

BUILDING HEALTHY CITIES



# WASTE-FREE SCHOOLS HANDBOOK



June 2022

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## Building Healthy Cities

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# PREFACE

The USAID-funded Building Healthy Cities (BHC) project aims to improve healthy urban planning across four cities in Asia. The project engages with sectors that contribute, directly or indirectly, to citizens' health and quality of life.

BHC's work is rooted in three core values. The first is **multi-sector engagement**,<sup>1</sup> which provides all municipal sectors a common understanding of how they contribute to health. The second is strengthening **community empowerment** in municipal decision making, especially for women, children, and vulnerable populations. Specifically, BHC is dedicated to building community awareness and capacity of how to engage decision makers to improve citizens' quality of, and access to, services and information. The third core value supports **using data for decision-making**, so data is not just collected but used on a regular basis to inform funding and planning decisions. Figure 1 shows BHC's core values and how they interact with the activities we fund. Developing **waste-free schools considered all three core values in the Da Nang context**.

The Waste-free Schools (WFS) initiative is built on a multisector platform. Working with the Department of Education, the Food Safety Management Authority, and the Department of Natural Resources and Environment, WFS creates continuous communication among these three institutions. For schools that would like to include health into this discussion as well, please see BHC's [Teachers Training Guidelines for Health Promoting Schools](#). WFS used co-creation methods to customize activities to each school. These techniques empower students and teachers to make the materials most useful to them.

WFS builds on education and food safety data that BHC has gathered within the city of Da Nang. This manual provides some initial guidance on indicators for program monitoring. Volume II contains tools and resources that can be used to adjust and improve the program.

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<sup>1</sup> **Sectors may include any of the following:** urban planning and development, information and communications, women and children, nutrition and food safety, education, water and sanitation, waste management, environment and natural resources, transport, and tourism and commerce.

Figure 1: Building Healthy Cities Core Values and Activities



### Why Waste-free Schools?

Any school can address food safety or waste management on its own, or use the principles of refuse, reduce, reuse, recycle (4Rs). Why is the WFS initiative trying to address these areas together? Is this not harder than doing them separately? The answer is that combining all three reduces waste, costs, and negative consequences of addressing any two area by itself. Here are examples showing the benefits of an integrated approach:

1. **Food safety training** that encourages throwing spoiled food into regular trash bins, or encourages excessive use of single-use plastics, would create more waste and less opportunity for recycling. WFS emphasizes green options such as composting spoiled food; use of non-plastic, environmentally friendly food packaging; and recycling food containers (e.g., milk and drink cartons) whenever possible.
2. **Waste management planning/educational programs** that do not recognize that most waste is organic (including food) means that kids will learn to throw this valuable “garbage” away. WFS aims to teach children the value of composting.
3. Any **4Rs communication** that is done without referencing food safety and waste management risks failing to meet its goals, as most people will likely throw out recyclables if there is still food or drink left in them. WFS provides waste bins and educational tools to inform children and their families how to segregate recyclables from organic waste safely to maximize reuse of both materials.

The WFS model focuses on the educational methodology of learning by doing, which is applied synchronously in waste management activities. Awareness, skill development, and behavior are key factors that determine the success of the WFS model, thus contributing to the improvement of municipal solid waste management practices. For primary schools, these factors need more attention, and children must receive proper instruction to establish awareness, develop skills, and improve behaviors that support good waste management practices.

### Target Audience

The main audience of this handbook is teachers at primary schools, especially in public schools in Da Nang. Teachers will be able to read this manual and explain its contents to the students.

## **Volume I: General Knowledge**

This volume of the Waste-free Schools Handbook is for teachers who participate in the Waste-free Schools program. Teachers should learn the concepts in Volume I before they start implementing the Waste-free Schools program described in Volume II.

# CHAPTER 1: Basic Concepts of Waste Management

## Purpose and Expected Outcomes

The purpose of this section is to provide the minimum required information for students to understand the concept of waste and waste management.

1. To learn the definitions of important terms related to the Waste-free Schools (WFS) concepts.
2. To understand the different types of solid waste and where it comes from.
3. To know how to manage, classify, and separate solid waste.

## Important Terms

Waste	Material that is not wanted; the unusable remains or byproducts of something.
Product life cycle	A product life cycle is the length of time from a product first being introduced to consumers until it is removed from the market. A product's life cycle is usually broken down into four stages: introduction, growth, maturity, and decline.
Waste management	The selection and application of suitable techniques, technologies, and management programs to achieve specific waste management objectives and goals.
Waste separation	The separation of waste into different categories that will be managed through different processes.
Recycling	The process of using waste to produce new products.
Composting	The process by which organic matter, such as leaves and food scraps, decomposes into soil.
Landfilling	A landfill site, also known as a tip, dump, rubbish dump, garbage dump, or dumping ground, is a site for the disposal of waste materials.

## What are the Different Types of Waste?

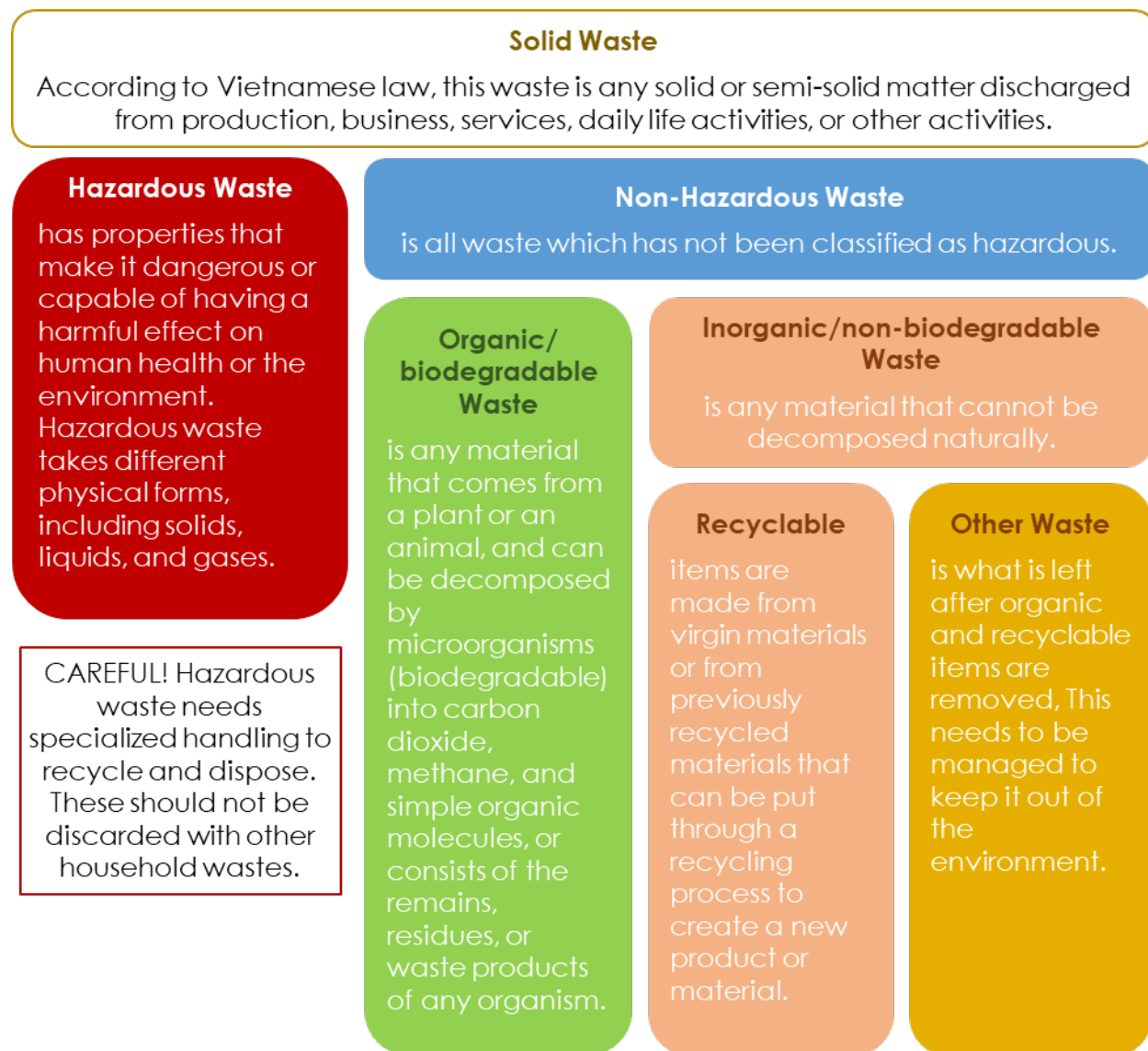
Every culture calls waste something different: garbage, trash, rubbish, etc. But what are we really talking about when we say waste? Waste occurs when we remove an item from regular use or when something is left over, and we no longer want it. Many different things end up in the waste pile, but some things may still be useful and may be needed by others. It is helpful to think of products as having a life cycle; this chapter will



describe types of waste and introduce ways we can return some types of waste to the life cycle.

Waste can be solid, liquid, semi-liquid, semi-solid, or contain gaseous material, but according to the U.S. Environmental Protection Agency and the Vietnamese government, they are all referred to as solid waste. Solid waste is any material that is thrown away. The figure below shows the types of solid waste and their definitions.

Figure 2: Types of Solid Waste





## Where Does Waste Come From?

Waste can come from production, businesses, services, daily life activities, or any other activities. The different types of solid waste shown above can be further broken down into categories that we can use to separate and manage our waste. Below are examples of solid waste that comes from daily activities and the categories of waste they become:

- Leftovers and vegetable peels become food waste.
- Old newspapers and cardboard materials become paper waste.
- Plastic bags and plastic bottles become plastic waste.
- Aluminum and other metal cans become metal waste.
- Glass bottles and porcelain become glass waste.



Solid waste in a public area.  
Source: <https://www.soils.org/about-soils/contaminants/>

### Teacher Tips

*Teachers can introduce students to solid waste through images of solid waste in public areas, landfills, etc. Teachers should solicit feedback from students, asking:*

*What do you know about solid waste?*

*How can solid waste impact our lives?*

*What can we do to reduce solid waste every day?*

*What happens to the waste we create?*

## How Do We Manage Our Waste?

If we do not manage the waste we create, it can cause many issues for people and the environment, including blocked drains and air pollution.

### Teacher Tips

*Teachers can walk students through this graphic novel created by BHC to explain some of these issues: [Waste Management and Its Impact on People and Environment](#) (available in [English](#) and [Vietnamese](#)).*

In Vietnam, waste is managed by separating it into three streams: biodegradable organic waste; recyclable, reusable waste; and all other waste. You will often see the colored bins shown in Figure 3.

Figure 3. Example of Waste Separation



Figure 4. Examples of Organic Waste



Source: <https://xulybenuocthai.vn/chat-thai-ran-la-gi/> and <http://longbien.hanoi.gov.vn/thong-tin-pho-bien-phap-luat>

### Teacher Tips

Teachers can introduce students to waste management using this video on what happens to the waste we create: [Tìm Hiểu về Tác Hại Của RÁC THẢI NHỰA Trong 6 Phút](#) (Learn about the harmful effects of plastic waste in 6 minutes).

### How Do We Separate Our Waste?

#### GREEN BIN

#### Biodegradable Organic Waste

Organic waste includes the following materials:

- **Green waste** refers to waste resulting from the maintenance or removal of vegetation, including but not limited to grass, brush, branches, leaves, flowers, shrubs, and small trees.
- **Food waste** includes fruits and vegetables.

## Teacher Tips

Teachers can show this video to help explain the concept of organic waste: [Quá Trình Phân Hủy Của 3 Loại Rác](#) (Decomposition process of 3 types of garbage).

The image below shows more types of common organic waste that can be put in the green bin:

Figure 5: Additional Examples of Organic Waste



Key: 1. fruit and vegetable peels; 2. eggshells; 3. tea leaves and coffee grounds; 4. soiled tissues; 5. meat and bones; 6. garden and leaf litter (small twigs, leaves); 7. house sweeping dust; 8. prayer flowers, garlands, banana leaves; 9. cooked food leftovers; 10. ashes; 11. coconut shells, sugarcane fiber, banana trees/plants, tree branches (all these take time to degrade and should be kept in separate receptacles).  
Source: CAG 2020.

Organic waste can be managed either through the green bin, where city services collect it for composting or for turning it into gas for energy, or you can compost it at home. For example, leftover food, peels, and other waste from fruits and vegetables can be composted in a backyard or rooftop composter bin.

**ORANGE BIN**

## Recyclable, Reusable Waste

Recycling is the use of waste as raw materials to produce new products. If you must throw away something, then recycling is the most environmentally friendly method of waste disposal. Recycling in households or at schools means separating recyclable materials into groups, such as:

**Paper waste:** any type of paper, old newspapers, and cardboard.

**Plastic waste:** plastic bottles, plastic containers, etc.

**Glass waste:** glass bottles, jars, etc.

**Metal waste:** aluminum, tin cans, etc.

Figure 6: Examples of Recyclable and Reusable Waste



Source: <http://www.quan12.hochiminhcity.gov.vn/bau-cu-2011/lists/posts/post.aspx?Source=/tintuc&Category=&ItemID=7323&Mode=1>

**YELLOW BIN**

## All Other Waste

Any items that cannot go into the green or orange bins need to go into the yellow bin.

What happens to your waste when you throw it in this bin? It enters the waste management process, which includes the collection, transportation, treatment, and disposal of waste, together with monitoring and regulation of the waste management process. The process is described in the Zero Waste City Manual (CAG 2020).

Some common waste management procedures in Vietnam for “other” waste are:

- Burning solid waste in municipal incinerators to reduce the volume of waste and to generate energy.
- Landfilling, which allows for long-term storage of solid waste but is not considered a final disposal method. Landfills cannot be built in environmentally sensitive areas, and they use on-site environmental monitoring systems that check for any sign of groundwater contamination and landfill gas.





Source: BHC 2021b.

### Teacher Tips

Teachers can ask students:

*What are some different types of waste?*

*What do the different colored bins mean for how we separate our waste?*

*What happens to waste that goes into the yellow bin?*

*How can we send less waste to landfills?*

### Classroom Resources

#### Small Group Discussion (20 minutes)

*Divide the students into groups of five. Give each group the same pictures of different waste products. Students should discuss where the waste came from, what types of waste it is, and which trash bin it should go in. Please note that teachers should follow the guidelines and regulations of the school or local authority.*

### Key Takeaways

1. Not all waste is garbage; much of it can have a new life if we dispose of it properly.
2. Non-hazardous solid waste can be organic and inorganic, and each has a different method of disposal and management.

## CHAPTER 2: Basic Concepts of the 4Rs

### Purpose and Expected Outcomes

The purpose of this section is to provide the minimum required information for students to understand the concept of the 4Rs.

1. To be able to explain the 4Rs and how they fit into the management of waste.

### Important Terms

4Rs	The 4Rs—Refuse, Reduce, Reuse, Recycle—are practical steps you can take to reduce the amount of waste you produce.
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### What Are the 4Rs and How Do They Relate to Waste?

The 4Rs stand for *Refuse, Reduce, Reuse, and Recycle*. These four steps make for a simple yet effective way to think about the items we buy, use, and dispose of. Each of the 4Rs helps us to consider a number of important aspects related to our consumption. The 4Rs are important to waste management, because when everyone uses the 4Rs in their daily activities it can greatly reduce the amount of waste going to landfills or incinerators. Remember that the order of priority is to refuse, reduce, reuse, and recycle.

#### Teacher Tips

Teachers can introduce students to the 4Rs by sharing this video: [Reduce, Reuse, Recycle, Repeat | Recycling Ideas for Kids](#).



**Refuse**

**Refuse a product that is not reusable or recyclable to prevent it from entering the purchase-use-waste flow.**

**Refuse** means cutting down on waste simply by refusing to buy individually packaged items and single-use plastics, and avoiding the use of disposable plates, utensils, and cups.

“Refuse” to create any unnecessary waste when you are shopping by:

- Bringing a reusable bag.
- Purchasing unpackaged items.
- Buying in bulk using reusable containers.
- Leaving behind free samples and single-use plastic.

If you cannot re-use it, REFUSE it!



## Reduce

**When products are impossible to refuse, find ways to reduce the quantity used.**

**Reduce** means purchasing or using less of any materials that generate waste. Related to this, it also means maintaining the products and materials you have and using them for a longer duration.

Before you purchase new toys, games, or clothing, think about whether you will still want to use them in a month. You can reduce your food waste by only taking as much as you can eat at each meal. You can reduce the amount of plastic you throw out by refusing plastic bottles.

Overall, you can reduce the amount of waste you create by reducing the number of things you buy and then have to throw out.



## Reuse

**Reuse products as many times as possible to prolong the life of any item.**

**Reuse** means using old items for the same or other purposes before disposing of them. Many items can be used over and over. Certain devices, clothing, shoes, etc. can be reused by other people, limiting the amount of waste being produced, while also saving money.

Reuse means thinking of a new use for an already used item. This can extend a product's life span. Even if you cannot reuse something, maybe someone else in your community can. You can "up-cycle" items at home or at school by turning used items into new materials or products of greater quality, such as using them for artistic or environmental projects. Old scraps of fabric can be sewn into new dresses and bits of glass can be turned into decorative bowls. Always talk to an adult about how to do this safely!

Some ways to reuse include:

- Refilling jars to store beverages or leftover food.
- Trading or selling your used clothes, electronics, or toys.
- Repairing clothing, furniture, electronics, etc. to be able to use them again.
- Re-purposing wood, plastic, or metal bins as playground equipment or planters for vegetables or flowers.
- Converting clothing into cloth bags or cleaning rags, and handing down shoes of older children to be used by younger children.
- Reusing wrapping paper, newspapers, gift bags, and bows for future gifts.





**Recycle**

**Recycle products to enable them to become raw materials for secondary or new products.**

**Recycling** is the use of waste as raw materials to produce new products. Recycling means segregating materials and selling or sending them to agencies that produce new materials from recyclable waste.

You can recycle items by putting them in the orange bin. Waste such as plastic bottles can be converted into many different products, including eco-bricks to pave your playground. Some other benefits of recycling include:

- Reducing the amount of waste sent to landfills and incinerators.
- Conserving natural resources such as timber, metal, and water.
- Preventing pollution caused by collection of new raw materials.
- Helping to improve the environment.
- Helping to create new well-paying jobs that service recycling activities.

## Classroom Resources

### **Small Group Discussion (10 minutes)**

*Divide students into groups and let them discuss the following questions:*

- *Why are the 4Rs important?*
- *How do you plan to refuse, reduce, reuse, and recycle?*

### **Interactive Exercises (10 minutes)**

- *Students present their ideas and explain why the 4Rs are important and how they plan to use knowledge of the 4Rs to create waste-free schools.*
- *Teachers can give comments for each presentation. For example:*
  - *Plan for reducing: use plates to talk about portion sizes and how to avoid wasting food.*
  - *Plan for reusing: bring in some items that are commonly thrown away, break students into groups of three to five, and ask them to come up with at least three ways to reuse that item in their daily lives.*
  - *Plan for recycling: Ask students to pitch ideas on how to increase recycling at their school. This could be anything from adding signs onto bins to having a competition to see which classroom collects the most aluminum or paper.*

### **Video on Waste Management**

*During break time, the homeroom teachers can show students this video: [Building Healthy Cities Project Waste-Free Schools](#). Show the video three times per week at first, then gradually decrease the frequency to once per week when it is clear that students have absorbed the information. After the video, teachers can ask questions about the content to test students' ability to understand it (Appendix 2).*

### **Key Takeaways**

1. The 4Rs can help us reduce the amount of solid waste we generate.
2. Use the 4Rs in order of priority: Refuse, Reduce, Reuse, Recycle.
3. The 4Rs are an important part of good waste management.

# CHAPTER 3: Basic Concepts of Food Safety

## Purpose and Expected Outcomes

The purpose of this section is to provide the minimum required information for students to understand the concept of food safety.

1. To learn the main principles of food safety and how it relates to waste management.

## Important Terms

Food safety	The conditions and practices that preserve the quality of food to prevent contamination and foodborne illnesses.
Foodborne illness/poisoning	Foodborne illness is caused by consuming contaminated foods or beverages.
Germ	Any type of bacteria or virus that can contaminate food and make you sick.

## What Is Food Safety and How Does It Relate to Waste?

Food safety refers to the conditions and practices that preserve the quality of food to prevent contamination and foodborne illnesses. The principles of food safety aim to prevent food from becoming contaminated and causing food poisoning and foodborne diseases. This can be achieved through various means, the primary ones being four core practices: to keep clean and to separate, cook, and chill foods.



**Clean:** Wash hands, utensils, and surfaces often. Germs can spread and survive in many places.



**Separate:** Raw meat, poultry, seafood, and eggs can spread illness-causing bacteria to ready-to-eat foods, so keep them separate.



**Cook:** Food is safely cooked only when the internal temperature is high enough to kill germs that can make you sick. See the [safe minimum cooking temperatures chart](#) for how to safely prepare meat, seafood, chicken, and other foods.



**Chill:** Refrigerate perishable food promptly. Bacteria that cause food poisoning multiply quickest between 40°F and 140°F.

### Teacher Tips

Teachers can use the “[Kids fight BAC](#)” curriculum to share good food safety techniques, including the four practices listed above.

Food safety is also directly related to good waste management. Food waste poses significant risks to food safety and the environment. If organic waste, such as food, is not thrown away or is thrown away in the wrong bin, it can rot and contaminate the places we eat, play, live, and work. Unsafe food should be thrown out properly based on waste management practices.

Rotting organic food waste can also attract pests, which carry diseases, and if they interact with the food you eat, they can make you very sick. If we do not compost organic waste properly, then the food we grow in that compost can also become contaminated.

### Teacher Tips

Teachers can ask students:

*Why is food important to our health?*

*How do waste and food relate to each other?*

Figure 7. Examples of Safe and Unsafe Food Handling



Source: [atvstp.org.vn](http://atvstp.org.vn) and [dinhduong.com.vn](http://dinhduong.com.vn)

## Classroom Resources

### **Small Group Discussion (10 minutes)**

Divide students into groups of five. Teachers give the students pictures related to food safety and food-related risks and ask them to explain which pictures show safe and unsafe food handling, and why.

### **Interactive Exercises (30 minutes)**

Practice knowledge of the four core practices:

**Clean:** Have students practice washing their hands while singing for 20 seconds or as long as it takes to sing the *Tập tầm vông, Bé khỏe bé ngoan, Rửa mặt như mèo* twice.

**Separate:** Have pictures of four to six types of foods, including meats, eggs, vegetables, and fruit, as well as a picture of a garbage can, and ask students to organize them into two groups that must be kept separate (meat, eggs, and the garbage can must all be kept separate, while fruits and vegetables can be together but away from the others).

**Cook and Chill:** Using the same pictures, ask students which foods have to be chilled and cooked properly to ensure that they can be eaten safely (fruits and vegetables do not have to be chilled and cooked, while meats and eggs do).

### **Video on Waste Management**

During break time, the homeroom teachers can show students this video: [Food Safety for Mothers and Children \(Vietnamese\)](#). Show the video three times per week at first, then gradually decrease the frequency to once per week when it is clear that students have grasped the information. After the video, teachers can ask questions about the content to test the students' ability to understand it (Appendix 3).

## Key Takeaways

1. Food is safest when you use the four core practices: clean, separate, chill, and cook.
2. Good waste management is necessary for food safety.

# CHAPTER 4: The Waste-free School Model and the Effects of Solid Waste Management, 4Rs, and Food Safety on Health

## Purpose and Expected Outcomes

The purpose of this chapter is to show how poor management of solid waste, as well as practicing the 4Rs and food safety, fit within the waste-free schools concept and impact people's health.

1. Students understand the Waste-free School model.
2. Students understand how poor solid waste management affects our health.
3. Students understand how the 4Rs contribute to better, safer solid waste management, and which health risks to watch out for when practicing the 4Rs.
4. Students understand how poor food safety affects health, and how this relates to safe solid waste management.

## Important Terms

Hazard	A food safety hazard is as any biological, chemical, or physical property that may cause a food to be unsafe for human consumption.
Microplastic	Microplastics are small plastic pieces less than five millimeters long. They come from a variety of sources including larger plastic pieces (often garbage) that have broken apart, resin pellets used for plastic manufacturing, or in the form of microbeads, which are small, manufactured plastic beads used in health and beauty products.
Single-use plastic	Single-use plastics, or disposable plastics, are used only once before they are thrown away or recycled. These items are things like plastic bags, straws, coffee stirrers, soda and water bottles, and most food packaging.
Cross-contamination	Cross-contamination is the transfer of harmful bacteria to food from other foods, cutting boards, and utensils if they are not handled properly.



## The Concept of Waste-free Schools

The WFS concept is designed to take into consideration the current state of waste management practices and the facility conditions in a school as it strives to achieve optimal waste management. The main goals of the WFS initiative are to:

- Raise awareness about solid waste management among students.
- Enhance recycling practices.
- Reduce waste generation, including food waste.
- Improve food safety.

It is important to understand how each of these areas—solid waste, 4Rs, and food safety—relates to our health, and to the other areas, in order to understand why we should change our behaviors.

## How Does Waste Impact Our Health?

Waste can impact our health in many ways. Within communities, waste can affect our health by:

- Blocking drains and causing flooding, accidents, and injury.
- Attracting animals and causing disease.
- Causing air pollution when people burn waste in the streets, resulting in burns, asthma, and suffocation.



Source: BHC 2021b.

At the industrial level, waste can impact our health in the following ways:

- Soil contamination can occur if hazardous waste is spilled or buried in the ground. If we grow food in contaminated soil, there is a risk that our food will also be contaminated and harm human health.
- Water contamination occurs when rainfall easily mixes with toxic liquid substances and seeps into the water streams to end up in nearby bodies of water. Thus, the neighborhood fountain, pond, lake, or even drinking water taps



are susceptible to the dangers of contamination. Drinking contaminated water can make people very sick.

- Air contamination occurs when paper and plastic are burnt at landfills and release gases and vaporized chemicals, which causes air pollution that hurts the surrounding environment and human population. Children, women, the elderly, and those who live near landfills are at significant risk. Waste disposal workers, employees of waste collection points and landfills, and others who come in contact with waste materials are also at high risk.

Remembering the 4Rs helps to reduce the amount of waste that needs to be processed.

Figure 8. Example of the Effects of Poor Solid Waste Management



Source: <https://nhandan.vn/moi-truong/wwf-ra-mat-cuon-truyen-tranh-ve-rac-thai-nhua-459894/>

## Classroom Resources

### Small Group Discussion (20 minutes)

Show this graphic novel on waste management and ask students what they would do if they were Binh: Waste Management and Its Impact on People and Environment (available in [English](#) and [Vietnamese](#)).

Divide students into groups and let them discuss the following questions:

- What are the effects of solid waste management on health?
- How can we avoid garbage burning?
- How can poorly managed waste lead to dumping of waste on streets?

## How Do the 4Rs Contribute to Healthier, Safer Solid Waste Management?

Practicing the 4Rs contributes to healthier, safer waste management for the following reasons:

- Refusing and reducing plastic use means that you will eat and drink fewer microplastics, which can contain contaminants such as trace metals and some potentially harmful organic chemicals.
- Separating organic waste to be composted (which is a form of both reusing and recycling) means it will not decompose in “other” or “recycling” waste bins or near food sources, reducing the risk of contamination and illness. It also reduces the risk of pests being attracted to household waste bins.
- Recycling waste means less environmental pollution from mining and factories, which keeps you and your family healthier.

### Teacher Tips

*Teachers can share and discuss these plastic reduction initiatives with the students:*

*Schools in Ho Chi Minh City are testing ways to reduce plastics use through a campaign that focuses on plastics and health: [Making “Zero Waste” Cool in Vietnam](#).*

*[Green Hub Da Nang](#) has many resources on how to reduce plastics use and how plastics affect health.*

## How to Avoid Health Risks When Practicing the 4Rs

While the 4Rs can help make waste safer, you do need to follow a few safety rules when practicing the 4Rs.

While it is good to **refuse** single-use plastics and **reduce** waste, if you really need something in order to safely eat your food, you can accept that item (for instance a fork if you cannot safely wash your hands before eating).

When **reusing** an item, first check that it is not dangerous. This means, for instance, that a glass or metal bottle does not have broken or sharp edges that could cut you. You should always wash any item thoroughly with soap and water before reusing it. Look for and avoid sharp edges and wear gloves when sorting and separating piles of **recyclables**. Always rinse recyclables that had organics in them to avoid contamination.

## Classroom Resources

### Small Group Discussion (10 minutes)

*Activity #1: Go to the waste bins in the school cafeteria, and ask students to visually assess whether organic waste has been thrown into the recycling, waste bins, or on the floor or tables. They can use their eyesight and sense of smell to do this. If they see organic waste in the wrong bins, discuss why this could make people sick. For example, the garbage man could get food poisoning from handling the bags, kids could get sick if they touch organic waste on tables or floors, kitchen staff could accidentally contaminate school food if they touch organic waste that has not been properly composted.*

*Activity #2: Pick out a few waste items that can be reused for storing items in the classroom. Have students discuss how they would prepare them for safe reuse (washing, checking for sharp or broken parts, etc.).*

## How Does Food Safety Affect Health?

Safe food handling practices and procedures must be implemented at every stage of food production to curb risks and prevent harm to consumers.

Unsafe food can affect your health in several ways:

- *Biological hazards* such as bacteria, viruses, parasites, and food allergens can cause infections, allergic reactions, and even death.
- *Chemical hazards* such as cleaning products, pesticides, unsuitable metal containers, and excessive food additives can cause poisoning, burns, and chronic diseases.
- *Physical hazards* such as broken glass, metal, hair, fingernails, stones, leaves, packaging, pests, and nesting materials can accidentally make its way into food and cause illness or injury.

### Food Safety Facts

- Many people get sick from the food or drink they consume.
- Lack of handwashing accounts for 33 percent of all food poisoning cases. Good personal hygiene is therefore important, particularly after defecation and before cooking and eating food.
- Contaminated or rotten food may appear, smell, or taste different, but often there is no change and it is difficult to know if food is contaminated.
- Food poisoning and foodborne diseases can lead to serious health problems and even death. The risk is higher for children under five years old, pregnant women, and the elderly.
- Staying healthy saves money. Healthy families can avoid additional costs of medication and health services.

## How Does Safe Waste Management Make Food Safer?

Good waste management around your home, school, and local restaurants decreases the risk of cross-contamination of waste and food. What does this mean? Cross-contamination means the accidental transfer of contaminants from one surface or substance to our food as a result of improper handling procedures. Poor waste management can cause spoiled organic waste, chemical waste, or even physical objects in waste to accidentally get into your food, making it unsafe. Overflowing waste bins can also draw pests into kitchen and eating areas, further increasing the risk of contamination.

The best way to avoid waste contamination of food is to keep organic and inorganic waste separate and fully contained in closed bins, away from food. These bins need to be emptied regularly to avoid overflow and pests being attracted to the organic waste.

### Teacher Tips

*Teachers can create a simple game on a piece of paper where each space covers a key food safety concept. Here is an example that can be modified for your context: [Finish First Family Activity Sheet](#).*

## How Are Food Safety and Waste Management Linked?

In primary schools in Da Nang city, food waste may account for as much as 69 percent of a school's total solid waste (Building Healthy Cities Project 2021a). Food waste increases the amount of garbage generated, impacts the nutrition of children, and increases financial burdens.

Common methods of food safety can help improve waste management, such as avoiding food waste and reducing single-use plastic. The packaging of food items also contributes to waste. Recycling food wrappers, composting leftover food, or storing it in reusable containers can decrease the waste that ends up in landfills.

### Ways to Avoid Food Waste

- Be aware of how much food you throw away.
- Do not buy more food than you can use before it spoils.
- Plan meals and use shopping lists. Think about what you are buying and when it will be eaten.
- When eating out, become a more mindful eater. If you are not very hungry, request smaller portions. Bring your leftovers home and refrigerate or freeze them within two hours. Check with the sellers to see how long they will be safe to eat.
- Avoid wasting food and over-using food packaging.

### Ways to Avoid Food Waste (continued)

- Keep food in covered containers or sealed storage boxes, and check leftovers daily for spoilage.
- Use your freezer. Freezing is a great way to store most foods to keep them from spoiling until you are ready to eat them.
- Check your fridge often to keep track of what you have and what needs to be used. Eat or freeze items before you need to throw them away.
- To keep foods safe when entertaining, remember the two hour rule: do not leave perishable foods out at room temperature for more than two hours. Keep hot foods hot and cold foods cold.

### Classroom Resources

#### **Interactive Exercise (20 minutes)**

*Play a game called “unwanted dinner guests.” Break students into groups of three to five, and ask them to list the types of unwanted guests they might be inviting to dinner if they have waste lying around their food, and if they do not follow the four core practices of food safety.*

*Answers include bacteria, viruses, fungus, pests, chemicals, broken glass, dirt, and other physical objects that should not be in food.*

### Key Takeaways

1. Waste management is everyone's responsibility.
2. Poor waste management negatively impacts people's health.
3. The 4Rs can help make waste management safer and healthier.
4. Good waste management makes food safer, which helps to break the vicious cycle of disease and malnutrition caused by unsafe food. Unsafe food can cause diarrhea and is dangerous!

## **Volume II: Implementation of the Waste-free School Initiative**

This volume of the Waste-free Schools Handbook is for administrators, staff, and teachers who implement the Waste-free Schools program. Understanding of Volume I is needed before implementing the activities in Volume II.

# CHAPTER 5: Solid Waste Management

## Baseline Assessment

As a first step for administrators implementing the WFS program, the school must conduct a baseline assessment to observe the current situation of solid waste management practices and analyze the characteristics of the solid waste management system at the school.

### Learning Objectives

- Measuring the amount of waste generated daily.
- Analyzing the changes in the amount of waste generated during a week.

### Preparation

- Worksheet 1: Identification of Waste Generation
- Worksheet 2: Measurement of Waste Composition
- Worksheet 3: Awareness Assessment



# Worksheet 1: Identification of Waste Generation

Source: Dr. Toan Pham Phu Song, The University of Danang - University of Technology and Education.

**Goal:** Students understand how much waste they generate in a day.

## Preparation:

Implementation groups	Time	Materials
Staff and students (grades 4 and 5): At least 3 persons including 1 teacher	10 minutes/day for 5 consecutive days	Notebook and pen Personal protective equipment (gloves, masks, etc.) Waste collection bins

## Instructions:

1. For the next five days, keep all waste generated in specified bins.
2. At the end of the week, take each type of waste and determine the volume by filling sized containers completely. Do not compress the waste.
3. Calculate the total volume of waste generated per day by accumulating the measured volume (V).

$$V = V_1 + V_2 + V_3 + V_4 + V_5$$

4. Measure the weight of the waste in kilograms (kg). Then calculate the density (D) of the waste.

$$D = \text{kg} / \text{L}$$

5. Calculate the mass (M) of the waste.

$$M = D \times V \text{ (kg / day)}$$

6. Store the waste for use in worksheet 2 activities.

Use Appendix 4 to record the results.

# Worksheet 2: Measurement of Waste Composition

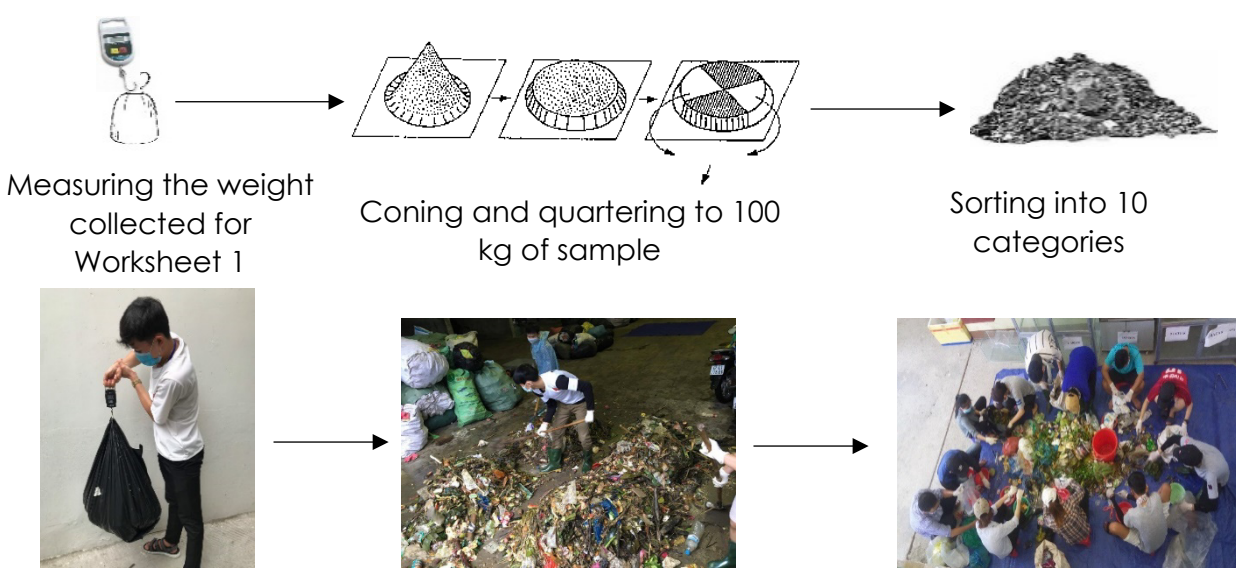
Source: Dr. Toan Pham Phu Song, The University of Danang - University of Technology and Education.

**Goal:** For students to measure the composition of waste from various sources in school.

## Preparation:

Implementation group	Time	Items
Staff and students (grades 4 and 5): 10 persons	3 hours	Plastic <b>pots</b> (10), plastic tank 20 liter (5), inox tongs (10), tarpaulin (4m x 4m)  Hand electric scales (2) (capacity 50 kg)  Personal protective equipment (gloves, masks, caps)

Figure 9. The Waste Composition Analysis Process



## Instructions:

1. Weigh the amount of solid waste collected for Worksheet 1 using a hand electric scale with 50 kg capacity. Waste can be divided into small samples with a suitable weight to match surveyor's ability.

2. Mix and reduce the volume of waste to about 50 kg by using the coning and quartering method.
3. Sort the 50 kg of waste into 11 categories (*Table 1*).
4. Measure the weight of the waste by category using the hand electric scale.
5. Calculate the proportion of waste components:

$$C_i(\%) = \frac{m_i}{m} \times 100\%$$

Where:  $C_i$  (%) is the percentage of the category  $i$ .

$m_i$  (kg) is the amount of the category  $i$ .

$m$  (kg) is the total amount of the sample.

Use Appendix 4 to record the results.

Table 1. Waste Categories

No	Category	Description
1	Food waste	Food waste from cafeterias
2	Kitchen waste	Organic waste from kitchens
3	Garden waste	Leaves, flowers, and tree branches
4	Paper	Cardboard, newspaper, notebooks, copy paper
5	Tissue paper	Tissue paper (from bathrooms and cafeteria)
6	Metals	All kinds of metal (cans, bottle caps, aluminum foil)
7	High-value plastics	PET, PPT bottles, hard plastics
8	Low-value plastics	Plastic bags, single-use plastics
9	Combustible waste	Leather, rubber, textile, wood, bamboo
10	Incombustible waste	Soil, ceramic, glass
11	Hazardous waste	Batteries, medicines, chemical items

# Worksheet 3: Awareness Assessment

Source: Dr. Toan Pham Phu Song, The University of Danang - University of Technology and Education.

**Goal:** Assess the awareness of waste management of staff and students.

## Preparation:

Implementation group	Time	Items
Staff/teachers: 2	3 minutes/class 30% of the students	Questionnaire (Appendix 1)

## Instructions:

1. Ask students the questions in Appendix 1 and tally the responses (yes/no).
2. Calculate the percentage of students who responded yes and no.
3. Do a short interview with students to understand their thinking and any difficulties.



*Conducting questionnaire on awareness of solid waste management.*

# CHAPTER 6: The Waste-free School Model

## Building the WFS Concept

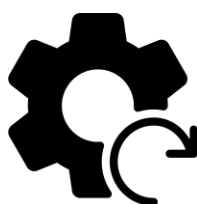
The WFS model aims to optimize waste management activities based on the conditions of the school. This means that the WFS model may not be the same in every school. However, the WFS model needs to be designed according to the following priorities:



### **Identify the types of waste for separation at the source.**

This is an important step that significantly affects waste flow and waste management activities in the school. The types of waste are prioritized for sorting from simple to detailed:

Recyclable waste (papers, metals, high-value plastics) → Hazardous waste → Leftover food waste → Organic waste



### **Reset the solid waste management system.**

This step is intended to adjust the current waste management system to match the waste flow with sorting and response in daily activities. Some points should be given special attention:

- The number, size, distance between, and location of collection bins and trash.
- The area for sorting leftover food and kitchen waste for composting.
- Appropriate placement for communication panel.



### **Assess the applicability of 4Rs.**

The 4Rs activities should be widely applied in school activities for students, teachers, and staff. The roadmap for implementing 4Rs activities should be studied and developed based on the waste management practices and conditions of the schools.



### **Set up an operating team.**

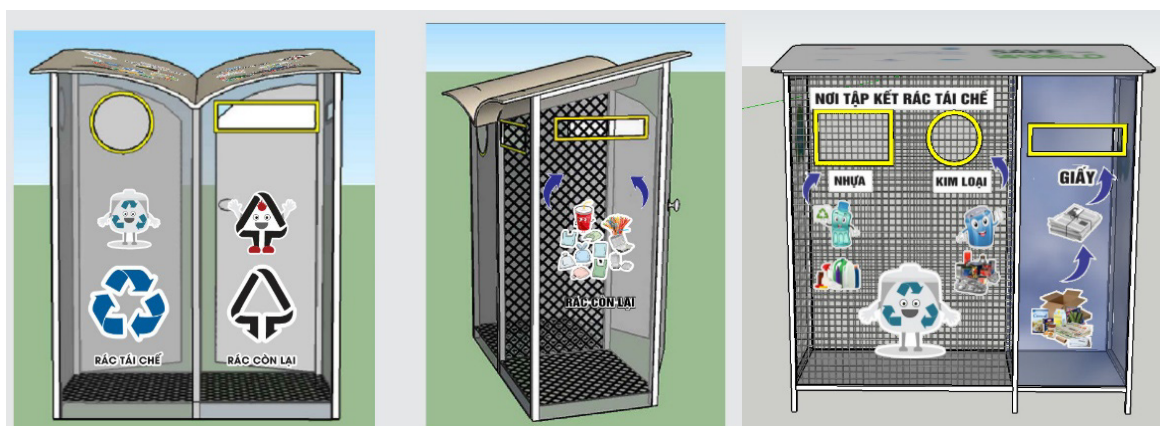
An operating team that includes teachers, staff, and students should be established and trained. The team should be assigned tasks and roles corresponding to their functions in the schools. Some needed positions are:

- Student meals manager to segregate and recover leftover food.
- Kitchen manager to sort and recycle kitchen waste.
- Sanitation worker to collect waste after sorting.
- Everyone monitors waste management behavior of staff and students.

## Setting up Systems

The equipment used in the WFS model will be based on the school's facilities and financial situation. The equipment should ideally be made from recycled and environmentally friendly materials.

Figure 10. Design of a Two-compartment Bin and Recycling Station

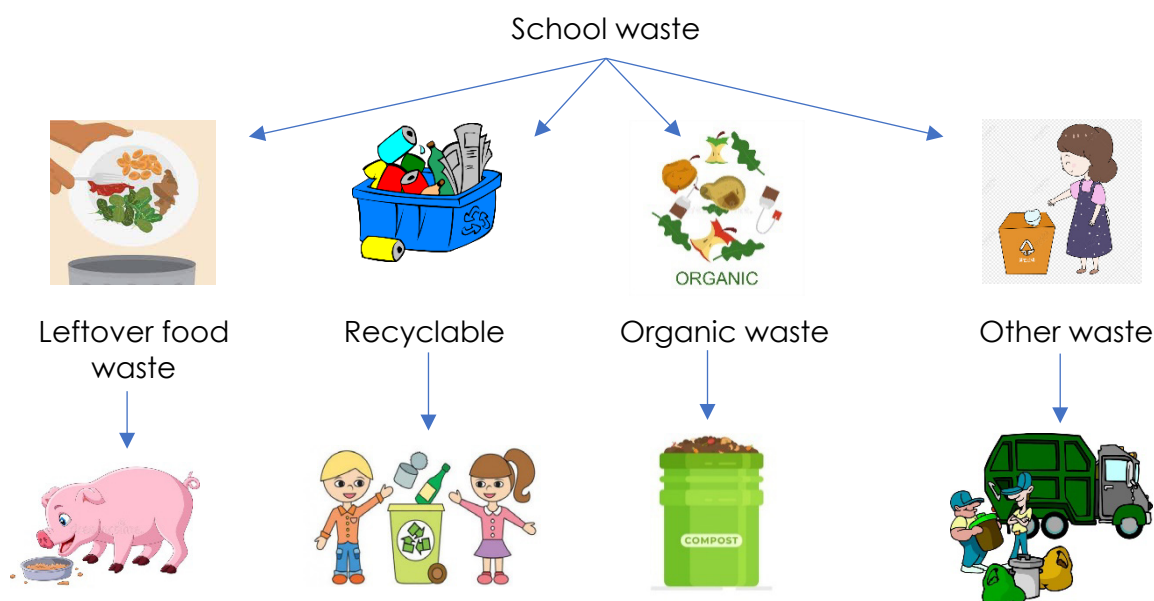


## Separating Waste at the Source

Depending on the school's waste composition, available facilities, and local requirements, waste should be separated into the following categories:

- Leftover food waste from the cafeteria is sorted into the plastic tank for livestock.
- Organic waste (kitchen and garden) is segregated at the source for composting.
- Recyclable waste (paper, high-value plastics, metal) and other waste are separated into two-compartment bins and collected at the gathering point.

Figure 11. Concept of Waste Separation at the Source





## School-wide Activities

The following activities are aimed at teachers, staff, and students with the goal of implementing the 4Rs in daily life around the school. Encouragement, information, and training are the main methods for raising awareness of these activities among staff, teachers, and students.

### Refuse Activities

*Preparation:*

- Media materials: panels, videos, training workshops.
- Waste management regulations should be promulgated.

*Details:*

Activities	Content	Expected results
Refuse to use single-use plastic items	Not using plastic bottles in meetings. Encourage alternative personal items.  Not using plastic bags and single-use plastic items (foam boxes and plastic spoons, cups, and straws).  Not using plastic bags when shopping, bringing alternate bags (e.g., cloth bags).	The amount of plastic waste in schools will be decreased.
Refuse to add food when full	Take just enough food to eat.  Prepare fewer meals for students when food is leftover in previous meals.  Students should refuse food when they feel full.	The amount of food waste in schools will be decreased.

Teachers should ask students to design a poster with the above content.

### Reduce Activities

*Preparation:*

- Media materials: panels, videos, training workshops.

*Details:*

Activities	Content	Expected results
Reduce packaging items	Use reusable bags to reduce plastic bags when shopping.	The total amount of waste in schools will be decreased.



	Reduce bulky waste (wooden parcels, foam pads) from equipment purchases by returning it to the delivery company.  Purchase refill packs (oil, seasoning, dishwashing liquid, etc.) to reduce the use of plastic bottles.	
Reduce paper waste	Do not print when not needed to reduce paper waste.  Reduce napkin and tissue use during meals.	The amount of paper waste in schools will be decreased.
Reduce food waste	Share extra food with others.  Encourage appropriate amount of food for each student (via the information in the nutrition handbook).	The amount of food waste in schools will be decreased.

## Reuse Activities

### Preparation:

- Media materials: panels, videos, training workshops, guidelines.

### Details:

Activities	Content	Expected results
Reuse containers	Reuse glass bottles/tanks, bags, and other items.  Reuse metal, ceramic, and other containers/packages.	Containers, bottles, packages, and bags will be reused as much as possible to reduce generation of waste.
Reuse paper	Reuse single-sided printing paper.	Single-sided printing paper is reused for other purposes.
Reuse food waste	Reuse leftover food as livestock feed.	Leftover food will be stored and collected daily for livestock.

## Recycle Activities

### Preparation:

- Composting system to recycle organic waste, and office equipment to create teaching and office supplies from the waste.

*Details:*

Activities	Content	Expected results
Recycle plastic, glass, and paper boxes and bottles	Clean used items and recycle them into office, teaching, or decorating products (pen holders, flower vases, etc.).	More recycled products are created.
Recycle organic waste	Organic waste (kitchen waste and garden waste) is recycled daily into the composting system.	Compost is made up of good quality organic waste, useful for farming and school gardening.

## Training by Doing

*Preparation:*

This activity will be conducted daily at waste collection points in the school. Staff and members of the environmental club will act as instructors to monitor student performance. The number of instructors should be equal to the number of waste collection points.

*Instructions:*

1. In the first week, the instructors will guide students to sort waste from the two-compartment bins during break time.
2. From the second week, the will instructors observe student behavior, encouraging good practice and supporting students as needed.
3. The instructors will gradually add incentives and continue to support students in their practice.

*Expected Results:*

1. Students proficiently practice collecting and sorting waste into the correct bins.
2. Waste separation at the source is maintained, and the efficiency of waste segregation is gradually improved.



# CHAPTER 7: Measure and Evaluate the Process Effectiveness

Source: Dr. Toan Pham Phu Song, The University of Danang - University of Technology and Education.

Administrators can use the following indicators to evaluate the performance of the WFS model. Each method provides a timeframe for conducting these evaluations.

## Technical Performance

### Performance of Waste Generation Reduction (PWR - $H_G$ )

- *Evaluation:*

$$H_G(\%) = \frac{M_1 - M_2}{M_1} \times 100 \quad \text{or} \quad H_G(\%) = \frac{V_1 - V_2}{V_1} \times 100$$

Where:  $M_1$  is the total amount (kg) or  $V_1$  is the volume (L) of waste before applying WFS model.

$M_2$  is the total amount (kg) or  $V_2$  is the volume (L) of waste at the assessment time.

- *Method:* The amount of waste is measured by weighing. The volume of waste is evaluated by storing trash in volume-specific containers (see Appendix 5).
- *Monitoring:* The monitoring frequency is once per month, recorded on seven consecutive days.
- *Person in charge:*
  - Sanitary and security staff are responsible for monitoring and recording data.
  - The Environmental Club is responsible for monitoring, checking, and summarizing data.

### Performance of Recycling Practice (PRP - $H_R$ )

- *Evaluation:*

$$H_R(\%) = \frac{M_{R1} - M_{R2}}{M_{R1}} \times 100 \quad M_R = M_{RM} + M_{FW} + M_{OG}$$

Where:  $M_{R1}$  is the total amount (kg) of waste recycled before applying the WFS model.

$M_2$  is the total amount (kg) of waste recycled at the time of assessment.

$M_{RM}$  is the amount of recyclable material waste (papers, metals, plastics) collected for selling.

$M_{FW}$  is the amount of food waste collected for livestock.

$M_{OG}$  is the amount of organic waste treated by composting.

- *Method:*
  - The amount of waste is measured by weighing (see Appendix 6).
  - $M_{RM}$ ,  $M_{FW}$  and  $M_{OG}$  is collected regularly by recording the amount of recyclables after transactions or before treatment.
- *Monitoring:* The PRP is assessed and monitored twice per year in the last month of the semester.
- *Person in charge:*
  - Sanitary, security, and kitchen staff are responsible for recording data as assigned by the school board.
  - The Environmental Club is responsible for monitoring, checking, and summarizing data.

### **Performance of Waste Separation Practice (PSP - $H_s$ - %)**

- *Evaluation:*

Recyclable separation efficiency:  $H_s(\%) = \frac{m_{R'}}{m_R} \times 100$

Misclassification rate:  $H'_s(\%) = \frac{m_{O'}}{m_O} \times 100$

Where:  $m_{R'}$  is the amount (kg) of recyclable waste detected in the recyclable compartment.

$m_R$  is the total amount (kg) of recyclable waste in two compartments.

$m_{O'}$  is the amount of other waste detected in the recyclable compartment.

$m_O$  is the total amount (kg) of other waste in two compartments.

- *Method:* Waste from two compartments of the bins is gathered separately for segregation. The amount of recyclable and the other waste is measured by electric hand scales (see Appendix 7).
- *Monitoring:* The evaluation of the PSP is conducted by the Environmental Club twice per year in the last month of the semester.
- *Person in charge:*
  - Staff and students participate in the PSP assessment activities.
  - The Environmental Club is responsible for monitoring, checking, and summarizing the data and reporting to the school board.

## Awareness Raising Effectiveness

### Proportion of Using Plastic Items (PUP - $R_P$ - %)

- *Evaluation:*

Proportion of using plastic items (PUP):  $R_P(\%) = \frac{N_P}{N} \times 100$

Where: N is the number of students/staff in the school.

$N_P$  is the number of students/staff using single-use plastic items in school at the time of the survey.

- *Method:* The number of students/staff using single-use plastic in schools is collected group by group, class by class. Single-use plastic items are foam boxes, plastic cups, straws, bags, and bottles.
- *Monitoring:* The evaluation of the PUP is conducted by the Environmental Club twice per year in the last month of the semester.
- *Person in charge:*
  - Staff and students participate in the PUP assessment activities.
  - The Environmental Club is responsible for monitoring, checking, and summarizing the data and reporting to the school board.

### Proportion of Understanding of the WFS Model (PUM - $R_M$ )

- *Evaluation:*

Proportion of understanding of the WFS model (PUM):  $R_{Mi}(\%) = \frac{N_{M,i}}{N_M} \times 100$

Where:  $N_{M,i}$  is the number of students/staff in the survey who understand the key information (i) of the WFS model.  $N_{Mi}$  should be summarized in a table.

$N_M$  is the total number of students/staff in the survey.

- *Method:* A questionnaire will be sent to teachers. Also, questions will be asked of students one-on-one in class by the teacher. The students' responses will be recorded to evaluate the  $R_M$ .
- *Monitoring:* The evaluation of the PUM is conducted by the Environmental Club twice per year in the last month of the semester.
- *Person in charge:*
  - Staff and students participate the PUP assessment activities.
  - The Environmental Club is responsible for monitoring, checking, and summarizing the data and reporting to the school board.

## Consensus of Students, Staff, and Society

Consensus of students and staff on the WFS model and environmental activities is evaluated by the following indicators:

- Number of environmental/cleaning activities held per year.
- Number of students and staff who participate regularly in environmental/cleaning activities.
- Number of students who participate in operating the composting model.
- Number of organizations and residents who participate in environmental/cleaning activities.

The evaluation of these four indicators is conducted monthly by the Environmental Club and reported to the school board at the end of the semester.

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# APPENDIX 1: Awareness Assessment Questionnaire

The purpose of this informal survey is to capture the information and awareness that students have about waste and waste management activities at school. Please read the following questions to the students.

Ask students to raise their hand if they want to answer “Yes” to any of the following:

1. Is all waste we produce garbage?
2. Is food waste garbage?
3. Are there more than one type of waste disposal bins?

Bonus question, ask students to say the three types of bins.

4. Is it true that waste management does not affect your health?
5. Is good waste management important for food safety too?
6. Did you put all your waste so far today in the right bins?

Teacher can lead a round of applause for those who answer yes to this question.

## Answers:

1. No, garbage is only that which goes to the landfill and cannot be reused as something else.
2. No, it is waste that can become compost.
3. Yes, there are three bins for organic/compost waste, recycling, and landfill.
4. No, good waste management means you will not get sick from biological, chemical, or physical hazards in waste.
5. Yes, good waste management means food can be safe from cross-contamination.
6. Answer depends on the child's experience that day.

## APPENDIX 2: Training Through Media Questionnaire

Answers to these questions are within the video provided in Chapter 2 ([Building Healthy Cities Project Waste-Free Schools](#)). Only administer this questionnaire after viewing of the video.

1. How many compartments does our school trash can have? What are the compartments?
2. Have the students put the correct garbage in the corresponding compartments in this video?
3. What do we need to do before putting the garbage in the bin?
4. What types of waste are recyclable?
5. Should we get a lot of food or just enough to eat? If you have leftovers, what do you do?
6. Do you know what organic waste can be used for?
7. Do you know what to do with the recyclable waste that we separate?

*Thanks for your support!*

## APPENDIX 3: Education on Food Waste/Safety Group Discussion Tool

Within the context of the WFS model, these are questions that can be asked within the group context to facilitate discussion and understanding. Use after viewing the video in Chapter 3 ([Food Safety for Mothers and Children \(Vietnamese\)](#)).

1. How does the environment affect our health?
2. Who are the groups that are particularly susceptible to bacteria and toxins in food?
3. Do you think water and food are important to our health? Why?
4. What are some of the issues that come from consuming unsafe food?
5. Please list some safe food techniques.
6. What can we do to improve food safety?

*Thanks for your support!*

## APPENDIX 4: Situation of Waste Generation and Characterization

Source: Dr. Toan Pham Phu Song, The University of Danang - University of Technology and Education.

School: .....

Academic year: .....

Total daily amount of solid waste generation in the school							
	Mon (.../.../202...)	Tue (.../.../202...)	Wed (.../.../202...)	Thu (.../.../202...)	Fri (.../.../202...)	Sat (.../.../202...)	Sun (.../.../202...)
m (kg)							
V (L)							
D (kg/m3)							

Composition of solid waste in the schools (kg)								
Categories	Paper	Metal	Plastics	Food waste	Organic waste	Hazardous waste	Other waste	Total
m (kg)								
%								

# APPENDIX 5: Performance of Waste Generation Reduction (PWR - H<sub>G</sub>)

Source: Dr. Toan Pham Phu Song, The University of Danang - University of Technology and Education.

School: .....

Academic year: .....

Volume of solid waste generation - V <sub>1</sub> (L)								
Date	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
V <sub>1</sub> (L)								

Volume of solid waste generation - V <sub>2</sub> (L)									
	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total	H <sub>G</sub> (%)
... - ..., Jan 2022									
... - ..., Feb 2022									
... - ..., Mar 2022									
... - ..., Apr 2022									
... - ..., May 2022									
... - ..., Jun 2022									
... - ..., Jul 2022									
... - ..., Aug 2022									
... - ..., Sep 2022									
... - ..., Oct 2022									
... - ..., Nov 2022									
... - ..., Dec 2022									



## APPENDIX 6: Performance of Recycling Practice (PRP- $H_R$ )

Source: Dr. Toan Pham Phu Song, The University of Danang - University of Technology and Education.

School: .....

Academic year: .....

Composition of solid waste in the school (kg) (before implementing Waste-free Schools model)									
Categories	Paper	Metal	Plastics	Food waste	Organic waste	Hazardous waste	Other waste	Total	$M_{R1}$ (kg)
m (kg)									

Composition of solid waste in the school (kg) (after implementing Waste-free Schools model)										
Categories	Paper	Metal	Plastics	Food waste	Organic waste	Hazardous waste	Other waste	Total	$M_{R2}$ (kg)	$H_R$ (%)
1 <sup>st</sup> Semester										
2 <sup>nd</sup> Semester										

# APPENDIX 7: Performance of Waste Separation Practice (PSP - H<sub>s</sub>)

Source: Dr. Toan Pham Phu Song, The University of Danang - University of Technology and Education.

School: .....

Academic year: .....

The composition of solid waste in bins (kg)												
Categories		Paper	Metal	Plastic	Other waste	Total	m <sub>R</sub> (kg)	m <sub>R</sub> ' (kg)	m <sub>O</sub> (kg)	m <sub>O</sub> ' (kg)	H <sub>s</sub> (%)	H' <sub>s</sub> (%)
1st Semester	Recyclable compartment (kg)											
	Other waste compartment (kg)											
2nd Semester	Recyclable compartment (kg)											
	Other waste compartment (kg)											

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