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## Module 8

# Selecting and using Sustainable Materials



**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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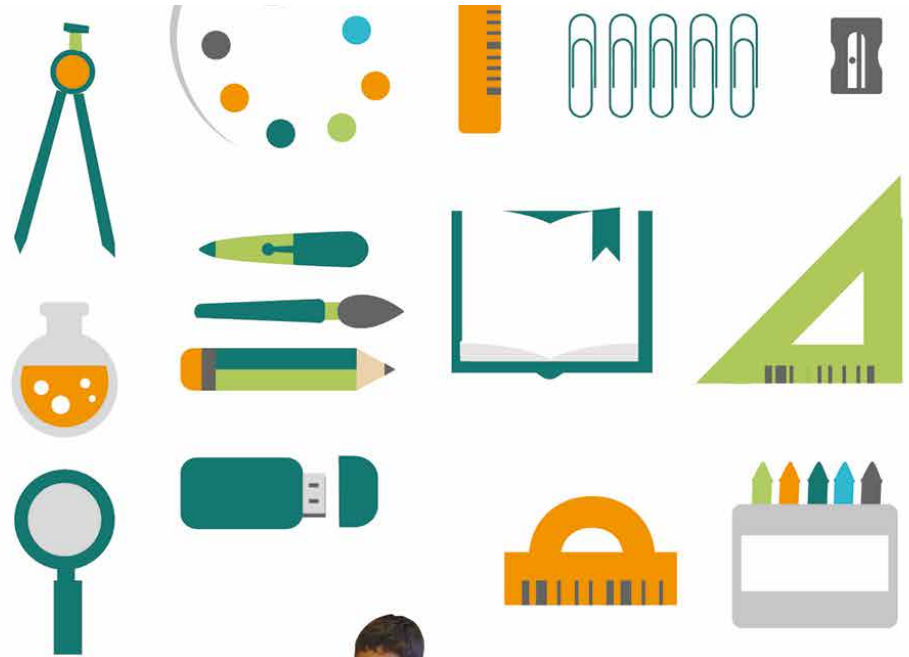
# Rise Up

Against Climate Change



Thousands of children and young people who attend schools every day (on schedules ranging from 4 to 10 hours) consume large amounts of natural resources (water, trees made into paper, fossil fuels for energy, and others). These resources are used in the manufacturing of books, notepads, backpacks, pencils, paint, and so on.

To a large extent, schools represent the way a society uses its natural resources. Using these materials in a more sustainable fashion will lower demand for natural resources. We can also learn innovative ways of using them in the learning process.





# Know what you use

How many books do you think your school uses and discards each year? Have you ever thought about the number of trees and the amount of water and energy needed to produce them, or what happens to them once discarded? In general, how much and what type of materials are consumed at your school? Do you think they could be used and handled in a better way?

Notebooks, pencils, sheets of paper, paint, pens, and chalk are used every day in school. If you multiply each of these items by the number of youth, and multiply this by the number of grade levels (considering that in Latin America and the Caribbean, elementary education takes 12 years to complete), you would undoubtedly end up with an enormous, unimaginable figure.

All educational materials are produced from natural resources (forests, minerals, oil) and use enormous quantities of water and energy for production, distribution, and marketing, in addition to the waste they produce once unpackaged and discarded.

## Box 1.

### We can all do our part

In Latin American and the Caribbean the number of children and young people studying in primary and high schools exceeds 114 million. Can you imagine the potential effects if each one of them were aware of alternate school materials and products and exercised sustainable consumption of these resources?





## Box 2.

### Forests

Creating a ton of paper requires 15-17 adult trees, 100,000 liters (26,417 gallons) of usually clean drinking water, and 6,000 kilowatt-hours (kWh) of electrical energy. Also, highly polluting products (such as caustic soda, sodium sulfate, or magnesium) are used to process the pulp (in washing, screening, bleaching, drying, and filtering).





## Forests

As a result of their misuse, forests in temperate and tropical climates are some of the most damaged ecosystems in the world. An annual loss of 13 million hectares (28 million acres) worldwide was registered at the outset of this century (FAO, 2010)—an amount that is equivalent to more than the total surface of a country such as the Honduras. This means that half the forests have disappeared from the earth, and along with them their biodiversity and vital environmental benefits (clean air, water filtration, and soil fertility, among others).

It is estimated that nearly 78 percent of primary forests—known as such because they had not yet been processed or significantly altered

by human activity—have been destroyed, and the remaining 22 percent are threatened by activities such as excessive or illegal timber removal, changes in land use (for agricultural activities, livestock rearing, or urban activities), construction of large dams and reservoirs or roads, forest fires, and pests. Latin America, where 22 percent of the planet's native forests (FAO, 2010) are concentrated, is responsible for one-third of the world's deforestation.

Two major raw materials provided by forests are wood—used to produce items from pencils to boats—and wood-derived cellulose, which is used to make paper and cardboard.







**Bauxite mines  
provide the main  
raw material of  
aluminum**



## Oil

Another natural resource involved in nearly all aspects of everyday life is oil. It is used for many products—the most well-known being plastic, which is common in school supplies such as pens, markers, totes, backpacks, bag linings, and so on.

In addition, oil and its derivatives are used to work the machinery and other equipment used in the production of most items. An enormous amount of energy is needed to extract, transform, transport, and then commercialize products that are seemingly small and simple.

## Mines

As they are not apparent to our eyes, we are usually unaware of the origin of the mined materials found in items of everyday use: the graphite in pencils, the pigment in color pencils, the metal in soda cans, and so on. Mining is one of the oldest activities known to mankind. Despite its great importance, it presents significant hazards to health and the environment. This is mostly due to inappropriate mining technologies, the high utilization of energy and water in the mining process, the unsustainable disposal of waste, the absence of environmental recovery of processed soil and subsoil, and the careless processing of harmful materials (which leaves the towns surrounding mining enclaves exposed to serious health risk).

Of the communities affected by mining activities, many are poor and have inadequate access to health services. In Latin America, where the use of obsolete, careless mining technologies and processes predominates, ethical boundaries are often crossed—for example, the negative effects of manganese mining on the motor activity and intellectual development of children nearby have been clearly documented in Mexico (Rijos, 2010).

Water is not a direct source of school materials, but it is involved in their production. In general, water is used in over 90 percent of all production processes performed on the planet, and is a basic resource for industrialized processes.

Of the total water on the planet, only 1 percent is available for human use. Of this, at least 20 percent is used by the industrial sector (UNESCO, 2009)—to heat, cool, and generate steam; in transportation; for cleaning; or as a solvent (for example, in the beverage industry).

If the water used in industries is polluted, it will pollute everything in its path, damaging or destroying ecosystems in the process. Unfortunately, in Latin America roughly 70 percent of all industrial waste is discharged without treatment, leaving a huge impact on local ecosystems and the people who depend on them.

### Box 3.

## Our water footprint

With every product we consume we leave a water footprint—that is, the amount of water used or contaminated to produce the item consumed. We don't see it, but it is there: water is used in every phase of production, transportation, and marketing. For example, producing one letter-size sheet of paper involves 13-20 liters (3.4-5.3 gallons) of water, and in some cases an overwhelming 300 liters (79 gallons) (Rep, 2011).





## Making a change in your school

Sustainable use of school materials involves consciously and responsibly choosing the type of materials to be used; making optimum use of these materials; and, once they are no longer useful, devoting them to alternative uses, recycling them, or discarding them in a safe and responsible manner.

Developing and participating in the sustainable use of school materials benefits the entire school community, since responsible choices yield economic benefits. Three steps are involved:

- A survey to identify what types of materials and products are used in the school
- A brief research project on the origin and final destination of these products: their production sites, the natural resources from which they are derived, how they are used at the school, and their final disposal
- The design of a plan for the sustainable use of materials and products in the school

The first step in developing a strategy to improve the school's consumption is to conduct a short survey. You need to identify what, when, and how materials and products are consumed in the school; where they come from; and what impact their production and consumption generates.

The larger the school, the greater the consumption. But the problem is not so much the total volume as the quality of consumption—that is, the goal is not to stop consuming, but to do so responsibly and carefully. This involves two of the three steps outlined above: A survey

to identify the types of materials and products used in the school

- A brief research project on the origin and final destination of the materials and products used

## Identifying the materials and products used in your school

To identify school materials and products, it is easiest to look at school areas and educational levels separately, in the event that the school has several. It will also be helpful to know the total number of students per grade, and the number of teachers and administrative staff, to make an overall assessment of the consumption of different products and materials. Table 1, which you can adapt to the conditions of your school and your experience, can help you in this task.

Carrying out a survey in organized groups helps you finish more quickly. If you are a teacher, your students can form teams, with each in charge of investigating one type or group of materials or products. Similarly, if you're a student, you can ask your classmates to divide up the work with you.



**Table 1. Surveying the types of materials and products consumed in the school**

	Users	Educational level	Materials used (sample lists)
Classrooms	<b>Teachers</b>	<b>Preschool</b>	<i>Chalks - Erasers - Markers- Cardboard - Cartons - Colored paper - Others</i>
		<b>Primary school</b>	<i>Chalks -Erasers - Markers - Cardboard - Cartons - Colored paper - Others</i>
		<b>High school</b>	<i>Chalks -Erasers - Markers - Cardboard - Cartons - Colored paper - Others</i>
		<b>Baccalaureate</b>	<i>Projector, computer - Chalks -Erasers - Markers - Cardboard - Cartons - Colored paper - Others</i>
	<b>Students</b>	<b>Preschool</b>	<i>Coloring books - Crayons - Colored pencils - Cardboard - Plasticine - Others</i>
		<b>Primary school</b>	<i>Textbooks - Books or workbooks - Colored pencils - Erasers - Pencils- Pens - Others</i>
		<b>High school</b>	<i>Textbooks - Workbooks - Colored pencils - Erasers - Pencils- Pens - Others</i>
		<b>Baccalaureate</b>	<i>Textbooks - Workbooks - Colored pencils - Erasers - Pencils- Pens - Others</i>
	<b>All</b>		<i>Wooden benches - Plastic board - Plastic trash containers - Others</i>
Workshops and labs	Teachers		
	Students		
	All		
Offices	Administrative staff		
	Teachers		
	Cleaning staff		
School cafeteria	All		
	Kitchen staff and other		
	All		
Schoolyard	All		
Service or storage areas	Administrative staff		
	Cleaning staff		

Once you have drawn up a list of materials and products, you can conduct a small survey to determine the quantity of the materials consumed in the school. You can adapt table 2 to the type of school and the list of materials that you use. The form may be filled out by experienced teachers who find out from students or their parents the average amount

of materials they buy in a year. If one group comprises 50 children, for example, you could survey 8-10 parents to calculate an average. Once you have arrived at an average, multiply it by the total number of children in that grade, to estimate total consumption.

**Table 2. Calculating the average amount of materials that a student uses throughout a given school year**

Student's grade:			Number of students in the grade level			
Student	Quantity per type of material					
	Notebooks	Pencils	Books	Paint	Erasers	Plastic wrapping
1						
2						
3						
4						
5						
6						
7						
8						
Total						
Average per student						
Total consumption by grade						
Total consumption in the school						

If the school provides books to students, simply ask the person in charge how many are delivered each year per child.

**Table 3. Total amount of materials consumed by students each school year**

Grade	Quantity and type of material					
	Notebooks	Pencils	Books	Paint	Erasers	Plastic wrapping
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
TOTAL						

An exercise similar to the example in table 3 may be performed to estimate the quantity of materials consumed in the administrative areas, the cafeteria, the offices, or among a group of teachers. This will yield the school's total consumption. Some materials, such as

blackboards or benches, are not replaced each year. It is easy to make a distinction between perishable materials—that is, those whose life cycle lasts till the end of the school year (at least under current school practices)—and those whose life cycle extends beyond that.



# Learning the origin and final destination of those materials and products

Once you have an idea about what you are consuming, to complete the research and help you decide the course the school's consumption should take, you need to know about the life cycle of school materials from the moment they are produced until they are discarded.

## Box 4.

### You're using more water than you think

To produce a kilo of cotton, an average of 10,000 liters (2,642 gallons) of water is used; roughly 250 grams of cotton is required to make a T-shirt or shirt (Water Footprint, 2012). This means that part of what you are wearing today may have required about 2,500 liters (660 gallons) of water!

Figure 1. Water and the life cycle of a t-shirt



Source: Worldwatch Institute, 2003.

## Box 5.

### The life of a product

The life cycle of a product begins at the moment the originating raw material is extracted or produced and ends when the final product is discarded, reused, or recycled. Other materials and natural resources are generally used in production, and are released into the environment as waste when the product is discarded.

Researching the origin and end-life of materials can be a rewarding experience for both students and teachers. The project lends itself to collaborative work. For example, a school or class may be divided into teams, each of which conducts research on the path followed by a different material or product.

The research will involve finding several important pieces of information, including:

- Name of the material that is being researched
- Natural resources involved in its production (you may find this information through Internet searches or in your school library or a library near your school)
- If possible, the water footprint left by the product or material (though not calculated for all existing products, estimates are available for many of them, especially on the Internet)
- How is it used in the school (only once, then discarded? recycled? reused?)
- If it is discarded, how and where?

**Table 4. Sample of research on the life cycles of school materials**

Material	Natural resources involved in production, distribution, and marketing	Water footprint (if possible to calculate)	Use in the school	How it is discarded and where
Textbook	<i>Trees, water, fossil fuels, minerals.</i>	<i>Approximately 50 liters (13 gallons) of water per book.</i>	<i>Students use it once.</i>	<i>Discarded at home once the school year ends.</i>
Workbook	<i>Trees, water, fossil fuels, minerals.</i>	<i>Approximately 50 liters (13 gallons) of water per book.</i>	<i>Students use it once.</i>	<i>Discarded at home once the school year ends.</i>
Notebook	<i>Trees, water, fossil fuels, minerals.</i>	<i>Approximately 50 liters (13 gallons) of water per book.</i>		
Pencils and colored pencils	<i>Trees, graphite, lead, and other minerals.</i>	<i>Not available.</i>		
Plastic wrapping	<i>Oil.</i>	<i>Not available.</i>		
Paint	<i>Oil, water, minerals.</i>	<i>Not available.</i>		

## Recommendations: Designing a program for sustainable use

Once you know the type, amount, and method of use of the school's materials and products, you will discover alternatives to improve consumption. This will help you sustainably choose and use the materials that the school consumes.

Using the information you've gathered, modify the example given in table 5 to organize what you want to do, how you can accomplish it, and the timeline to implement it. You may want to identify various solutions to a problem, so you can later choose the one best suited to your circumstances and needs.





**Table 5. Improving the use and consumption of school materials**

Material	How it is used in the school	Current method of disposal	Alternative use	Alternative to current disposal	What benefits would each alternative yield?
Textbook	<i>Students use it once.</i>	<i>Discarded at home once the school year ends.</i>	Share. Loan books to students, who are then responsible for returning them in good condition at the end of the school year. Then loan the same books out the coming year.  Promote school fairs to sell used books.	Create recycled paper or cardboard as part of school activities.  Collect and sell books or give them to a recycler.	Students develop a sense of responsibility (by caring for their books), solidarity with the following generations, and environmental commitment.  Fifty liters of water would be saved per reused book.  Cost savings to school families.
Workbook	<i>Students use it once.</i>	<i>Discarded at home once the school year ends.</i>	<i>Can't be reused since students need to write in them.</i>	Create recycled paper or cardboard for school activities.  Collect and sell them or give them to a recycler.	Reinforcement of environmental values among students.  Development of skills for recycling of materials.  A modest source of income for the educational center.
Notebook					
Other					

## Box 6.

### With commitment, carbon footprints can be reduced

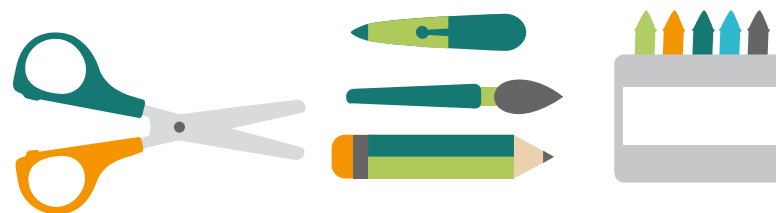
In California, on the west coast of the United States, many schools have sought to lower their carbon footprints. Among them is the Prospect Sierra School, which made eco-friendly changes to the materials students consume on an everyday basis.

An agreement was reached among the entire school community—students, teachers, parents, and administrative staff—when an environmental audit of the school revealed the large volume of waste generated each year: 8,000 kilograms (17,636 pounds) of recyclable material and 15,000 kilograms (33,069 pounds) of garbage.

Now, in addition to choosing healthier foods for their students, Prospect Sierra School also chooses foods with the least amount of packaging, distributes its press releases and newsletters via e-mail, and reuses its office materials in addition to cutting energy and water consumption.

Source: Green Schools Initiative, 2012.

The life cycle of many school materials—for example, pencils, erasers, foil, paint, and glue—ends alongside the school year. Others (such as furniture and equipment in classrooms, offices, workshops, laboratories, and so on) will be of use for a greater length of time. Following are some recommendations on how to select materials and handle them in a more environmentally friendly way.



## Materials

- Choose materials with optimum durability. Teachers and students have experience using classroom materials and can make suitable recommendations. Making environmentally responsible choices is a principle to be practiced and passed on to student groups, and not because it's fashionable or draws attention. The school teaches by example when it chooses to engage in the wisest practices available.
- Choose products free of polluting materials. This means reading labels, especially when choosing pens or markers for paper, blackboards, or chalkboards.
- Minimize school supplies made of plastic, such as markers and pens. Put their lids on when not in use, use them only for specific activities, and avoid those with oil-based contents.

- Choose those that are produced locally or in the nearby vicinity to lower transportation costs.
- Choose products sold in bulk to cut down on packaging materials.
- Share information about environmentally friendly products with other community members. The bulletin board or school blog is a good tool.
- Promote research among groups of students and teachers on the origin and destination of school products, and cultivate awareness of production and consumption processes.
- Collectivize the use of certain materials, such as colored pencils, pencils, rulers, and pens. Using a common box of materials in the classroom is an environmentally wise choice. Since resources are shared, students don't have to compete in acquiring the newest or most fashionable materials.
- Eliminate private ownership of textbooks by loaning them yearly—each student uses them, takes care of them, and returns them at the end of the school year. So, if the book is still part of the curriculum the following year, a new student can use it.
- Promote fairs featuring the sale of used books and materials among the student community to stimulate commitment to the environment, cost savings, and the value of caring for an object (which requires valuable natural resources for its production).
- Schools should carefully recommend textbooks to their

students to avoid having to change them year after year. This will help the proper implementation of practices described in the preceding two paragraphs.

- Encourage reuse of materials for other purposes (cans converted into containers for pencils or plants, sheets from notebooks converted into recycled paper for boxes, notebook covers reused for photocopying, and so on).
- Promote the collection of materials that cannot be reused for recycling in the community.
- Develop some of the products used every day in the school or enable the reuse of materials—for example, students can make nontoxic glue, paper, and cardboard, and even containers for waste disposal or storage of materials.

## Furniture and equipment

- If wooden furniture is to be purchased, make sure the wood is reforested or is legally logged timber. Ideally, the certified wood should come from sustainably managed forests. In Latin America increasingly more groups and companies are being certified. You can get this information from any environmental organization or your local government's environmental authority.
- Regardless of the material used, furniture should be chosen for high durability and undergo frequent maintenance, particularly since it will be subject to rough treatment.
- Furniture should be adaptable to the school's changing needs and future plans, so there is no need to discard it.
- Also, if possible, furniture should be made under fair and socially responsible commercial guidelines, using environmentally responsible practices.

### Box 7.

## Making Nontoxic Glue

### Materials

- A one-liter double-boiler pot
- Spoon
- Clean bottle
- Adhesive label

### Ingredients

- Half cup of water
- Two packs of unflavored gelatin
- Two tablespoons of white vinegar
- Two tablespoons of glycerin

### Procedure

- Dissolve the unflavored gelatin in cold water inside the bottle.
- Heat it in a double boiler, remove from the pot, and allow its temperature to lower (so it is not too hot to touch).
- Add the vinegar and glycerin, and mix well.
- Allow to cool and put the lid on.
- Label with the product name, and date of preparation and expiration (six months from the date of preparation).
- Store in a dark and dry place.



## Monitoring and evaluating progress

As you make changes in the use of school materials, monitor progress and note practices that require further improvement. In some cases monitoring can be performed once every two or three months; in others, at the start and end of the school year will be enough (as in the case of reused textbooks).

To make your evaluation more complete, conduct a small survey (maybe even several times a year) involving the entire school community. Ask if they see any changes in the consumption of school materials, and collect their thoughts on the process. Also ask what they would like to do to improve the school's environmental performance. This provides you with feedback throughout the program and helps you consider new goals, taking the expectations of the entire school community into account.

## Obtaining information

Although in Latin America and the Caribbean it is not always easy to find products that were generated ecologically, this is fast changing. Browse the Web (by using such search terms as *green page*, *green product*, or *green or ecological materials*) or ask any of the environmental associations in or near your community.

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