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Module 6

Comprehensive solid waste management

IDB

Rise Up Against Climate Change!
A school-centered educational initiative
of the Inter-American Development Bank

Rise Up
Against Climate Change

A school-centered educational initiative of the Inter-American Development Bank

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Contents of module 6

Rise Up

Against Climate Change


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Identifying the problem

Take a look at the garbage bin in your school or home. Have you ever wondered what makes its content garbage?

If you look inside, you may see that the waste at the bottom of the bin is made up of items that are no longer of use and therefore have been tossed out. You may also find materials that are of mixed composition (made of glass, paper, metal, organics, and the like). Breathe in deeply, and you may notice an unpleasant odor.

This is a sample of our consumption. We disregard the origin and history of these items, their ultimate destiny, and the consequence of their disposal for the environment and human beings. And this disregard is, without a doubt, what turns waste into a problem.

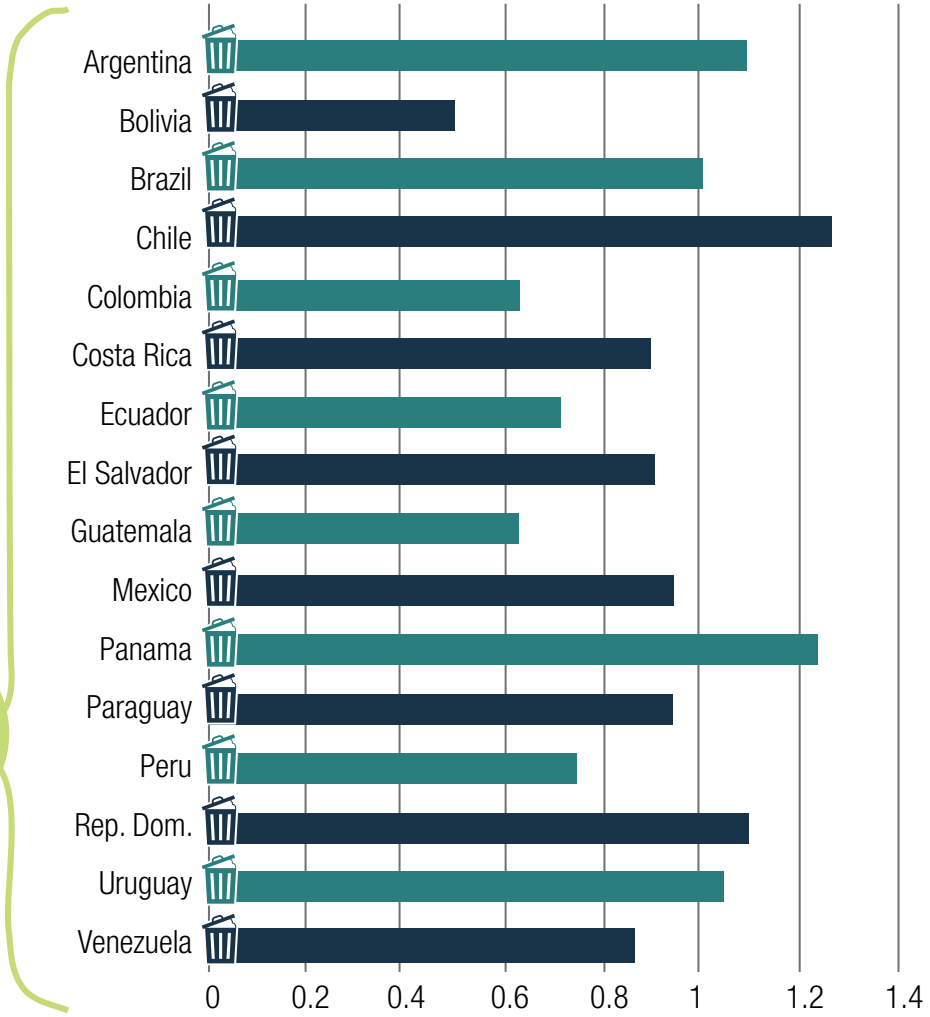
Have you ever stopped to look at the amount of garbage that accumulates in your school in a day or a week? Have you taken a look at the mountains of waste at your town's dump? Do you know who—or how many people—generate it? Can you imagine how many tons of waste are produced by the 7 billion people who currently inhabit the planet (UN News Center, 2011), or, for that matter, the amount of waste produced by the nearly 600 million people living in Latin America and the Caribbean, or the LAC region (PAHO, IDB, and AIDIS, 2010)

The United Nations (UN) has discovered that the global generation of waste per person, per day, is somewhat greater than 1.76 pounds. It also notes that this amount is increasing, especially in the planet's highly industrialized cities.

Estimates indicate that the production of waste varies greatly across countries and depends on their level of industrial development. For example, a person in the United States generates about 6.17 pounds daily, in Argentina 2.53 pounds, and in Guatemala 1.34 pounds (PAHO, IDB, and AIDIS, 2010).

Per capita
daily solid waste
generation
in Latin America and the Caribbean

Figure 1. Solid waste generation in selected countries in Latin America and the Caribbean



According to the Pan American Health Organization (PAHO), the Inter-American Development Bank (IDB), and the Inter-American Association of Sanitary and Environmental Engineering (AIDIS), cities in the LAC region generate 295,000 tons of waste from homes and 436,000 tons from schools, shops, offices, markets, hospitals, and collection from street cleaning and public lands daily. These institutions estimate that an average of 2.05 pounds of waste per capita per day is generated. Do you know how much garbage you produce daily? Have you ever given it thought?

Handling this amount of garbage entails great expense and effort and results in a long list of environmental problems that are particularly acute when management is poor.

That waste and its source products originate from natural resources is an additional problem. Do you know where the items you use come from? Do you know what they are made of?

Familiar items such as soft drink packaging, candy wrappers, lamps, light bulbs, paper, pencils, and paints are all manufactured from natural resources. Plastics are obtained from oil, glass and aluminum soft-drink cans from a few minerals, and paper from the cellulose in trees. All of the products we use are obtained from such natural resources as water, forests, minerals, oil, and additional sources of energy. So when we discard what we consider to be trash, we are actually throwing away the natural resources that were used in their manufacturing. We are missing out on the opportunity to *reconvert* them into raw materials for other products.

Table 1. Time required to decompose various materials

Material	Time
Organic waste	3 weeks to 4 months
Paper	3 weeks to 2 months
Tin container	10 to 100 years
Aluminum container	350 to 400 years
Plastic materials	500 years

Source: www.ecoeduca.cl.

Think about the path waste undergoes once we throw it away. Do you know what happens to it? Where does it end up? What effects does it produce?

Its usual path begins when we place various types of waste in a bin or container where it gets mixed together, producing what is known as garbage. This makes its subsequent separation and reuse difficult and is the main reason why the LAC region formally recovers and recycles only 2.2 percent of its municipal waste (PAHO, IDB, and AIDIS, 2010).

From homes and work facilities, waste enters a collection system whose efficiency varies by country, region, and neighborhood. The average collection rate for LAC is 93.4 percent of the population; however, as is shown in table 2, the differences among countries are rather vast. Argentina services its waste with a collection system that covers almost the entire population, whereas Paraguay's system reaches less than 60 percent of its population (PAHO, IDB, and AIDIS, 2010).

Figure 2. The solid waste cycle in Latin America

Table 2. Garbage collection coverage in selected countries in Latin America and the Caribbean

Country	Percent of population with garbage collection
Argentina	**99.8**
Belize	**85.2**
Bolivia	**83.3**
Brazil	**96.0**
Chile	**97.8**
Colombia	**98.8**
Costa Rica	**90.4**
Ecuador	**84.2**
El Salvador	**78.8**
Guatemala	**77.7**
Honduras	**64.6**
Jamaica	**73.9**
Mexico	**93.2**
Nicaragua	**92.3**
Panama	**84.9**
Paraguay	**57.0**
Peru	**84.0**
Dominican Republic	**97.0**
Uruguay	**98.0**
Venezuela	**100.0**

Source: PAHO, IDB, and AIDIS, 2010.

The effects on the environment produced by inadequate waste management include:

- A role in climate change through emissions of a mixture of mainly greenhouse gases (GHGs, such as methane and carbon dioxide) released into the atmosphere
- Altering of physical, chemical, and soil fertility properties through contamination by residual oil, grease, heavy metals, acids, and so on
- Contamination of surface and groundwater
- Altering of flora and fauna through contamination or destruction of the ecosystems they inhabit (as when plastic in aquatic environments causes strangulation or other damage to organisms)

Despite significant advances in the region, roughly 50 percent of the waste generated in the LAC region receives inadequate final disposal (PAHO, IDB, and AIDIS, 2010). In many rural areas and landfills (municipal or open-pit), garbage burning continues to take place out in the open. This generates hazardous emissions with deeply negative health impacts, including cancer in the general population and, especially, among groups of scavengers (both adults and children) who live and work near landfills.

To conclude, inadequate handling of solid waste triggers a range of negative impacts on human health and on the environment. Trash is a major problem that requires urgent attention and shared responsibility.

The road ahead is long, which is why we must take our first steps immediately, as is already being done in several parts of the world and the LAC region. Steps to reduce or solve the waste problem through improved handling and comprehensive waste management depends on joint actions among governments, industry, and the people who generate waste.

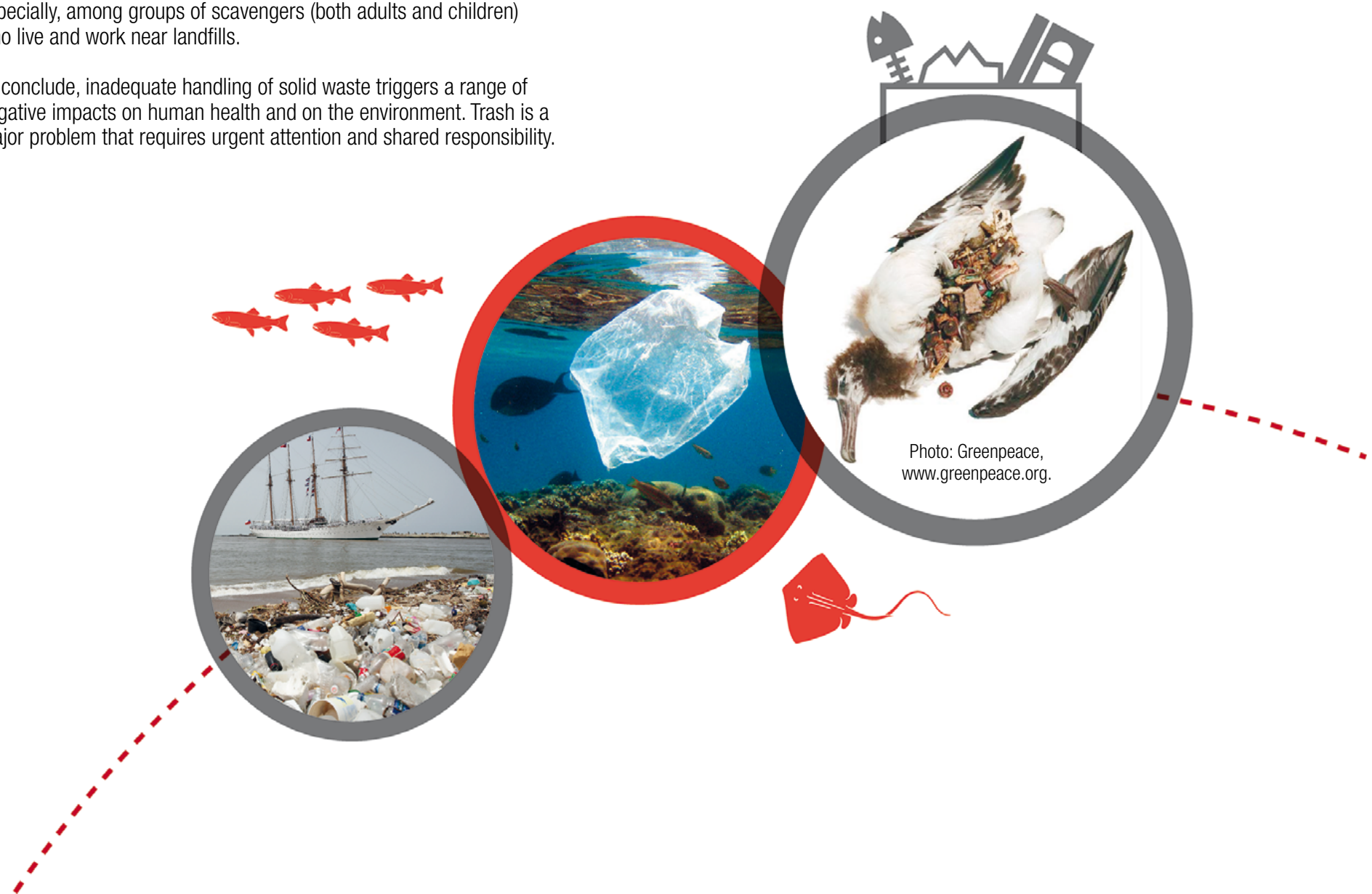


Photo: Greenpeace, www.greenpeace.org.

Making a change in your school

At this point you may be wondering how you can help your school reduce the garbage problem. How can waste be best disposed of? Can any of it be renewed rather than discarded?

As we have seen, promoting proper waste handling requires the initiative and participation of the people who generate the waste. We all contribute to the solution; no space, no matter how small or common, is insignificant, and no action is without impact. This applies to schools, households, and work centers.

Your school can contribute by mitigating the adverse effects of its own waste, and by showing that it is possible to learn to manage waste properly. Schools offer an ideal starting point for change, since they are dedicated to the teaching and learning, socialization, organization, and coexistence that shape human beings and build their future.

Your school can serve as an important model of proper waste management principles for your community and region.

Anyone can intervene and perform these waste management improvements:

- Before choosing a product, consider whether its packaging is necessary.
- Reduce the amount of waste generated by:
  - Choosing products with little or no packaging, or those that create reusable waste.
  - Avoiding unnecessary purchases.
- Reuse waste already generated. Put your waste to new use.
- Separate waste to facilitate recycling; use appropriate sanitation methods.
- Educate yourself about waste management.

Diagnosis

The first step in setting up a proper waste management program at your school is to perform a diagnostic study. Gather information on what products are being used and what type of garbage is generated, how it is managed, and what effects it produces. Gaining more information on the school's specific problems will help you make the best decisions to promote proper waste management. This task can be accomplished in two steps:

- Analyzing your school's waste management systems
- Identifying the types of waste generated at your school

Analyzing your school's waste management systems

In table 3 we offer an example survey that will help you investigate the generation and handling of waste at your school and its environmental impacts. Once the survey is completed, analyze your results and decide what you should do to reduce the environmental impact of your school's waste. Solutions may lead to small economic benefits for your school.

Table 3. School waste management: a survey

Topic	Questions	Answers and comments
Purchases and procurement (future waste)	What stationery and classroom and office items does the school purchase (including those bought by students at the teacher's request)?	
	Which items are recycled?	
	Which items are recyclable?	
	What items can be replaced by recycled and recyclable goods?	
	What items could be dispensed with?	
	Do any items have unnecessary packaging or wrapping?	
Product sales within the school (future waste)	What products are sold within the school (such as food, notebooks, and other materials)?	
	Which of these products or packaging is recycled (paper, cardboard, glass, among others)?	
	Which of these products or packaging is recyclable?	
	What products can be replaced by recycled and recyclable items?	
	What products need not be sold at your school?	
	Do any of these products use unnecessary packaging or wrapping?	
Types of waste (this kit offers a guide to conducting a detailed study on waste types)	What types of waste are produced and where are they generated? The types of waste you might find include: paper, metal, glass, electronic, organic (food scraps and garden waste) and sanitary waste, among others. It is necessary to find out what types of waste are produced in each of the school's areas: classrooms, offices, courtyards, gardens, sports courts, laboratories, cafeteria, auditorium, and so on.	
	Does waste contain substances harmful to humans or the environment being generated (from medication, batteries, insecticide and pesticide containers, cleaning materials, medical and veterinary refuse, and so on)?	
Quantity of waste by type	What volume of each type of waste is produced over a given time?	

Table 3. School waste management: a survey, continued

Options for the reuse and recycling of waste	Can any of the waste generated in the school be reused? Which and in what ways?	
	Do people from the area/community buy and recycle any waste produced at the school (who, location, types of waste recycled, procedures for buying and selling, pricing, collection services offered, and so on)?	
What does the school do with the waste it generates?	What types of containers are used by the school for waste deposits (volume, material, shape, location, and so on)?	
	Who collects waste inside the school? (type and number of staff, organization, schedule, responsibilities, and so on)	
	Describe the school's internal waste collection routine.	
	Does the school currently recycle any of its waste? Which items? Who does it? How and why is it done?	
	Does the school currently have a procedure in place for reusing waste? If so, describe. Who is responsible for it? How and why is it done?	
	Is there a temporary waste storage area, and what are its features (provide location, size, equipment, types of storage, picture of facility, and so on)?	
	Does the school's common waste storage area prevent adverse effects to the environment and human health? (Have measures been undertaken to prevent the spread of insects and rodents, accidental or intentional burning of trash?)	
	Who collects waste from the common storage area and how? Is collection private, a public service of government, or a service performed by school staff?	
What happens to the waste off school grounds?	How is waste transported and what happens to it off school grounds? Is waste taken to a higher-capacity vehicle, to a field for burning, to a transfer station, to a recycling plant, or some other place? What is the final disposal site of school waste (downhill, vacant lot, open-pit dump, landfill, or other)?	

Identifying the types of waste generated at your school

Identifying the type and quantity of your school's waste can be done as part of classwork. Students and teachers can team up and clear up any questions regarding the waste generated at the school in a very short time. Below, we suggest a process that can be suited to your own needs.

We recommend that you:

- Use protective equipment (plastic gloves, masks, long-sleeved shirt, and so on) to avoid contact with any potentially risky materials.
- Prepare a ventilated or outdoor work area in or near school grounds, equipped with a table or board covered with plastic, where waste can be analyzed.
- Prepare all needed materials before work begins.
- Evaluate all school waste, noting its origin, not including trash from the bathrooms.

Materials

For your protection in the work area, use:

- Plastic gloves
- Masks
- Comfortable clothing (that can be soiled)
- Goggles (to protect from dust or small particles)

Prepare the work area with a table, tables, or a board where work tools and trash can be placed.

For waste collection use:

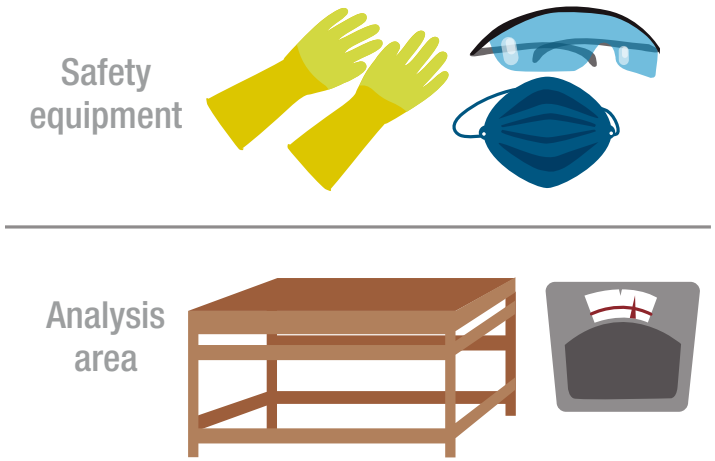
- Large, tough bags (at least two for each source of garbage: classrooms, offices, workshops, kitchen and/or cafeteria, schoolyard, and garden)
- Adhesive tape or labels to identify the waste's origin on each bag

To analyze waste use:

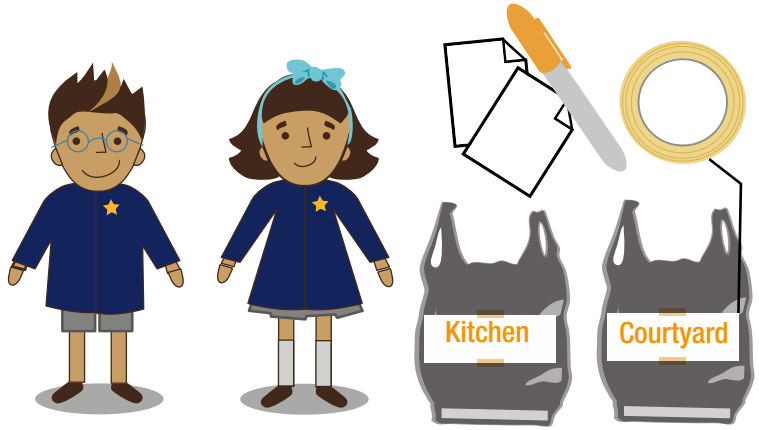
- Weighing scales (at a large school use at least two per table)
- Index cards
- Markers

Procedure

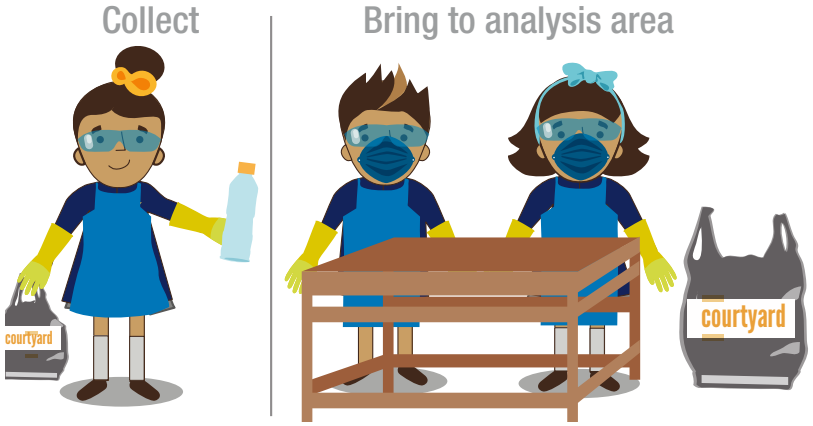
- Prepare the site where waste will be analyzed before beginning collection and give precise instructions to participants on how to proceed with and organize their work. Teamwork involves distinguishing tasks and establishing explicit partnership arrangements. It is important to agree on safety recommendations, avoid direct contact with trash, use protective equipment, not play with or eat any waste, and comply with all agreements made by the team.



- Divide participants into pairs and determine collection sites. Each team should label its bags with the garbage's place of origin. You may collect from as many places as you deem appropriate. At minimum, you should include classrooms, offices, workshops, kitchens, cafeterias, schoolyards, and gardens. Each team must have bags, tags, and markers to organize its work.



- Pick up the trash from each collection site and carry it to an analysis area.



- Once all bags arrive at the analysis site, each one should be carefully opened and the trash removed and carefully separated according to type. You may determine your own categories. We suggest the following:
  - » *Organic (food and garden scraps) and inorganic (remaining materials).* This can help if the only thing you want to do is to make use of organic waste to produce compost and allocate the rest of the waste to the garbage truck because there is no other way for you to use the inorganic waste.
  - » *Organic, recyclable inorganic, and nonrecyclable inorganic.* Use these where recycling exists in the community and it is possible to sell or give away the recyclable material but not other materials (as many plastic materials are still not recyclable).
  - » *Paper and cardboard, PET [1] and other plastics, aluminum cans, glass, organic waste, and others* (cans made out of materials other than aluminum, remnants of fabric or wood, and so on). Use these if the community collects each of these materials separately for recycling later.

1 Those used to pack most sodas

- Each category of separated waste must be weighed; its date must be recorded on a spreadsheet devised for that purpose (which will be discussed later). This procedure should be repeated with all the garbage collected.

When analysis is complete, all waste (including the plastic used to cover the separation tables), gloves, and masks should be placed in the school's waste storage area.

Table 4. Identifying types of waste by school area

Type of waste	Origin of waste				
	Classrooms (may be separated by individual classroom)	Offices	Workshops	Kitchens and cafeterias	Schoolyards and gardens
Paper and cardboard					
PET					
Other types of plastic material					
Aluminum cans and debris					
Glass					
Organic waste					
Hazardous waste (toxic liquid used for fumigation or cleaning, batteries, and so on)					
Other materials					

Data processing

Information may be obtained and analyzed from data sheets filled in by students and colleagues. This information will help identify sources and types of waste generation, and is vital to planning comprehensive waste management at your school.

Recommendations

Although each school has its own characteristics and requirements, some general recommendations apply to the design and implementation of a comprehensive waste management plan:

- Understand your school's waste generation as a three-phase system:
    - » Entry of consumer products (future waste)
    - » How these products are used
    - » Waste output
- Detect problems at each stage and make proposals to reduce and properly manage each.
- Seek out alliances and the participation of the entire school community, particularly the school's board of directors. To do this effectively, it may be useful to draw on the diagnosis results.
- Keep the school community informed of why and how to reduce, reuse, and separate school waste. Use different means: a school bulletin board, flyers and notes sent to students, school blogs and websites, and others to which you have access.

You can form a planning group to devise solutions and proposals for achieving comprehensive waste management based on the results of your diagnosis. Take the options discussed above into account. To aid in your effort, table 5 outlines some ideas and examples.

Waste management

Table 5. Analysis of waste management options

Types of waste generated by the school	Weight or volume of daily generation	How to reduce generation	Potential use	Ease of management	Management difficulties	Comments or recommendations for management
Organic waste	For example: 22 pounds daily, rising to 110 pounds in the pruning season.	Not possible.	School compost.	Can be integrated into students' curricular activities.	Schoolyard area. The chances of attracting harmful fauna decreases with exclusive use of vegetable waste and no animal waste.	Can build or buy composting containers to minimize space used for composting.
			Offer to farmers as feed.		Transport to an animal breeding ground.	Find out if pickup can occur at the school.

Table 5. Analysis of waste management options, continued

Paper and cardboard 	11 pounds daily; increases during certain periods (midterm week, fairs, and so on).	Stimulate reuse and creation of recycled cardboard or paper for crafts and other uses.	Sale or recycling at school as part of school activities.	Can be collected at the school and sold once a considerable amount has accumulated. Recycled material can be included in the school curriculum, then distributed among students.	The storage area should be isolated from the classrooms to keep dust and mites from exacerbating allergies among students and teachers.	The tool storage area or a large plastic bag placed in the schoolyard may be used.
PET 	11 pounds daily.	Encourage the school community to use reusable containers.	Collection and sale.	May be easily collected because it is unaffected by sun or rain. Someone may be asked to regularly go to the school for pickup.	They quickly build up; we must ask the school community to crush them so they take up less space.	We can create containers with mesh or chicken wire to deposit them while we collect enough to sell.
Other types of plastic material 	4.4 pounds daily.	Motivate the school community to use reusable containers.	—		They are difficult to handle and reuse; the best option is to curtail their use.	

Table 5. Analysis of waste management options, continued

Aluminum cans and debris 	22 pounds daily.	Encourage the school community to use reusable containers.	Collection and sale.	May be easily collected because unaffected by sun or rain. May be crushed to take up less space. Someone may be asked to regularly go to the school for pickup.	They quickly build up; we need to ask users to crush them and use as few as possible because of their great impact on the environment.	It is easy for people to collect them for sale; they have a high value in the market.
Glass 	6.61 pounds daily.	Encourage the school community to use reusable containers.	Collection and sale.	May be easily collected because it is unaffected by sun or rain. Someone may be asked to regularly go to the school for pickup.	Glass is dangerous and should be stored in such a way that the school community is not placed at risk.	Recyclable and has some value on the market.

Reduce waste generation

While reuse and recycling are important, waste reduction is the most efficient way to remedy the problem of trash. Remember, *no* waste is better than *recycled* waste.

We recommend the following steps to promote waste reduction in schools:

- Buy bulk materials, without packaging or wrapping.
- If the school uses printers and photocopy machines, establish a policy to print and photocopy on both sides of the paper.
- Reuse envelopes, folders, and binders. Discard labels and other markings; use labels to cover up preexisting data.
- Establish a school policy where any products sold in service areas are in reusable, recyclable, or returnable packaging. Avoid using disposable dishes, glasses, and cutlery.
- Encourage the school community to pack their lunches and snacks from home in reusable containers and bags.
- Encourage students and school staff to bring their own mugs or thermoses for water and soft drinks.
- Promote competitions and incentives to produce less waste.

Find new ways to use waste

Reusing items

By reusing items, students, parents, and teachers can reduce overall school waste. There are many ways to repurpose garbage or extend its life cycle. The imagination and creativity of the school community are key to this effort. Below is a series of general recommendations:

- Promote the use of both sides of a sheet of paper. Simply place a small box to collect and store paper to be reused next to each printer, copier, or other piece of paper-using equipment.
- Encourage students to share school supplies such as rulers, erasers, pencils, colored pencils, dictionaries, calculators, and so on in groups. Suggest they keep these common materials in a box. Refill the box each year with the contributions of successive groups of students.
- Promote the use of school supplies from the year before. You may, for example, reuse notebooks if they contain unused sheets. School supplies can be examined at the end of the school year to fix and pick out items that are in good, reusable condition.
- Establish a school policy creating new modes of ownership and use of textbooks and school supplies; ensure wide dissemination of this new approach. For example, the school may announce that students can own textbooks for only one year. In this way, books are used and taken care of, then passed on to the next group of students the following school year.

- Organize bazaars to sell secondhand school supplies.
- Save waste, including materials that can be used to develop items that enrich school activities such as pencil holders, portraits, book covers, notebooks, teaching materials, and toys, among others.
- Promote the use of rechargeable batteries.

Recycle

Recycling means reprocessing materials so as to turn them back into raw material. This is normally done only at an industrial level; the exception is paper, which can be handcrafted in the school. Remember that recycling is only possible to the extent that waste is separated and unmixed. The responsibility of the school community (of teachers, students, parents, administrators, and so on) is to ensure that waste is properly separated before it reaches the recycling site. Outlined below are steps and recommendations to properly separate waste.

Separate waste by type

The aim of waste separation at school is to gather waste materials that can be transformed through composting, reusing, or recycling, or some other method identified and proposed by the school community. We suggest you separate only the waste to be recycled or reused; in doing so, you guarantee continuous collection. Otherwise, the school may turn into a warehouse of waste materials, which could adversely affect the work of the school community.

For this you have to find out who might be interested in using or receiving the waste the school separates out. We recommend that you make a list of recyclers in your area and region, including organizations and foundations that promote recycling efforts.

Since activities vary in distinct areas of the school, so does the waste they produce. Once you obtain this information from the diagnosis, you can determine the type and size of containers needed for each area of the school.

The physical characteristics of bins or containers and their labeling should promote and facilitate waste separation. For this reason, you should use containers or bins of distinct colors to distinguish each type of waste. You may also place signs nearby that indicate the bins' proper use and provide further information on the school's waste management project.

There are many levels and systems of separation. One of the simplest classifying systems is as follows:

- *Organic waste*. Food scraps, garden clippings, wood, sawdust, and so on.
- *Recyclable waste.* Glass, metal, paper and paperboard, PET plastic packaging, and so on.
- *Toxic or dangerous materials.* Batteries, containers with liquid remainders (such as cleaners, pesticides), and so on. Though the school generates few of these materials, they must always be taken into account.
- *Everything else.* The remainder of the waste created, including plastic wraps, toilet paper, pens, disposable dishes and cups, and so on.

Give this careful thought and make decisions on the number of levels to use based on your needs and capacities identified in your comprehensive plan.

To avoid fruitless waste separation, ensure that collection adheres to your classification. Inform project staff responsible for waste collection at school, and take the following points into account:

- Sometimes staff members collect recyclable waste and sell it; they may therefore find a project like this threatening. If the essential purpose of the project is to reuse waste, the collection and sale of recyclable material by others does not affect the project and actually contributes toward it. Invite them to be project participants, ask for their ideas, and take their suggestions into account.
- Waste separation involves a change in the way community members collect and store waste. You will probably need to obtain other types of containers or bins and to establish a new routine for the cleaning staff. Make sure that a clear waste collection procedure is in place for staff and that they have the equipment and materials necessary to carry it out.
- Moreover, to maintain the participative mood of all the school community, it is helpful to frequently affirm the benefits and the importance of what is being done.

General storage and collection

Utilizing waste requires preparing a space to collect and temporarily store it until it is picked up by a recycler. It is best if all classified waste is clean and dry. When this is done, and it is stored in an organized fashion, it does not take up a great deal of space or give off unpleasant odors. It also does not pollute or breed harmful animals, and there is no need to remove it daily, but only according to the collection schedule agreed to with the recyclers.

In general terms the storage area must be:

- A dry, orderly space with a roof
- Equipped with facilities for loading and unloading
- Easily accessible to the staff responsible for waste collection at the school and also to recyclers who pick up the material
- A space big enough for storing and organizing the amount of separated waste generated in one week's time
- Outfitted with several containers or troughs large enough to separate the collected waste
- Free of harmful animals and unpleasant odors, and clean

It is important for the staff in charge of the general collection area to keep a separate record of the waste stored, identify its type and quantity, and record the progress made from the outset. Disseminate this information throughout the school community through a bulletin board, posters placed throughout the school, informative talks, brochures, guided visits to the storage area, and any other material or activity by which the results of waste management can be promoted in the school community.

There are many ways to prepare a separate waste storage area. To store the waste, you can use bins or large containers, troughs made with wooden partitions, or modules or booths placed in the schoolyard, garden, or school service area. How you prepare the common collection area for recyclable waste at your school will depend on the characteristics of your school, the creativity of the school community, and the resources at your disposal.

The collection routine of recyclers is another important factor in defining the characteristics of the common recyclable material storage area and ensuring that waste is reused. This is the last step to take to ensure the effectiveness of the community's participation. Consider the following in doing this work:

- Identify companies or organizations that recycle waste in your town and region, contact them to learn about their services and collection requirements. We recommend that you create a directory of recyclers in your area and region. This directory will provide you with a menu of options for where to send the school's waste for recycling.
- Each recycler lays down conditions for receiving or picking up refuse (volume, degrees of separation and cleaning, type of preparation, and so on) that you will have to consider when defining the general methods of collection at the school and the proper size of the area and its allowable contents.
- Select recyclers who offer the best conditions for the project and come to an agreement with them regarding regular, formal collection routines for recyclable material. Remember that this selection depends on the pace at which the collection area of recyclable material reaches saturation and how smoothly the project is

Source: www.ciudadsaludable.org - www.elquetzalteco.com.gt - www.puravidaatitlan.org

Make good use of organic waste

To prevent organic waste generated in the school from being disposed of in the traditional way and causing the usual adverse effects, the school community can take these very simple and effective steps:(each line must be sensitive to a click to carry to extensive information)

- Create compost (manure or organic fertilizer)
- Practice vermiculture (composting with worms)

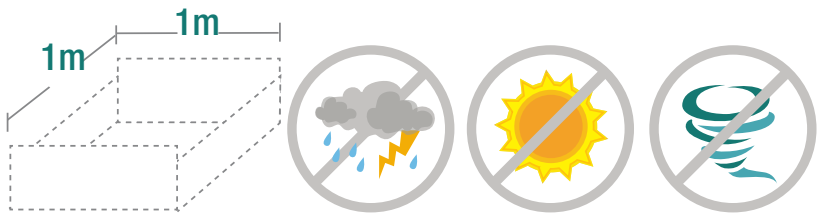
Compost (manure or organic fertilizer)

Compost improves soil through the decomposition of organic matter. The end result of composting is a dark brown substance called *humus* or *compost*, which enriches and restores the soil when mixed with it.

Your school can allocate a space in the schoolyard or in the garden to install a composting container. The process is very simple. All you need is determination and a little bit of time for maintenance.

A variety of structures and containers can be used to develop your compost. Some are made of wood, chicken wire, and bamboo; some use car tires for partitions; others can be dug directly in the ground of the school garden. To create one, follow these steps:

1. Choose an area roughly 1 meter square that is not exposed to excessive sun, wind, or rain.



2. Use a composting container, a bottomless cage-like structure made out of wooden dowels measuring roughly 24 x 24 x 31 centimeters (cm), with walls made of strips of wood or a similar material common to your region, with 0.6-inch separations to allow for air flow.

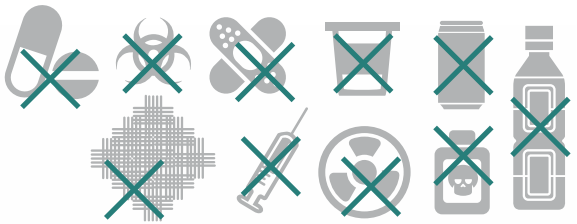
3. Place the composting container directly on the ground so that the waste comes into contact with the living organisms that compose it. In the backyard or garden, the process begins with 6 inches of soil at the bottom of the container.
4. Place the first level of soil—4 to 6 inches thick—in the bottom of your compost container. Include sticks, if you have any, dry tree branches, or garden grass. To avoid flies and odors, form a sort of soil box that will help you ensure that waste does not come into direct contact with the air from any side.
5. Add the organic waste (just the amount made in a bin or container with a lid in eight days) and spread it evenly. If possible, break or cut refuse into pieces; the smaller the pieces, the greater the surface area in contact with moisture, air, soil bacteria, and the rate of decomposition. Avoid including animal waste to avoid drawing the interest of unwanted animals such as rats, cats, or dogs.

6. Completely cover the waste with leaves and dry grass and soil, or simply soil. Make sure nothing is exposed.
7. Sprinkle water to dampen—always keep the compost slightly damp.
8. Cover the composting area with plastic or canvas, let it stand until another tray of chopped organic waste is collected, then repeat the steps from point four on.

Worms, bacteria, fungi, earthworms, and other organisms that perform specific decomposition functions will appear in the compost. As the compost matures, these organisms will disappear. In 8 to 10 weeks, you will have black soil, which is removed from the lower door or bottom layer of the container and sifted through a coarse mesh. The material passing through the mesh is dark soil with high-quality nutrients that can be used as fertilizer for your plants, garden, or community park. What remains on the mesh is deposited into the composting container to continue the decomposition process.

The compost may include: kitchen leftovers (such as fruits, vegetables, eggshells, tea bags, coffee filters, and food scraps), hair, bird feathers, leaves and branches, sawdust, grass, herbs, flowers, paper napkins, and animal excrement (except from cats). Although bones from meat, fish, and chicken may be added, this is not recommended for school compost containers.

The compost may not include: medical waste, sanitary pads, skin, rubber, plastic, glass, metal, contents from vacuum cleaners, paper in large quantities, cigarette filters, plants sprayed with poison or insecticides, toxic substances, cleaning products, or staples or rubber bands (such as those often used in packing food).



Source: www.pontevedraverde.blogspot.mx - www.reciclajeyproduccionlimpia. wordpress.com. - www.infojardin.com

Vermiculture or vermicomposting

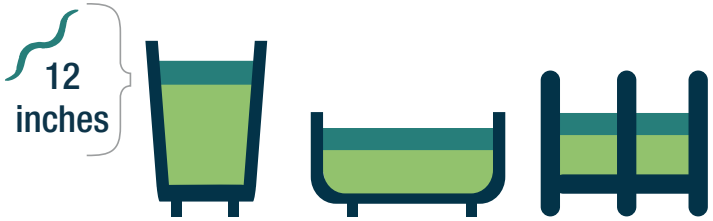
Another way to use organic waste generated at schools is vermicomposting. To prepare, introduce a red worm—*Lumbricus rubellus*—which can be found in the manure of cows and horses, or a Californian worm—*Eisrnia fetid*—into the waste. As the worms develop, they produce excellent-quality compost.

The end product of vermicomposting is a substance called *humus,* which is an excellent soil improver. When mixed with soil, it lends permeability to both air and water, increasing water retention and the soil's capacity to store and release nutrients.

You can be sure that these worms will not produce problems in the yard as they do not like light and prefer to remain near their food source. They will therefore remain inside the structure you build to produce them.

To build a vermicompost container, consider the following points:

- Any container is good, but because worms eat and live on the surface (on the top 12 inches), the best are wider than they are deeper.



- You can start with fruit boxes, tubs, or plastic trays lined with newspaper or cardboard, which have been punctured with many holes to prevent the worms' suffocation.
- A definitive model can be made out of wood. On average, a box of 12 x 24 x 35 inches is sufficient to generate 3.3 pounds/day of organic waste. Based on these data, you can calculate the size of your school's vermicomposter.
- The number of worms you need will depend on the amount of organic waste you can produce. If you want to keep 4.4 pounds of worms, you need 2.2 pounds of organic waste per day (in a 2-to-1 worm-to-waste ratio).

To start planting worms:

- Once you have the worms and a container, place a thin layer of dry material (grass, leaves, or paper) at the bottom of the box to facilitate drainage.
- Above the dry material, place a layer of organic matter that has been moistened with water, and place the earthworms on it.
- Finally, cover it with a small, lightweight layer of organic matter. Cover the entire surface with grass, cardboard, or black plastic to prevent light from drying out the vermicomposter.

If everything goes well, two weeks later it will be possible to add a little more organic waste. Be careful not to add too much waste as this could cause the worms to drown and die. The first few months are devoted to reproducing worms; compost is created later.

For maintenance:

- Add a thin layer of organic waste daily (animal manure, rotting fruit, sugarcane, coffee pulp, wood chips, or any type of organic matter).
- Irrigate periodically to maintain constant moisture. Be careful not to create puddles.
- After two or three months you can begin harvesting humus. To do so, add food to only a corner of the box for a few days, so that all of the worms can concentrate there and the soil from the rest of the box can be harvested.

Monitoring and evaluating progress

Environmental

- Keep a record of the waste that is being sent out to be recycled. This way you will know how much waste is being sent to final disposal sites in the community and better measure progress since the program started. Be careful with month-to-month comparisons as natural variations occur according to time of year and school activities.
- Carry out regular on-site supervision of the school's different areas. During these tours, you should review the content of bins and the extent of waste separation. Also check the recyclable waste accumulated in the school's common collection area and the operation of its facilities. It is important to record all issues and abnormalities observed.
- Schedule regular visits to examine the conditions of the compost and vermicompost operations. During these visits, record problems and obstacles observed as well as those reported to you by staff or teams responsible for maintenance.
- Conduct interviews or meetings with staff responsible for collecting the school's separated waste and supervising the common collection area. Identify obstacles and record comments and suggestions.
- Conduct interviews and hold meetings with the recyclers that collect or receive the school's separated waste. Ask about problems and recommendations.
- Existing formulas can help you calculate the natural resource savings associated with recycling. For example, it is estimated that every ton of paper recycled prevents the logging of 17 trees. Using records of your progress, you can calculate how many trees you have saved.

Social

- Conduct meetings with school community groups to describe the experiences of the different project participants (students, teachers, administrative staff, waste collection staff, and administrators). Ask them to evaluate their experience. What would they repeat? What would they adjust or change? Record participants' comments in writing.
- Place a suggestion box to afford you the community's perceptions and proposals regarding the project.

Economic

- If you have decided to sell any waste, maintain a log of what has been sent out to be recycled, and the income the school has earned from its sale. It is important for the information recorded to be very clear and accessible to anyone.
- Reduction and reuse activities result in economic savings that must be monitored. To do this, compare expenditures—such as on office supplies and teaching materials—before and after the project.
- Even where selling recyclable materials generates income, the savings are small compared with the environmental benefits of proper waste handling. This is the value that should be weighed at all times.

Tips for finding financial support

Perform an Internet search to find organizations, institutions, and other entities to support your school's project. Identify those that offer support to schools in LAC. Look for information concerning the type of financial support offered, whether and how often direct invitations are made, and other important issues.

Key words to use when searching include *financial support* and *schools in Latin America and the Caribbean.* Some sites of interest are:

- *Civil society online* (http://lasociedadcivil.org/): provides information on sources of funding as well as information on international cooperation agencies that support projects in countries in LAC
- *Latin America Donor Index AVINA and the Outreach and Partnerships Office of the Inter-American Development Bank* (www.indicedonantes.org/): a system that helps nonprofit organizations connect to necessary resources and philanthropic organizations, as well as peers working on similar issues or in similar locations
- *tupatrocinio.com:* a portal to search for sponsors and to advertise your search for sponsorship; search by area of activity (such as "environmental responsibility") or by country

We also suggest that you search and apply for project partnerships and sponsorships at responsible, sustainable companies in your country and region.

Do the following as you apply for financial support:

- Be clear and precise about what you are going to do; present a concise and coherent project plan.
- Develop a project that is comprehensive and embodies and articulates all crucial concerns: educational, environmental, social, economic, and other.
- Ensure that the project is compatible with the mission of the prospective institution or donor agency.
- Emphasize the experience and accomplishments of your school if it has already run other projects successfully.
- Clearly demonstrate the benefits of the project.
- Ensure the consistency of what you propose in terms of implementation processes, time, and costs.
- Assess whether financial support is essential. School waste management projects do not generally require large investments and have a primarily educational focus. Avoid seeking financial support for your project if possible.

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Module 6

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Rise Up Against Climate Change!

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