The team made an appointment with the resort owner, who is also the project sponsor, in the middle of December 2021 at the resort to discuss how she perceived the current circumstances of the waste management of the resort and how she desired to improve them. Since there is only one resort owner, convenience sampling was used. Later in early February 2022, the team also discussed with the owner to confirm her desires and the team's capability to deliver the desires via Zoom. This meeting also covered a broad update of our project, including the goals and objectives.
2. Resort and Community Administrators (4 interviews, 13% of interviews)
   Participants included the resort manager, the village leader, and the village health volunteer. Snowball sampling was used to recruit all three interviewees based on the suggestions of the resort owner, as she was in direct contact with her employees. The village leader and the village health volunteer also worked as the resort staff. Only the manager was interviewed twice about the overall waste management system of the resort in December 2021 and changes in the system in early February 2022.
3. River Kwai Park & Resort Staff (23 interviews, 74% of interviews)
   Staff participating in both the interviews and the behavioral survey were kitchen staff, service providers, accountants, janitors, gardeners, and technicians. Since the resort is small, some individuals work in more than one position. Purposive and snowball sampling

was used for selecting interviewees according to the resort manager's suggestions.

4. Chongsadao Subdistrict Administrative Organization (SAO) (2 interviews, 6% of interviews)

   The team sent a request letter for the visit allowance at the SAO on behalf of the BSAC Department to ask them to participate in the meeting in person. Purposive sampling was used for selecting two significant attendees: the Chief Executive and the Chief Administrator of the Chongsadao Subdistrict Administrative Organization. As the resort is situated within the Chongsadao subdistrict, the team gained an overview of the waste management system in Chongsadao and Kanchanaburi.

## Current Waste Generation and Waste Management at River Kwai Park & Resort

The team obtained background information about the River Kwai Park & Resort related to the Khon Kaen Sugar Industry Public Company Limited (KSL) natural agriculture center. The team focused on plastic waste management and acknowledged other purposeful benefits that organic waste can provide for animal feeding and other agricultural activities at the resort. The resort classified the waste into four types, namely:

1. General waste: non-compostable, non-recyclable, and non-hazardous waste, such as paper scraps, broken glass, ceramics, packaging materials, food, drink wrappings, and sanitary napkins. The resort combines dirty plastic bottles and bags with used face masks. The paper and glass are mainly sold to private sectors. Broken glass does not fit the above criteria and is further classified as hazardous waste.
2. Recyclable waste: Plastic bags and water bottles are sold to waste collecting businesses if the waste is clean enough. The resort doesn't remove labels tagged on the bottles or clean them completely, as the resort owner stated that such actions produce wastewater.
3. Hazardous waste is systematically categorized at the main waste separation station of the resort. The resort created name tags for each separated hazardous waste category to ease the burden on the staff when disposing of the waste. Used batteries, incandescent light bulbs, electronics wires, aerosol lacquer, and pesticides have separate disposal bins at the resort.
4. Organic waste takes up most of the resort's overall waste production. It is classified into food waste, animal excrement, and green waste. All of them are composted within the resort's area. Organic waste is divided up and dealt with as follows:
   a. Food waste: Derived from food preparation and leftover food after meals. The staff claimed that the resort composts them as animal feed for livestock such as pigs and boars, including poultry. Some food waste, such as ground eggshells, is used as fertilizers.
   b. Animal excrement: From pigs, boars, cattle, and poultry at the resort are used to formulate manure and ferment Effective Microorganisms (EM) water. Pigs and

boars compost their feces in approximately two weeks, but chicken feces need to be dried and rotted over the same period of time. These manures provide different farming benefits for different plants.

c. Green waste: Has the greatest variety of usages and proceedings. Some are used as animal feed, such as banana stalks. Lumber, branches, woodchips, and coconut shells are burnt to obtain charcoal as alternative energy sources and concurrently to obtain wood vinegar. Moreover, yard clippings are used to produce fertilizers.

Governmental and private sectors collect the waste from the resort. The garbage trucks from Chongsadao Subdistrict Administrative Organization collect the waste at the resort weekly, whereas the private trucks collect the waste three times a month. The waste collected by both sectors is transferred to the Chong Sadao dumping site.

## Local Waste Management Contractors

The private waste contractor confirmed that the waste from the resort ended up in the Chongsadao dumping site. When the team attended a meeting with the Chief Executive of the Chongsadao Subdistrict Administrative Organization, it was worthwhile to obtain information about the organizational structure of the waste management system within the Chongsadao subdistrict. The SAO claimed that the SAO, residents, and River Kwai Park & Resort's collaboration were essential to establish and process a better waste management system. Since the government can shape the way the waste is managed, the residents can also designate what and how the government can provide for their better quality of life and waste management facilities and services.

## Discussion with Professor Balistrieri

Meeting: 2/1/2022 at 11:00 am

The discussion with Professor Balistrieri started with our team presenting the problems and issues at the resort, following up with our goals and objectives to satisfy the sponsor’s desires. During the meeting, our team did not know the current values of the staff and only understood the situation from the owner’s perspective. The owner also wants to change the staff members’ lifestyles at home and at the resort, which would not be attainable for our project due to the amount of time to work on this.

Our group had many questions for Professor Balistrieri:

- What prevents people from changing their behavior?
- Why do people not change their behavior even when they are helped too?
- What stops people from changing their everyday activities to help the environment?
- How long does it take to create an emotional reaction to change the environment?
- Does creating incentives help create behavior changes?
- Other than financial motivation, what other incentives could be used?
- What information/sources would you recommend?

Which were answered throughout the discussion.

Professor Balistrieri started the conversation with the definition of value, stating, “value is something you feel strongly about and have chosen freely, believe in, and communicate to other people.”[11] All of the decisions that people make in their lives are based on their values, but changing a person’s behavior would require changing their values. Change can take upwards of two years, depending on their willingness and ability to move to the next stage. Willingness is important because it is about motivation. If the staff does not have the willingness to change behavior, it will be difficult to overcome the idea of reducing plastic waste at the resort. The ability to do a certain task is still essential but not as significant as willingness, as abilities can be taught. It is still harder to change a person’s values, especially as they get older because their values are more embedded in their lives.

A one-time program or lecture does not work for this situation since there needs to be constant growth and learning. Creating survey questions can be tricky because we cannot make any staff assumptions and focus specifically on behavioral-type questions. The professor wants the team to think about the big questions when creating survey questions:

- What motivates you?
- What do they want for doing this extra work?

Professor Balistreiri also gave the team example questions and methods to quantify the data to help analyze the staff’s current behavior:

- How often do you think about plastic destroying the earth?
    - 1 - never
    - 5 - constantly
- How often do you use a plastic container in your life?
    - Never
    - Always
- How often do you carry your own reusable container?
- How often do you encourage others to use reusable containers?

## Changing from Precontemplation to Contemplation

To go from the Precontemplation to Contemplation stage, the staff need to feel comfortable about going through the process of change. Emphasize the fact that management and the owner are there to support and help the staff through this change. This support can be the management and owner explaining that they will help them develop new habits over time, and will help them with their mistakes along the way instead of punishing them. For individuals who do not know about the problem, educate them about the impact that plastic waste has on the environment, especially in Thailand and Kanchanaburi (see Chapter 2, sections 2.2 - 2.5 for related information). When staff members can personally connect to the issue of plastic pollution and the impact it has on themselves and others they know, it will provide a purpose for them to change. Ask the staff for their input on the issue and ask them to be transparent about their opinions. This will make

them feel included in the conversation of behavior change and more in control of their decisions instead of being dictated what to do.[12]

## Changing from Contemplation to Preparation

Once the staff has reached the Contemplation phase, they need to gain confidence and be committed in their decision to change their behavior and use less plastic water bottles. The commitment to change is needed to make sure that the staff truly believes in the change since behavior change is value-based.[11] To help the staff align their values with the behavior change, the owner needs to provide information about how the behavior change will help the environment, the resort, and the staff members. Showing the impact that plastic pollution has on the staff's health and their loved ones' health will create an emotional connection to the issue of pollution and using disposable plastics. This emotional connection will influence their values to make the behavior change easier. Educating the staff about the new water filtration and purification processes is also important. The staff needs to trust the water they are drinking; otherwise, they will not use the filtered and purified water. We will provide the technical information about the water purification systems we suggest and a less technical and more understandable guide to how the systems work. The owner and management will also need to lead by example, showing the staff that they trust the water, which carries over into the transition from Preparation to Action.[11]

## Changing from Preparation to Action

In this stage individuals have acknowledged that their habits need to change, and are starting to collect information about how they can start changing. In the Preparation stage, education and collecting information before moving on to the following stage (Action) is very important. This stage can be over a year, with individuals creating a plan about how they can change. In this stage individuals are gaining the ability to change whether that be knowledge or gaining other important resources.[13] In this stage the staff at the River Kwai Park & Resort will have realized unsustainable habits, and will be planning how they can change their habits. This plan will be provided by the owner and management, which will be providing a guide to where the staff can get reusable water bottles (either provide it to them or where they can purchase one) and where at the resort they can refill them. The owner and management will emphasize the fact that they are also going through this change and preparing for action, just like the staff are. In this step information is very important to be able to move onto the Action stage.[13]

## Changing from Action to Maintenance

In the Action stage the change begins to happen. An individual must continue their new habits for six months to move onto the Maintenance stage. In the Maintenance stage, support and help from others are very important. In this stage individuals will still be challenged, and will have to find solutions to continue changing their behavior. This stage represents the importance of an

individual having the willingness to change. Once the Maintenance stage is reached, an individual has the ability to change, thus they must be motivated to continue to change their behavior.[13] At this stage the staff from the River Kwai Park & Resort will have begun changing their lifestyle to be more environmentally friendly by using reusable water bottles with the purified water. This could also include incorporating habits such as composting or recycling in their household. However, these individuals are still figuring out how to continue these changes incorporating these habits in their day to day lives. In this step short-term motivation and help are very important to move to the Maintenance stage.[13] Short- term motivation could look like implementing incentives such as monetary rewards or other beneficial awards for changing behavior. Also receiving encouragement from mentors in this step is important for continuing to the Maintenance stage.

## Discussion with Aj. Jatuwat Sangsanont

Meeting: 2/8/2022 at 4.30 pm

Our team provided the background, goal, and objectives of the project to Aj. Jatuwat to ensure that he acknowledged what we aimed to do. Since Aj. Jatuwat is a professor who specializes in water treatment systems, we started the discussion with the plan of the resort's potential water filtration system (Figure 11). Aj. Jatuwat advised that the plan was not practical enough because generally the river water needed to be processed through coagulation and flocculation to increase the size of the solid particulates in order to decrease the turbidity of the water before entering the filtration system. Additionally, Aj. Jatuwat suggested the team review the order of the filter component in Figure 11, precisely the coarse and fine sand. Moreover, charcoal should be the last filter component; charcoal is used to eliminate the unpleasant tastes and odors of the water that are already filtered off large sediments and particulates. If charcoal is used as one of the first filter components, it may enable the sediments to increase in size and clog the pipes.

The team also asked Aj. Jatuwat for the advice of how to eradicate the burnt waste in the resort's open burning and dumping site. Aj. Jatuwat did not think the resort should bury every waste, since it might release toxins into the environment and complicate further land uses in the future. Rather, the burnt waste should be separated and sent to the responsible waste collecting services, whether it be the governmental or the private sectors.

## Case Studies

### A structured protocol designed for green accommodation business with the assistance of academic theory and guest's perspective in Dharmajati Resort, Kanchanaburi.

In the case study in Dhamajati, Kanchanaburi constructs an architectural guideline based on theoretical knowledge and the customer's point of view towards ecological resorts. The methodology interviewed customers' attitudes toward the building, waste management system, water, and energy concerns along with environmental conservation activities. The interviews also ask the customers about their environmental awareness. The survey required specific information

such as means of transportation, travel time duration, number of companions, and expected costs. Construction and improper waste disposal can leave a lasting impact on human health and the environment. Knokwongnuwat stated in “A green hospital model” about how hotel buildings use more energy than hospitals.[14] Surrounding environmental resources must be highly reserved during the process of construction such as utilizing local plants as a building material. Not only the plantation but staff customs can also be designed to represent the identity of people in the community. Transparent material was chosen as a building material to use sunshine during the day to reduce electricity for light. To reduce the amount of air conditioning used, wind flow is capable of helping this. Besides, accommodation businesses spend additional water on a particular room, kitchen, and swimming pool. The number of bathrooms in the resort is encouraged to be reduced or to be shared. Reusing the towel and equipping solar water heating systems is considered suitable for water management. Water circulation for agricultural purposes and aerobic wastewater treatment is recommended in conjunction with appropriate drainage systems. Food waste will be further fed to the animal and composted for fermentation. The electrical meters are visible in the room, creating awareness for guests. Although there is stigma for incentives, the resort came up with the idea of rewarding guests based on their energy usage. The light will also be automatically cut off if the room is vacant.[15]

**An application of Ecological Footprint Method for an Ecotourism resort: Case Study in Fraser Island, Australia**

Kingfisher Bay Resort and Village (KBRV) and ecotourism resort was selected as the case study with the objective to calculate the ecological footprint, to identify and prioritize the contributing factors towards the ecological footprint, and to evaluate the potential of using the ecological footprint. These would indicate the progression towards sustainable development. For the first objective, if the ecological footprint is calculated, the data which is obtained can be used as a threshold to set up the policies and limitation of usage of natural resources. For the second objective, the key contributing factors will help to deal with the ecological footprint more efficiently and assist decision-makers in developing the plan for sustainability. The paper provides many methods such as Process Analysis in which all of the inputs in each successive production are summed to obtain the total ecological footprint or Input-output analysis that adopts a detailed commodity. It provides a view of interdependence caused by the passage of intermediate goods and services between industries before they reach the final consumer.[16]

**Case Study in Hoi An City, Vietnam including a breakdown of the origins of waste due to the hospitality industry.**

Hoi An City, Vietnam is known for being a tourism city in the center of the country. A study looked into waste management practices of 120 hotels and found that 58% of average hotel waste was biodegradable, 25.8% recyclable, and 15.7% other. However, the percentage of biodegradable

waste was higher for larger hotels. The study also found that the hotel industry in Hoi An City generated 2.28 kg/guest/day of solid waste.[17]

From analyzing the case study, hotels need to focus on minimizing waste generation by reducing the amount of organic and plastic use from guests. Plastic and organic waste can also be reused through recycling and composting systems which can benefit the environmental impact of the hotel industry in Hoi An City, Vietnam. If hospitality industries focused more on sustainability dealing with organic and plastic waste, they would be able to reduce their overall waste footprint by around 80% which would be a huge improvement.[17] River Kwai Park & Resort would benefit from focusing on sustainable waste practices because it would positively impact the staff, tourists, and the local community.

**Case Study in Maseru, Lesotho highlighting the lack of infrastructure to deal and dispose of waste properly.**

Rural areas in Maseru, Lesotho, struggle with solid waste management, specifically waste collection services and sanitation facilities. Solid waste in Maseru used to be managed well with only generations of organic/biodegradable waste which can be reused as compost for agriculture. Presently, the use of manufactured products causes soil and air pollution to these rural environments. These communities also lack the industrial infrastructure and financial stability to manage the increase in waste. Lesotho lacks a formal waste management system, leading to different local practices and solid waste management. There is no regulation on these different approaches to solid waste management in rural areas which could have environmental and public health consequences. Furthermore, some rural communities lack general knowledge about their solid waste management practices and their impact on the environment and human wellbeing. But, the indigenous communities are hesitant with the modern waste management methods because they want to keep their traditions, culture, and way of life, and some sustainable practices threaten that. The local authority will need to find a waste management system that will reduce environmental and health pollution while not disrupting traditions and culture.[18]

**Case Study of Education of Waste Management in Public Educational Institutions**

This study focused on the education of sustainability and waste management in the public school system in Bucharest, Romania.[19] The article touches on how in society, sustainability education and promotion begins in the public education sector. For schools to become more sustainable they must tackle the problem of waste management, and do that they must educate their students. In this study 457 institutions were analyzed, this included all different types of schools (e.g., preschools, primary schools.). The article touches on the fact that in order for waste mitigation practices such as recycling to be successful there must be infrastructure and it must contain little to no inconvenience to be successful and understood. It shows how most waste management in schools depends on the habits of each school as opposed to how many students

attend. Waste management plans in schools are templates for possible waste management plans in urban areas and are important focuses when assessing the sustainability mindset in a community.[17]

## Interview Questions for Management

- What are the current practices to dispose of waste at the Resort?
- Why do you use this method?
- What is your current knowledge about the impact (environmental) of the current waste management practices at the resort?
- What is your current knowledge about environmental sustainability practices with respect to waste management?
- Have you looked into other waste practices? If so, please describe them. Why were these practices not adopted/used?
- Is there any training about environmentally sustainable waste management practices that the staff is required to complete or is given the option to?
- Is there a significant difference in waste production during the off-season and high-season?
- How are plastics disposed of?
- How is the organic waste disposed of?
- What is burned?
- What is buried?
- Where does the largest production of waste come from?

## Anonymous survey for staff that helped provide guidance for waste management at the River Kwai Park & Resort

1. I try to reduce my plastic waste at **home**
    a. Never
    b. Not often
    c. Sometimes
    d. Often
    e. Always
2. I try to reduce my plastic waste at **work**
    a. Never
    b. Not often
    c. Sometimes
    d. Often
    e. Always
3. I think about the effect plastic has on the environment
    a. Never
    b. Not often
    c. Sometimes

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    d. Often
    e. Always
4. I would prefer to drink out of disposable water bottles
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree
5. I would drink filtered and purified river water if it was provided
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree
6. I think about climate change
    a. Never
    b. Not often
    c. Sometimes
    d. Often
    e. Always
7. I think r**ecycling** makes a positive impact on the environment
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree
8. I think **composting** makes a positive impact on the environment
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree
9. How do you feel about changes the new manager has made for the resort…
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

10. I carry around a reusable water bottle

a. Never
b. Not often
c. Sometimes
d. Often
e. Always

11. I think the Mab Aung Natural Agricultural Center is helpful when addressing environmental issues
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree
12. How often do you think about your personal impact on the environment?
    a. Never
    b. Not often
    c. Sometimes
    d. Often
    e. Always
13. Protecting the environment is one of my top values
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree
14. Write-In Question: What incentive would motivate you to drink filtered water to not use plastic water bottles?

## Interview Questions for the Village Headman and the Village Health Volunteer

- How do the villagers manage waste in each household?
- To which extent do the villagers understand the importance of waste separation?
- How do you motivate the villagers to separate waste on their own?
- How do you motivate the villagers to dispose of waste on their own?
- Where do the garbage trucks take the waste to?
- How do you prevent open waste burning in residential areas?
- What organization is responsible for collecting the waste within the Chongsadao area?
- What do you think needs to be improved?
- What is still lacking in the pursuit of sustainable waste management?
- What is the overall obstacle for the villagers to manage waste more sustainably?

## Consent/Introduction Script

Hello, we are a group of students from Worcester Polytechnic Institute in Massachusetts, United States. We are working with a group of students from Chulalongkorn University to help the River Kwai Park & Resort reduce their ecological footprint. To learn more about waste management at the resort and in the area, we would like to interview and survey the resort managers, staff, and guests about waste collection and disposal practices. Your participation is completely voluntary and you may opt-out of the survey at any time and may skip questions. Your responses will remain anonymous and will be stored in a password-protected database. Please let us know if you have any questions, comments, or concerns.

For managers:
Even though your responses will remain anonymous, there are a limited number of managers at the resort which makes it easier to figure out specific responses from people.

For staff and managers:
Your position title is a part of this interview/survey, but if you would like to withhold that information from the survey you may.
For staff:
Your responses will remain anonymous, and you will not be identified to the managers or the owners of the River Kwai Park & Resort. This survey will take about ten minutes.

## Kanchanaburi Interviews February 3-5, 2022

What the sponsor wants us to do:

1. Recommend a water purifier (*on process*)
2. Recommend a behavioral change plan for the staff (*on process*)
3. Find a solution to eradicate the resort's dumping site (landscape concerns)
    a. What to do with the burnt waste
    b. Should they bury everything?
4. Recommend ways to manage hazardous waste properly
    a. SAO suggested that residents, including the resort, can forward the **hazardous waste** directly to them.

(We were just informed of problems 3&4 during the resort visit.)

The manager confirmed to us that overall the resort's staff did not attend training courses at Mab Aung agricultural center at all. This might be a misunderstanding. Instead, they were only educated about waste separation and fundamental waste disposal techniques by Less Plastic Thailand last year at the resort. They were encouraged to try to separate the waste as much as they could to ease the ones working in the following waste-relating processes. However, the manager did not think the training helped much, since it was more of an individual concern towards the waste problems. This is somehow contradicting what the staff told us.

There are 32 staff members. Since the last resort's visit, the sponsor became more rigid and the manager claimed that the staff also became more serious about waste separation. She also clarified to us that most people who openly burnt the waste were not Thai who burnt waste to get rid of the unpleasant odor. However no more waste is dumped there. They want us to find a solution.

Moreover, the manager was uncertain how the resort should dispose of hazardous waste. They began to separate the hazardous waste more distinctly into several bins: + batteries. But they still did not know where they should forward these wastes to, aside from the private contractors they were familiar with. More importantly, broken glasses and tires are also their top concerns because they are too broken to be forwarded to the private contractors. For the portions that can be forwarded, almost all of them are transferred to be managed in BKK by both the contractors and KSL workers from the headquarter in BKK. They will also contact other private waste collecting businesses to see if any of them can take those broken glasses and tires. Moreover, the resort was not sure if they can classify plastic chemical containers in plastic waste. They did not separate infected waste such as used face masks systematically. And they agree that not knowing where the separated waste ends up discourages the people who would like to continue separating waste.

Lastly, the manager insisted that the resort can be the model of local waste management like the way they have been doing the KSL agricultural center all this time.

**Staff**

After we had an open discussion with the staff, they are eager to learn and apply waste separation to both resort and their personal life. The majority of the staff are highly concerned about the effect caused by improper waste management to the environment and human health. Nevertheless, we all agree that it still depends on each person's awareness.

The staff that have worked in the resort for more than 8 years stated that the resort used to burn all types of waste in the faraway area behind the resort without separation. The training by Less Plastic Thailand has encouraged the resort to implement a more organized waste separation system. It clarified the solid waste management and provided new knowledge for the staff such as the utilization of plant pots. However, not all the staff attend the training due to the fact that the training was held once. So the new staff will be given a knowledge transfer from their seniors. Moreover, the staff responsible for the agricultural sector tend not to recognize the resort's policy.

For their lifestyle, most of them have already applied the waste separation at home. The food waste ended up in the animal feeding whereas the water bottle was sold to the private sectors. The money earned from selling plastic waste is most likely to be the motivation for them to carry out waste separation. The staff really want to drink the provided filtered water if any because it can reduce their cost of buying plastic bottles. Otherwise, the rest of the waste is forwarded to the state garbage truck or burnt within a personal household.

Moreover, it is a good opportunity to hear from the people in the workplace about what can be done to improve current waste management.

**Water circulation system**

The resort staff do not use municipal water supply. Rather, they pump raw water from Khwae Yai River running alongside the resort instead. The river water is not used for consumption but only for utilizations such as cleaning and agricultural activities; drinking and cooking are not included.

The resort drains the river water to the settling tank with the addition of chlorine for a germ-killing purpose. They also add alum (sulfate salt of aluminum) to remove and settle large sediments that come with the water in order to make the water clear. A fundamental filtration system is used, however the technician claimed that the recent system is not effective. Therefore, the water quality is inferior to the municipal water supply. They also have a basic water treatment system before releasing the wastewater back into the river.

Collectively, the drinking water for the staff costs about 300 baht per month with the more or less than 30 drinking water tanks monthly. Note that not every staff member drinks from the central water supply of the resort. The resort also has a water cooler for the staff to fill their own water bottle.

As of February 2022, the manager still does not make up her mind whether the resort should provide a water refill service for the guests due to COVID. Still, she is interested in using glass water bottles instead of plastic ones.

## Chongsadao Subdistrict Administrative Organization

The SAO has done many projects to promote waste separation, reuse and reduce waste in the area.

**1**. The SAO has provided the training session for the resort business and all local people in the area to understand how to separate waste and how many types of waste needed to separate and can be reused or recycled.

**2.** The interesting ongoing project that the SAO established is exchanging electronic wastes with eggs. Since most of the local people have financial issues, the SAO then came up with the project that motivates people to separate wastes by rewarding them with an ingredient for food.

**3**. The SAO provides all types of separate bins in the public for each village and the private truck (the SAO pays for the truck) will come to pick up solid wastes to the dumping site.

**4.** For hazardous wastes, there is a waste collection area in each village for the hazardous wastes and the wastes will be collected by the SAO monthly. Or anyone can bring the hazardous waste to the SAO directly. Then, these hazardous wastes will be sent to the PAO (provincial administrative organization) for further management.

**5.** The SAO also provided the training session regarding organic wastes in households. They give the local people information on how to manage organic waste such as to produce fertilizers or EM water (the same way as the resort has done).

**6.** For the tire, the old tire can be sent to the tire changing shop and the SAO will transform it into useful products.

The Chong Sadao's dumping site is only composed of solid wastes and wastes that can't be recycled or reused e.g., plastic bags. The rest are separated into different types. The solid wastes

collected from all villages in Chong Sadao are still in Chong Sadao's dumping site and never sent to Kangsean's dumping site due to the high cost of transport. Besides, the public trucks that the SAO provides will collect one type of waste each time so the wastes are separated.

The obstacles that make the SAO unable to manage the waste collection system efficiently are budget and not enough trucks. However, they planned to buy more trucks and the trucks will be ready for use this March. The Chief Executive informed the team that when the new trucks come, they will contact the resort if the resort needs any help. Since the SAO will have a list of households and business sectors who want the public trucks to collect their wastes. Moreover, the SAO believes that all resorts are able to manage themselves since they are private sectors which have abilities to employ the private trucks daily or many times per week.

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