

Guidebook for Environmental Education on Solid Waste Management in Africa



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Background of the Guidebook

Japan Overseas Cooperation Volunteers (JOCV)

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- ▶ a system of dispatching Japanese volunteers overseas operated by JICA. Similar to the U.S. Peace Corps.
- ▶ includes more than **120** technical fields (agriculture, forestry, fisheries, education, health etc.).
- ▶ a total of **44,000** volunteers have been dispatched to **91** countries as of March 2019.



Background of the Guidebook

SWM Problems and EE Volunteers in Africa



Background of the Guidebook

Workshops @Morocco 2018 & Sudan 2019

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Training @ Yokohama

Outline of the Guidebook

- ▶ **Target:** practitioners in municipalities and educational institutions engaged in environmental education and community awareness raising in the waste management sector in Africa.
- ▶ **Objective:** to be used as a manual or a resource guide in developing and implementing education and awareness programs.
- ▶ **Structure:**

Structure	Chapter/Section
Situation assessment, problem analysis, issue selection	Chapter 1, Chapter 2
Planning	Chapter 3
Implementation, monitoring	Sections 4.1/4.2
Evaluation	Section 4.3



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Appendix

Bibliography/References

1.1 Waste Issues and Waste Management in Africa

The issues with waste are numerous. For example, littered streets tarnish a city's appeal, and illegal dumping and open burning of waste in town can damage resident health. Also, waste must be reduced to extend operation period of landfills.

Developed nations have addressed these waste issues one by one as cities expand and the economy develops. Many African nations, however, are experiencing urbanization at a pace unseen in developed nations, eliciting numerous issues all at once.

It can be hard to decide where to start when faced with this state of affairs. In order to prioritize the available measures, it is important to start off by analysing the structure of the issues: what they are (i.e. fundamental nature of the problems) and what is causing them. This chapter will provide the basic knowledge required to understand waste issues and analyse the situation and issues in a country or city where you are working.

(1) Rapid Population Growth and Urbanization

The African population has been growing faster than any other population in the world in recent years. In the 15 years from 2000 to 2015, the population of Africa has increased by roughly 50%. The growth of the population of African cities is more pronounced, increased even more sharply, by 70%, over the same period. This trend will continue in Africa: from 2015 to 2050, the total population is expected to grow approximately double, and the urban population is expected to grow approximately triple.¹

As populations explode, waste also increases. In many African nations, however, government-run waste collection and treatment services are unable to keep up with the situation. The lag is especially pronounced in Sub-Saharan Africa, where approximately half of the waste remain uncollected, damaging both sanitary conditions and the beauty of cities.² In 2016, 174 million tons of waste were generated in Africa. This is estimated to increase to 516 million tons in 2050—nearly a threefold increase.³

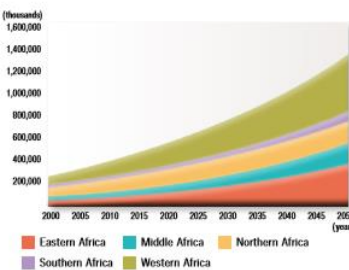


Fig. 1 Urban Population in Africa

(2) Waste Problems in Africa

a) Not maintaining urban sanitation

In African cities, it is common to see rubbish littering the streets and open lots, as well as rubbish spilling out from already full waste collection containers. Rubbish tossed in the rivers and gutters clogs the drainage channels and causes flooding. Such a state can lead to further illegal dumping and make the community less safe ('broken windows theory'). The food waste comprising the bulk of waste in Africa attracts insects and pests. In regions with high temperatures, waste tends to promote the breeding of flies and gastrointestinal pathogens that can cause the spread of diseases such as gastroenteritis, hepatitis, and cholera. In addition, accumulated water in plastic bottles and waste can attract mosquitoes, propagating malaria, dengue fever, and yellow fever.



Overflowing dumpsters



Waste clogging drainage channels



The theory that leaving the broken windows on buildings alone makes residents think that no one cares about the area, in turn lowering their morale and increasing crime.

b) Inadequate waste disposal

In many African cities, even where waste is collected, it is not being properly disposed. At least 70% of waste is disposed of in **open dump sites**. In Sub-Saharan Africa.⁴ In addition to pests, open dump sites invite a host of other issues, including offensive odours, fires, the contamination of surface and ground water from leachate, and associated soil contamination. These sites also generate and release methane, a greenhouse gas which contributes to climate change. Worse still, there have been many accidents in recent years with many human casualties resulting from collapse of waste piles in open dump sites.



Landfill collapse in Addis Ababa, Ethiopia



Large landfills without pollution control measures, surface compaction and soil covering. There have been frequent accidents with waste mound collapses, including Addis Ababa, Ethiopia (March 2017) and Maputo, Mozambique (February 2018).

c) Increase of waste requiring special treatment for disposal

In Africa, lifestyle changes brought about by economic growth are pushing up the amount of waste requiring special treatment for disposal such as plastics, electronic products, and tires. Additionally, large volumes of used electrical and electronic products are imported from developed countries to Africa for reuse, many of which no longer work and become E-waste (Electronic waste).

Without the adequate techniques and legal system in place for the proper disposal of waste in African nations, lead and dioxins will damage worker health, and the environment will be polluted.



E-waste (Electronic waste)

Steps in Building an Environmental Education Program



Incremental Targets of Environmental Education

Objectives of EE :

“To develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions to current problems, and the prevention of new ones” (the Belgrade Charter, UNESCO)

Step 1: Interest

*Become familiar with
and aware of
nature/the
environment*



Step 2: Understanding

*Learn how nature
and society are
intertwined*



Step 3: Action

*Take up
environmental issues
as one's one, acting
to resolve them*

Incremental Targets of Environmental Education

Applying the incremental targets of environmental education to waste issues yields . . .

Step 1: Interest

Show concern for how littering, etc. result in pollution and environmental issues



Step 2: Understanding

Learn where your waste winds up and how it is disposed (recycled)



Step 3: Action

Learn how to separate waste and put into practise

7 Elements to include in Environmental Education Programmes

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	Interest	Understanding	Action/Behavioural Change
(1) Fun	⊙		○
(2) Sense of Crisis	⊙	⊙	○
(3) Responsibility	○	⊙	○
(4) Effectiveness	○	⊙	○
(5) Feasibility		○	⊙
(6) Cost benefit			⊙
(7) Normative awareness			⊙

1) Fun: “That class on rubbish was interesting!”

“Rubbish” = Negative ⇒ Fun & Positive!



2) Sense of Crisis: “We can’t go on like this!”

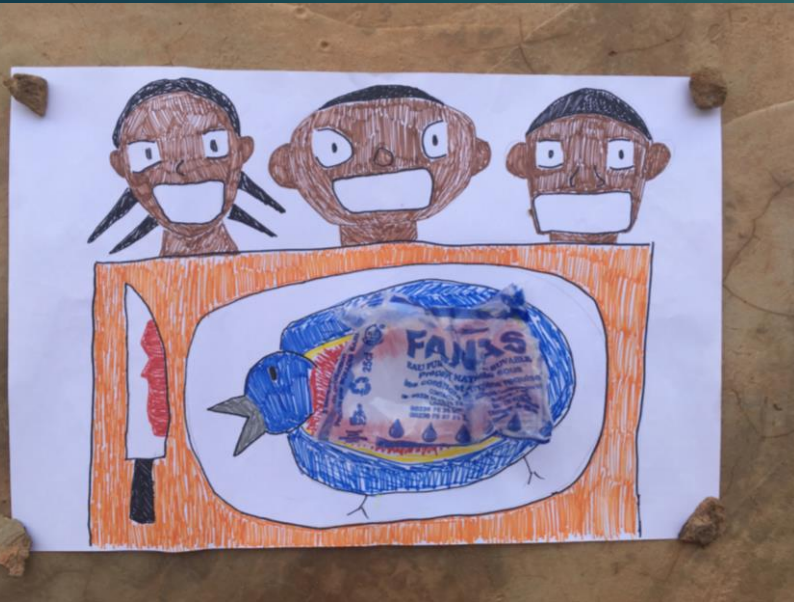


Figure 5.2 Blood lead levels in children living in proximity to the Dandora dumpsite, Kenya

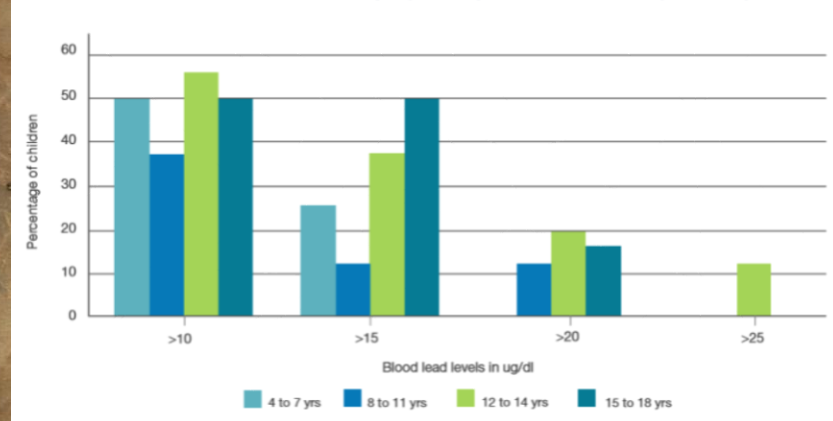
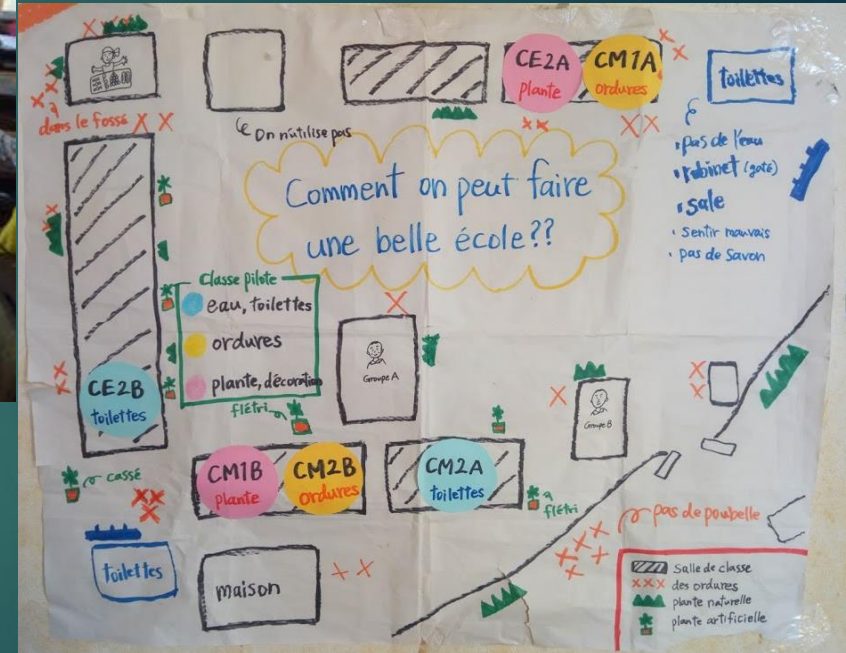


Table 5.1 Analysis of soil samples from Dandora dumpsite, Nairobi, Kenya

Elements	Mean elemental conc. of soil samples (ppm)			Reference values in soil standards	
	Within the dumpsite	Adjacent to the dumpsite	Waithaka soil samples (pre-urban area on the outskirts of Nairobi)	The Netherlands	Taiwan
Potassium	19 100	20 758	7 835	–	–
Calcium	77 000	14 558	4 300	–	–
Titanium	6 100	5 433	5 650	–	–
Chrome	689	157	118	100 ^a /250 ^{**}	100 ^a /400 ^b
Magnesium	3 500	4 366	2 400	–	–
Iron	84 800	45 800	57 100	–	–
Copper	507	105	BDL	50 ^a /100 ^{**}	120 ^a /200 ^b
Zinc	2 100	462	133	200 ^a /500 ^{**}	35 ^a /500 ^b
Mercury	46.7	18.6	BDL	0.5 ^a /2 ^{**}	0.29 ^a /2 ^b
Lead	13 500	264	34.5	50 ^a /150 ^{**}	50 ^a /500 ^b
Cadmium	1 058	40	–	1 ^a /5 ^{**}	2 ^a /5 ^b

Source: Kimani (2012)
Abbreviations: BDL, below detection limit

3) Responsibility: "I'm responsible, too"



4) Effectiveness: “I can make a difference”



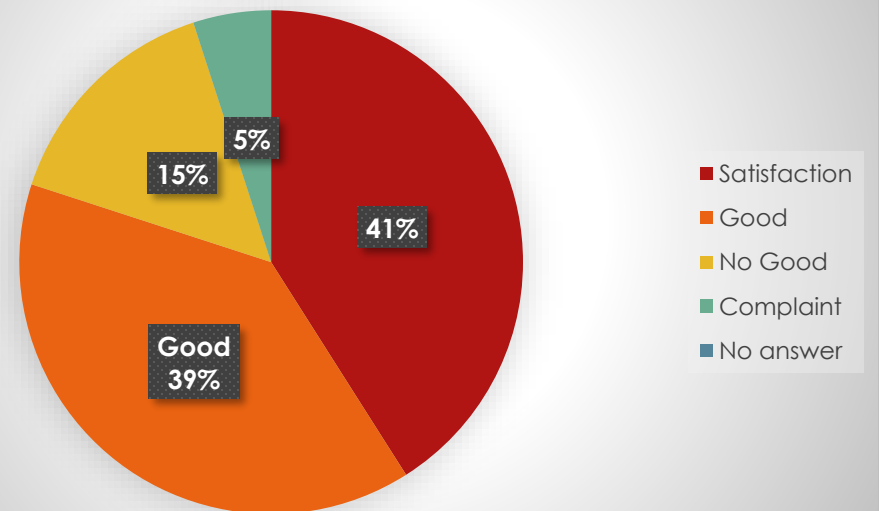
Before the Cleaning Campaign@School



After the Cleaning Campaign

Date	Start	Finish	Time	Car Type	Staff	Volunteer	Workers
2 October	7:30	8:32	1hour 2minutes	Container Truck	No body	No body	4
6 October	8:24	10:53	1hour 29minutes	Container Truck	No body	Artif,,lyadd, Ali nawi	4
9 October	8:17	9:28	1hour 11minutes	Compactor	No body	Artif, Iyad, Ali nawi	3
13 October	8:08	9:48	1hour 40minutes	Compactor	No body	Artif ,Iyad, Hansaa	3
16 October	8:50	10:27	1 hour 37minutes	Container Truck	Abu gaasim	No body	3
20 October	8:00	9:10	1hour 10minutes	Compactor	Abu gaasim	Iyad,	3
23 October	8:10	9:01	51minutes	Compactor	No body	Artif	4
27 October	8:12	9:21	1hour 9minutes	Compactor	Abu	No body	4
30 Oct							4

1, Waste Collection Satisfaction



5) Feasibility: “We can do that!”

HOW TO SEPARATE YOUR WASTE

ORGANIC



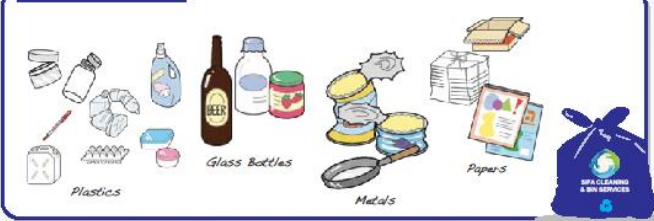
We provide you three coloured coded liner bags; Green, Blue and Brown.

It is your **RESPONSIBILITY** to separate your waste as I show with examples here. Let's make our environment **CLEANER & HEALTHIER** together!!!

If there is anything unclear, don't hesitate to contact **NCC/SIFA**. We are always happy to help you for better environment



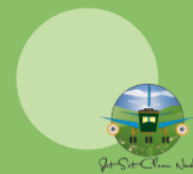
RECYCLABLES



OTHERS



[Component 2] School Composting



Introduction

What is composting?

Composting is a natural process through which organic materials are converted into a soil like product called humus.

Benefits of composting at school

- Composting at schools:
- Is a fun way to learn about nature while also reducing the amount of organic waste. An added bonus is that students can actually get to see the end result of their finished compost being used to beautify their school's compound.
 - Supplies needed nutrients and improves the soil structure of your school gardening etc. which is better than using chemical fertilizers and pesticides.
 - Reduces the need for landfill disposal and cut down on garbage collection, decreasing municipality's waste management cost.

Steps to follow

STEP1: Decide which (if any) compost containers to use

There are some ways you can go.

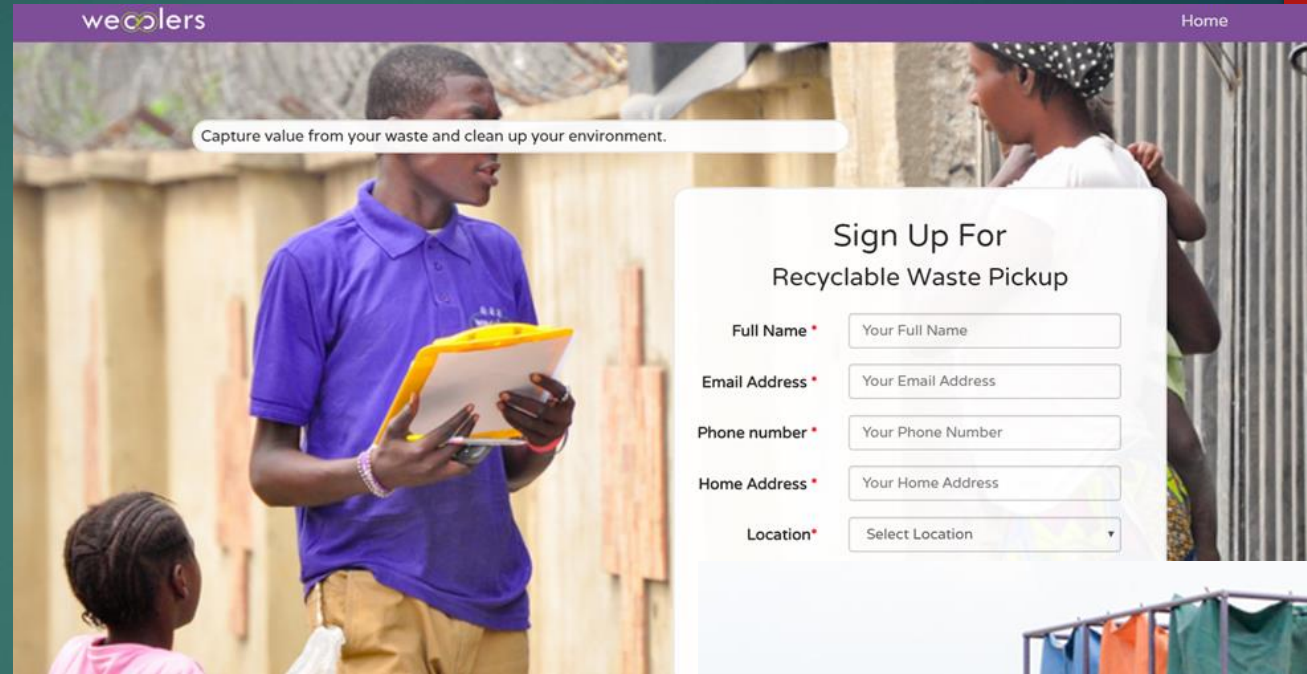
1) Wooden timbers

By using wooden timbers, make a square for compost. (Try to get waste timbers if possible)

- GOOD**
 - Keeps compost moist (retains moisture)
 - Easy to compact the compost to make it hard for fermentation
 - Looks presentable as a compost
- BAD**
 - May rot / decay overtime



6) Cost benefit: “Is this good or bad for me?”



Wecyclers in Lagos, Nigeria <http://wecyclers.com/>

7) Normative Awareness: Group Behaviour and Expectations



Examples of EE Programs and Teaching Materials

Case Program 1 Sorting waste at school (Kenya)

SORTING WASTE AT OUR SCHOOL

Year Created: 2018 | Created By: Yusuke ISHIKURO (JICA Volunteer)

Field	Country	Language	Audience (Numbers)	Activity Time	Location	Implementer
Waste sorting	Kenya	English	3rd-6th grades (40 students)	35 mins.	Classroom	Public servants

Environmental Behaviour Driving Elements

Fun	Sence of Crisis	Responsibility	Effectiveness	Feasibility	Cost Benefit	Normative Awareness
✓	✓	✓	✓	✓		

Goals

- Learn how much waste households discharge each day.
- Learn and put into practice proper waste sorting methods to reduce disposed waste.

Underlying Waste Management Systems

Source separation and collection system have been introduced (or attempted).

Tools Used

- 3 types of plastic bottles of differing weights adjusted by the amount of sand contained (with 1 of the 3 bottles equivalent to the per capita daily waste discharge for the target area)
- Waste cards (14 categories/for posting)
- Waste cards (14 categories/about 8 sets for distribution)
- Cards showing waste categories and disposal methods (for posting)
- Long rope
- Paper clips
- Dust bins for sorting (same number as waste categories)

Procedure

- ① Have participants pick up and compare the differently weighted plastic bottles to experience how much the daily per capita waste discharge is.
 - Learn how much waste you throw away. Understand that the amount is large.
- ② Ask participants what kinds of waste they throw away in their everyday lives.
 - Learn the categories of waste you throw away. Understand that there are many categories of waste and pose the idea of sorting them out (in subsequent steps).

- ③ Hang cards with the waste categories (organic/inorganic/recyclable) and their explanations (decomposes naturally, etc.) on a rope hung up before class starts and explain the categories.

→ Teach the participants basic information on waste.

- ④ Waste sorting card game

Form groups of 5-6 participants, pass each group a set of 14 waste cards, and have the groups sort different waste into their respective categories. Ask them what kind of waste falls under each category to prompt the participants for responses, and then hang the 14 waste cards by waste category.

→ Makes the audience think specifically what waste fits in each waste category and try to actually sort waste.

- ⑤ Explain how each waste category is disposed or treated and hang the disposal method cards on the rope.

→ Ask them which of the waste categories is actually waste to convey the idea that organic waste and recyclable waste are resources, not waste.

→ Explain the significance of waste sorting by illustrating that all the waste categories on the rope are thrown away, but sorting would reduce the waste taken to landfills (extending the lifespan of the landfills).

- ⑥ Teach the waste sorting method to be used at the school (different for each area) using dust bins. (Recyclable waste can be subdivided into 3 categories, etc.)

→ Stress checking the item materials when sorting.

- ⑦ Review of lessons learned in the program

Ask participants: How much waste do we each throw away per day? / Many categories of waste we throw away / Why waste must be sorted and the importance of sorting

Choose a few participants, pass them a waste card from the rope, and have them put it in the correct sorting dust bin according to the waste sorting method to be used at the school.

Chose a few participants and have them speak about what they learned today.

Pictures



Class in progress



Experiencing waste amounts with plastic bottles



Waste sorting card game

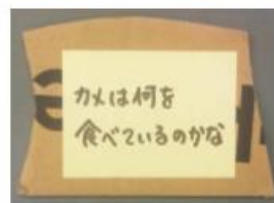
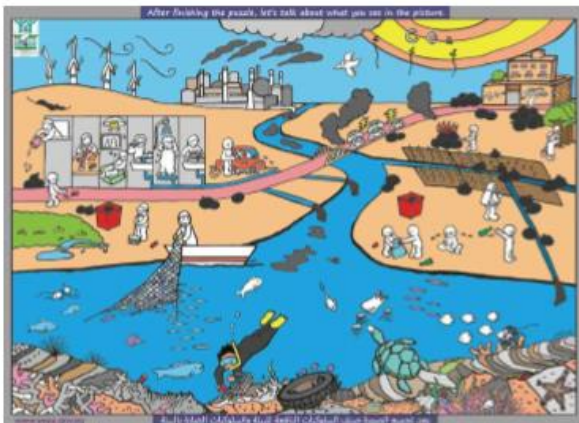


Sorting school waste as review



Final presentations on what was learned

Examples of Teaching Materials



① Environmental puzzle (Masakazu SUWA, Egypt): Questions related to the image on the front are written on the back each piece. Answer the questions as you put the puzzle together. Can be completed with even just 1 person.

How to make Kendama from plastic bottle

Preparation: 2 plastic bottles, A4 paper, Plastic bag, Glue, Scissors, Pen



1. After the top of the plastic bottle is removed, remove the top off it and use the lower part of it.



2. Make a hole in the side of the bottle and make a ball.



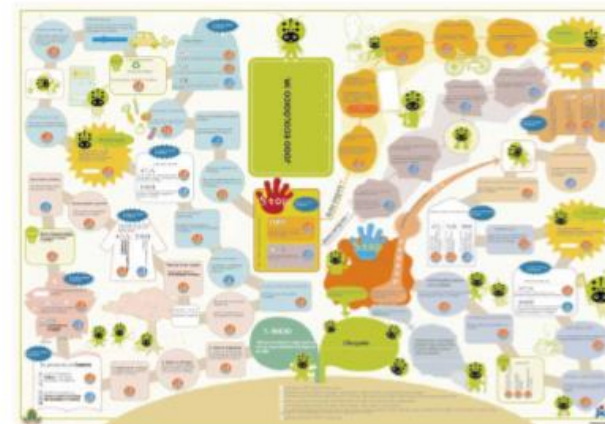
3. Turn the center of the part and the opposite side of string.



② Recycled crafts manual (Tatsuro MORI, Sudan): Explains how to make toys, pen cases, and more from plastic bottles and other recyclables.



③ Pac-Pac-kun, the playful dust bin (Masakazu SUWA, Egypt): Feed Pac-Pac-kun to choose while picking up waste. Simply fix a waste bag inside a cut out cardboard box and attach eyes. ²⁵



④ Environmental dice (Project for Promotion of Sustainable 3R Activities in Maputo, Mozambique): A dice game for having fun while learning about waste management and the 3Rs.



⑤ Recycled instruments (Sena HIROKI, Cameroon): Play songs about the environment using maracas made of recycled plastic bottles and waste/beads.



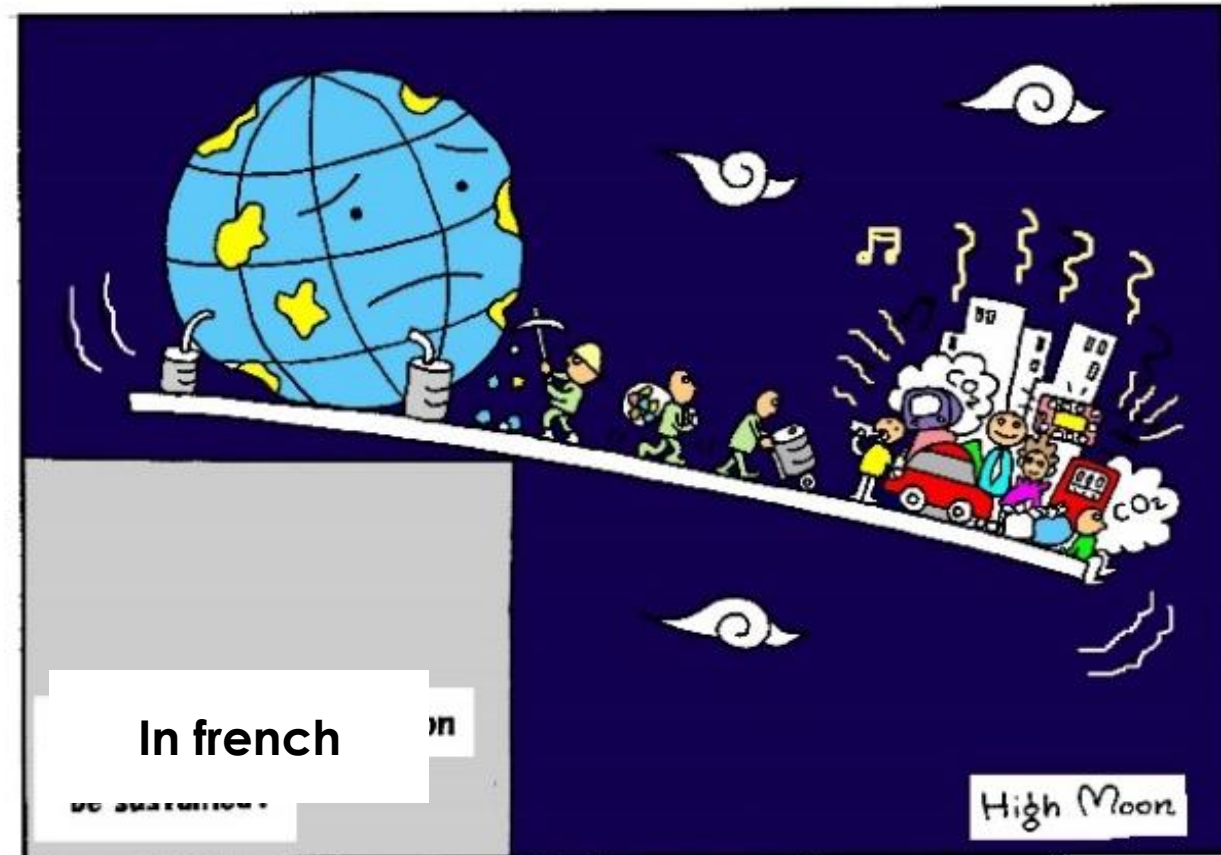
⑥ Homemade picture show, "Where Does Waste Go?" (Yuki EGAWA, Burkina Faso): The story of a plastic bag that gets eaten by a bird and comes out whole from the bird's stomach.



⑦ Waste sorting cards (Yusuke ISHIKURO, Kenya): A group game to practice sorting waste using waste cards at an elementary school.

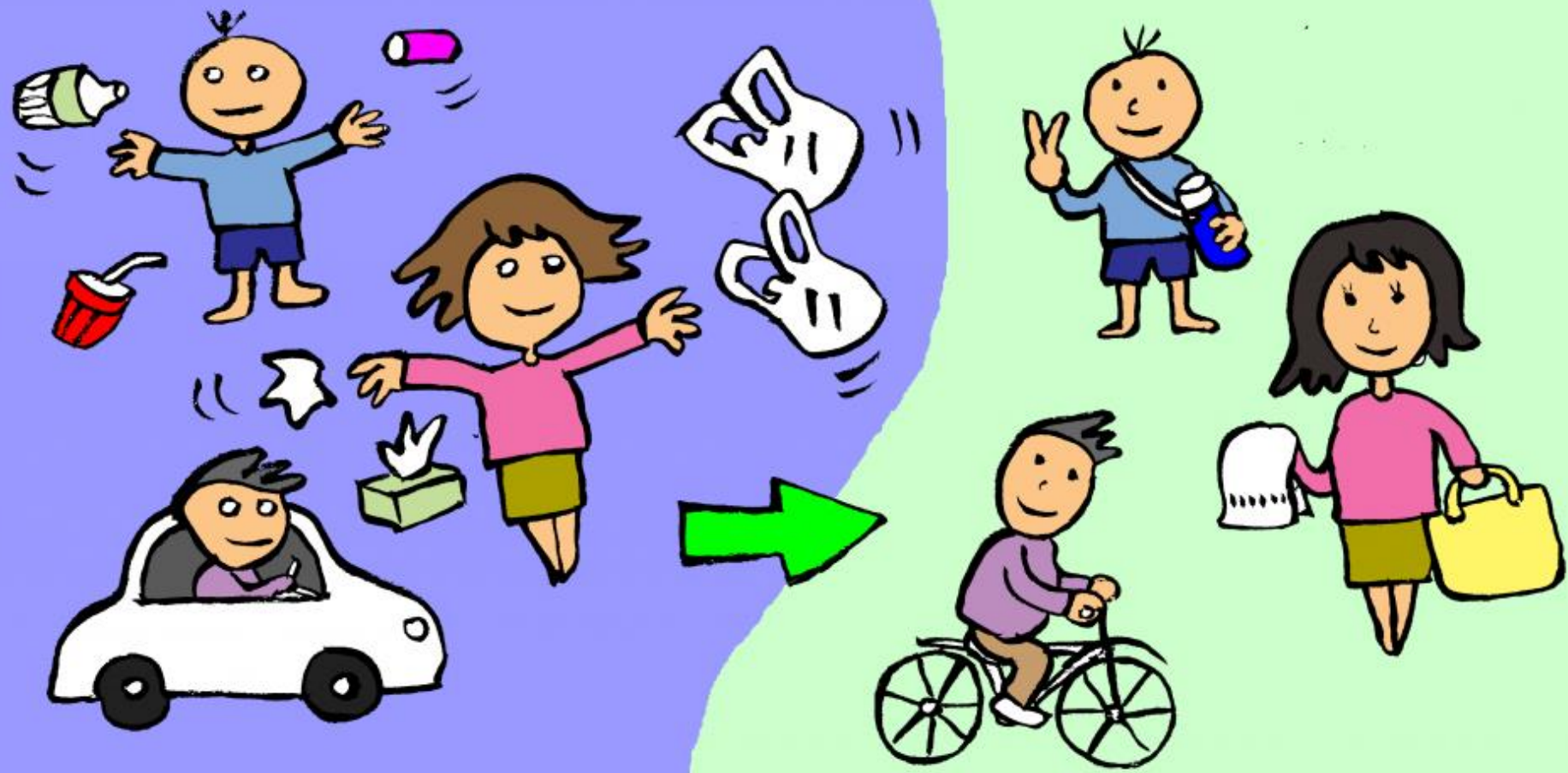
Recommended Environmental Education Materials: High Moon Environmental Comic

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In french

Source: from the High Moon Kobo website <https://highmoonkobo.net/>



「Change!」「Yes, We can!」
In french

High Noon