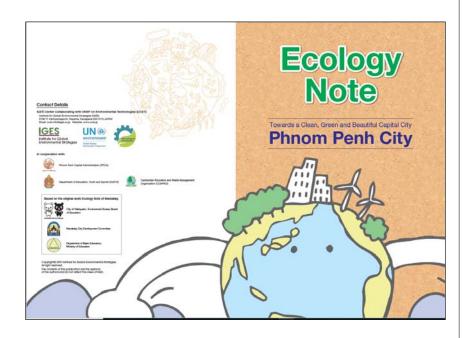
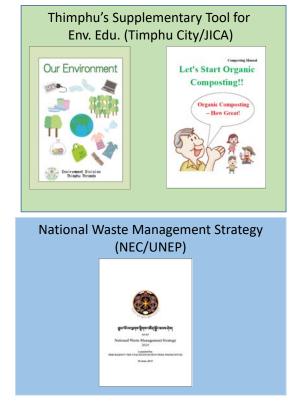
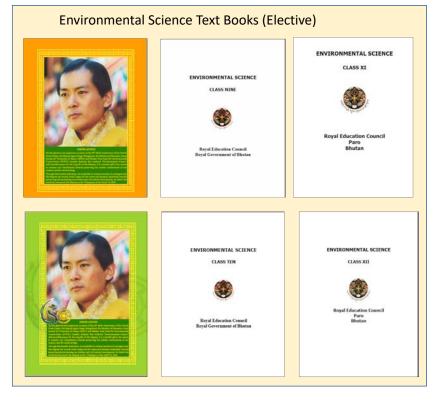
Discussions

- (1) How to enrich the content, visibility and usability of **Ecology Note** to meet with the local context of Bhutan (integration of GNH, 4Rs and others)
- (2) How can **Ecology Note** can complement with existing other EE programmes and efforts as well as building partnership to improve EE(formal and/or nonformal) in Bhutan



Existing materials and actions that can provide some valuable inputs

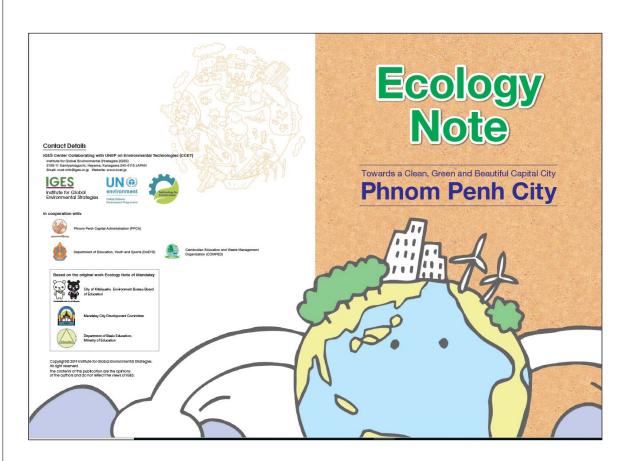




Some points that can be further strengthened and tailored to Bhutan context?

(based on CCET point of view)

- Integration of development philosophy: GNH? 4R but not 3R?
- Additional Contents
 - Content on Consumption and Production? "Where do our waste come from?"
 - Examples, and exercises for "Refuse, Reduce and Reuse" in addition to recycle.
 - Emerging topics: Single use plastics, marine plastics...etc.
 - A few cases of school-based 4R actions already taken by Bhutanese primary schools?
- Clarifications
 - Composting exercise: any material can be used as box as long as aeration is ensured.
- Examples employed in the materials (based on the experience at local)
 - Examples of fermented foods?
 - Upcycling exercise: availability of materials?
 - Waste and Climate: Add "open burning and open dumping"?
- Photographs, pictures, maps, logos, basic facts and figures...etc. to visualize local context



Introductio

Solid Visites Management (SMM) has become on of the most serior environmental and public health leases confronting cities in developing countries phonor Plant, the sepidal city of Carribotals in oft an exception. Repid urbanisation, economic growth and exception. Repid urbanisation, economic growth and exception. Repid urbanisation, economic growth and developing the past few deceded. According to the Phonor Plant Ceptial Administration (PPCA), annual waste generation has increased now 60,380 convaid waste generation has increased now 60,380 convaid waste generation has increased now 60,380 convaid waste generation has increased content, of the content of the convenience of weeke services are similar on the complete collection of their leadings. Arring to concern the test growing waste management system steap similar as bound solid waste management system integrating 3R practices Produce, researe and recycles.

In this new approach, promoting understanding or

wasta issue as well as active participation of all askabiliders including pacidod citizens, who are the need generation of decision-makers. This servironment learning bookship has been prepended based on the experiences of Pilaliyujaku City, one of the learning bookship environmental model desies in Japan, to provide intermation, tools and guidelines emphasising reducing environmental model was produced as in the provide intermation, tools and guidelines emphasising reducing whatever we can, teatree using landitis or other tachward and the second of the producing the pr

Table of Contents

Making a Green Map for our Neighbourhood

Left Fill for the Present Sold Wash Management in Our City and the Challenge of the Throw-heap Society

Our Lives and Wash

With Can Saily Got
Left Fill make Separation and Rengoling

Left I can Now Wash's Expansion and Rengoling

Left I can Now Wash's Can Be Changed into Resources

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Now Source Compost

How Compost Helps the Plants Gro

Meas for Reducing Waste

 Let's Think About Global Warming and Climate Char Global Warming



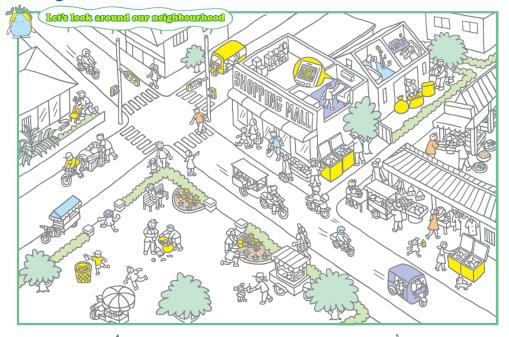






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Making a Green Map for our Neighbourhood



Let's Find Out the Present Solid in Our City and the Challenge of



The amount of waste generated per day in the Phnom Penh City as a whole is about 2,700 tons.

This is the same as the total weight of 500 elephants!

That much solid waste is generated in only one day. What do you think will happen if this situation continues?





In our society, many goods (things) are produced, used, and thrown away without being used for long time. Afterwards, they are unally collected and ends up in landfill. This type of society is sometimes called Throws-Away-Society-Every time was thrown society to the society of the took to produce it. Find our where do your belongings come from? What kind of, and how much material it dook to make them delongings come from? What kind of, and how much material it dook to make them delongings.

Waste Management the Throw-Away Society



Reduce Reduce waste

Reuse Use things

Recycle Turn waste into



I separate PET bottles and cans.

I use old newspaper for wrapping.

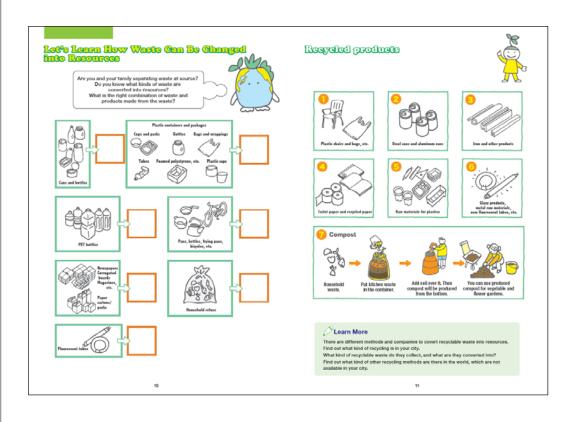
I use my own bag and don't ask for plastic shopping bags.

I turn off the TV when doing other things.

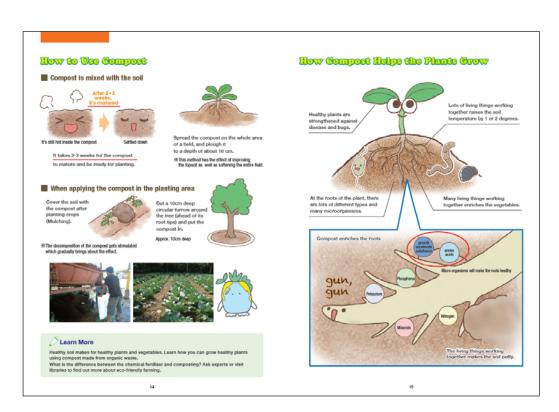
Let's Promote Waste Separation and Recycling What will happen to the following materials will be changed after separation and recycling? Let's find and connect with a line. Let's start to separate waste at home with your family members. Or waste includes variety of things. The waste generated at households can be broadly divided into three categories: (i) recyclates marinatie (paper, bjeatic, glass bottles, can, etc), (ii) biodegradables (left over ungetables and fruts, most, rice, breads, fish...etc), and (iii) other types of waste. Many cities often has separation rule for waste collection, so that same things can be collected, and later treated, together. Find out what kind of things are included in the waste at your home. What kind or folia does your area have?

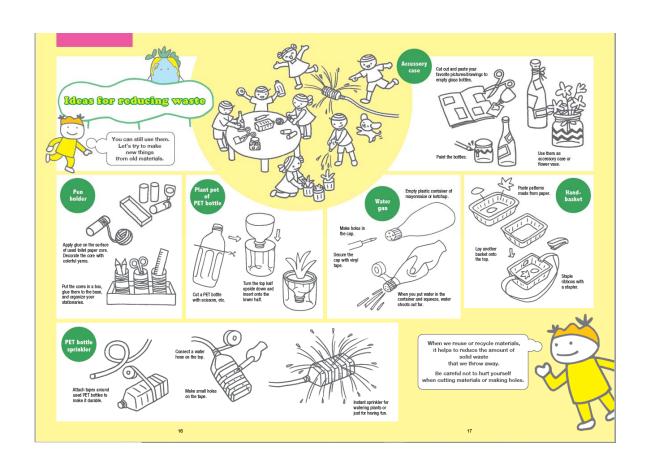
what happens to the waste that we throw away. Do you know where it goes after collection? Do you know what happens in the end? Let's challenge a quiz to find out how much you know about eco-friendly lives. Please read the following sentences and mark ○ if correct and × if not correct in □, and then connect with an appropriate tip on the right.

Let's think about the waste flow and learn about







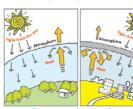


Let's Think About Global Warming and Climate Change

Clobal Warming

What is global warming?

The rise in the temperature worldwide is called "global warming." The cause of global warming is, simply put, the atmosphere surrounding the earth. The atmosphere wraps around the earth like a blanket. Thanks to the blanket, the earth catches heat given from sunsinght and makes the temperature comfortable for our fives. But more isn't always better, Now, the blanket of atmosphere is optima to thick. The reason for the atmosphere getting too thick is that the gas warming the earth is increasing too much.

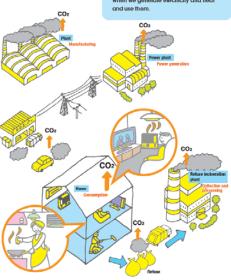


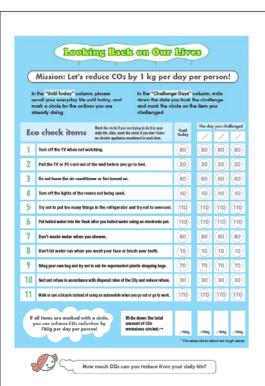
The earth maintains the proper temperature by wearing the blanket of the atmosphere (without the blanket of the atmosphere, the average temperature is would to become 16 degrees below zero).

On what occasions is CO2 emitted?

CO₂ (carbon dioxida) is emitted when we burn things and we exhale. What's more, we actually emit CO₂ in various ways in our ti

> We lead our lives by emitting CO2 even when we generate electricity and heat and use them.







In the living room @ 29.24 @ 11.24 @ 29.4 *# @ 5.9_k If the use is reduced by one hour per day ™tti @ 19,8⊾ 9.5a ¹₩ @ 53.2_k ···· @ 11.0u u∞ @ 1.9₁₁ In the bathroom @ 87,0 € @ 29.1_{kt} In washing

Washing machine @ 2,1_k In the kitchen Electric refrigerator

Adjust to the optimum temperature
if the temperature is adjusted trees in

install behind the wall by allowing
appropriate space @ 21.6_k @ 15.8₄ Winsh dishes collectively when the marchine is use if don westing is changed from manusi washing to marchine use drive @ 37.6₩ Microwave oven

to be microwave oven for propering vegetables @ 15.4₄

21

Teacher's Guide

About Ecology Note

About Ecology Note
Ecology Note – Towards Clean and Beautiful Cambodia – is a supplementary
material for primary school teachers who wish to introduce environmental education
for the first time, or for those who want to enhance the scope of educational work in
addition to what is already taught in the classrooms.

The scope of environmental education is wide, including various environmental

issues from climate change, bio-diversity, pollution of air, land, water, sustainable management of waste and finite resources including those exhaustible and management of waste and finite resources including those exhaustible and renewable. In this note, waster/resource management and climate change issues are given special attention as environmental issues most close to students and most pressing to Phnom Penh Capital City. It is recommended that the schools and teachers would gradually expand the range of topics to be treated in the school curriculum in the future. Also, for Ecology Note to better serve students and teachers, it is crucial that the tool is well positioned in a wider curriculum design with clear goals/direction, specific skills students are expected to learn, approaches and pedagogies employed, and annual teaching schedule...etc.

Designing an Effective Class for Effective Learning

In order to allow teachers to tailor their classroom activities to suite their needs, any component of this booklet can be photocopied and distributed in the classroom

The underlining concept behind Ecology Note is education through active learning The underning concept benind be body with each adulation through active learning – an approach that values spontaneous interests of students are life underlifted for learning. Going beyond a passive learning such as a unidirectional lecture primarily focusing on providing information to students, it also employs experiental learning where learning is guided by discovery from experience and reflecting on the experience. Field works, group discussions, report writing, and presentation are some of the examples of methods in this tool which encourage students to develop the skill to observe, analyze, organize, and communicate the acquired information to others.

The Ecology Note also encourage teachers to connect the educational resources around the school, teachers and students to the classroom education based on lecture. Using locally available resources and engaging experts and practitioners in the local community is an effective way to enhance students learning through social the local community is an effective way to enhance students learning through social interaction. For instance, inviting waste management experts to your classroom as guest lecturers, or visiting recycling companies as a educational field trip would help enhance student's understanding on subject matters, going beyond what they have learnt in their classroom. Schools can also consider university professors, officers of local administrations, farmers, companies and community groups as resource persons to support their lecture.

Lesson 1 Making a Green Map for your Neighbourhood (2 class period)

Alm:

This exercise is intended to give students a better understanding of the community resources for preserving retural environment, through exploring their own city with fresh eyes. The activity can also help students to develop the ability to organize analyze, and communicate the discovered information to others.

Required moterfuls:

Map of the neighborhood (a small area around the school), drawing papers, pencils, camera (if possible).

Procedure:

- 1. Divide students into groups (maximum 5) / Ask them to walk their neighbourhood with the map and identify the eco resources (dustbins, recycling and identify the eco resources (dusthins, recycling shops, bike lanes), people (farmers, wastle collectors) and places (agriculture land, greenspace) along with cultural sites that make their neighbourhood a special place? Jask them to take notes, sketch or photo these places. In the class room, they draw a map of the area / Different groups can present their maps to other

groups and discuss what they have found and their importance.

Follow-up:
Display the map on a bulletin board or similar.
Write a report about their neighbourhood using these information. During/after the discussion, it is important to highlight what community resources/actions (and which aspent) are considered supportive to environmental protection.

Relevant subject areas: Social Studies, Science, Art, Agriculture



Lesson 2 Let's think about Waste Management Issues

in your Neighbourhood (2 class period)

Alm:
This section encourages students to become aware of the basic facts about waste problems of the city, and the direct linkage between their daily lives, and to think about the environmental consequences of fleetyle. Highlighting the connection between for fleetyle thingshipting the connection between the connection of the first steps to nurture the sense of responsibility, atthudes, and behavior for environmental protection.

Bouttrad moderalis:

- Procedure:

 1. Ask students to think about how much garbage they, their family and city produce daily, weekly, monthly or annually. (Average daily waste generation in Phrom Parth City 18, 19 4-04 grams per person (ii) 975 tonnes or 975,000 slibgnarmes in the city as a whole).

 2. Discuss what happens to our environment if we keep confinuing throwing parhage using simple questions such as: if you throw one piece of paper on the ground of your classroom, would that marke a big difference? Suppose everyone in the

classroom does this at once, what would it look like then? How about if you do this once a week or once a month? Why?

3. Students can be shown waste collection points in their neighbourhood or the final disposal site to show them the real situation and discuss the neighbourhood.

Produce a bulletin board or display the results of the information from the questions / Write a report or fact sheet using this information. Take it home and share with the family.

Social Studies, Science, Maths



Lesson 3 Let's Discuss What Students Can Do to Reduce Waste (1 class period)

This exercise encourages students to understand the importance of lifestyle based on 3Rs – a life style without just throwing things away - in order to reduce waste and conserve resource use.

Papers and pencils

- Ask students to think about variety of household items that are thrown into the garbage. Discuss which of the items can reduced, used again (reuse) or recycled.

 Motivate students to take simple individual action using a check list of eco-actions and discuss how
- using a check list of eco-actions and discuss he these simple actions can protect our environm

eco-actions at schools, homes and neighbourhoods. Ask them to present what activities they have taken. Produce a bulletin board or display the results, or organize them into a report/fact sheet. Subject grees:

Social Studies, Science, Maths



Lesson 5 Let's Understand What Happens After Collection (2 class period)

Map of town/city, paper, pencil, waste management facilities (landfill site, incineration plant, recycling facility, composting center...etc.)

questions such as: "Are there any other options that would be desirable to manage your garbage? If so, make a list of recommendations". Students can also use the information gather to write a report on waste disposal or create a bulletin board or exhibit.

AIM:
To leam about different recycling methods and industries in Phnom Penh City. Students can also find out how their waste can still be used as a resource for producing various products.

- Procedure:

 1. Identify all the waste disposal options in your community. List up and mark them on a map.

 2. Decide where various types of garbage can go. Each item may have several options.

 3. Find out what recycling and composting options are available in your community.
- Further discussions can be facilitated by asking

Social Studies, Home Economics, Maths



Lesson 4 Educate Students About Waste Separation at Source (1 class period)

Through this exercise students will learn the different categories of waste produced in their daily lives as well as the disposal methods.

A sample of waste collected from households or classroom

- Procedure:

 1. Collect samples of waste which accumulate in the classroom after one day or ask the students to bring from their houses.

 2. Take 3 boxes and place them at the end of the room and ask the students to black them as recyclable, biodegradable or left-over for disposal.

 3. Setup two beams and left them sort the garbage by taking one item at a time and placing it in a container.
- taking one term as a win-way-container.

 After the students have sorted the garbage, go through the bins and ask why items were placed in certain boxes. Some items may appropriately fit into more than one box. The answers are not always clear, depending on options available in your community. This can also be done on paper

by drawing lines between the items and the containers on a handout called "Where Does This Trash Belong?"

Follow-up:
Discuss the idea of waste segregation and reduction. Ask (i) what items are not needed in the first place (ii) if durable products could be used rather than disposal ones (iii) if products with less packaging could be purchased. Encourage students to find out the segregation rules in their own residential area.

Subject areas Science, Social Studies



Lesson 6 Learn How to Make Compost from Bio-Waste (multiple class period)

This exercise is aimed at advancing understanding on the basic steps of composting, and its mechanism through an expertrial learning.

Required moderals:
Fresh sample of kitchen waste, cardboard box (if you want to make it in a box) or safe location, glass side or petri dish, hand lens or microscope, paper, pencel

- Percuit

 Procedure:

 1. Place kitchen or yard waste into the composting bin. Chop or shred the organic materials if you want them to compost quickly.

 2. Spread seed compost or soil or pre-made compost over the compost pile. This contains the microorganisms and soil animals that do the work of making compost.

 3. Adjust the moisture in your compost pile. Add dry staw or sawdust to soggy materials or add water to a pile that is to dry. The compost should be dump to touch, but not so wet that drops come out when you squeeze it.
- damp to touch, but not so wet that drops come out when you squeeze it.

 4. Allow the pile to ferment. It should heat up quickly and reach the desired temperature of 90° fto 140° or 32° to 80° in four to five days. Stir your compost as it ferments by turning it with a pitch fork or showell if you want to speed up the process. If you mix or than your pile every week, it should be ready to use in one to two months.
- 5. Your compost should look like dark crumbly soil mixed with small pieces of organic materials. it should have a sweet and earthly smell. The insects (worms, bacteria, fung) found in your compost pile do the work of making compost. If you don't see live organisms, take a fresh sample from the compost and check with a hand lens or microscope.

ollow-up: Develop a checklist to motivate students to take co-actions at schools, homes and neighbourhoods.

Ask them to present what activities they have taken Produce a bulletin board or display the results, or organize them into a report/fact sheet.



Lesson 7 Let's Try to Use Compost: Plants from Trash

Aim:

This activity is aimed at learning an example of how waste can be turned into a valuable resource at home, by focusing on how organic fertilizers produced from composting can be used to grow plants. In connection, the learning can be extended to the conditions for effective growth of plants, or agriculture in the city.

Paulitzed medicales.

Required materials: containers for plants, soil with compost, seeds, pits, fruit or vegetable parts that they throw away, and a little tender loving care

- Procedure:

 1. Discuss the different types of plants propagation, such as plants from seeds (peanuts, beans), plants from plants part (pineapple, potato), plants from exotic fruits (pineapple, potato), plants from exotic fruits (mango, avocado...etc).

 2. Ask students to collect them from the waste at home and bring to the classroom. Encourage to

plant and take care by individually or as a group.

Follow-up:
Monitor the progress of their growing. Discuss what students have discovered from the experience. Share the product with others and encourage to grow more plants



Lesson 9 Let's Study Global Warming and Climate Change Issues (1 class period)

Alm:
This section aimed at developing basic understanding about the mechanism of global warming, and to highlight the direct link between the problem and student's everyday lives.

- problem and student's everyday lives.

 Required motiertalis:
 space, pencils, checklist
 Procedure:

 1. Discuss what you know about dobal warming,
 and how our daily activities emit COz, which is the
 primary source of the worming.

 2. Discuss what kinds of things will begin to occur if
 global warming advances.

 3. Encourage students to find out what
 counter-actions are taken by your city, country
 and around the world, through books, videos or
 internet. Request parents and other resource
 persons around school to assist in providing such
 information.

Follow-up: Motivation to take action to reduce the CO₂ at

home with the family using the checklist. Calculate how much reduction can be achieved from their simple actions and motivate to practice environmentally-friendly life-style. Let students discuss and exchange their ideas for reducing OZ. The result of the procedura 3 above can be shared in a follow-up discussion, or be made report assignment. Subject rens:

Science, Social Studies



Lesson 8 Promote ideas for reducing waste (multiple activities)

Am:
This exercise is intended to provide opportunity to learn how waste materials can be reused or recycled into a new product, and to understand the importance of avoiding wastage of valuable materials in their daily lives. It is also important to communicate the importance of "reduce" as priority actions before "reuse" and "recycle" for reducing the impact to the environment.

science, biology, agriculture, social studies

(equired materials:

(i) trash collected from home (plastic bottles, milk cartons, newspapers, aluminium pie plate etc.)

(ii) craft items (glue, scissors, tape, string, paint, wire etc.)

- Procedure:

 1. Ask students to bring in a piece of trash collected from their homes (a plastic bottle, paper cores of used toilet paper, a cortainer, entryly glass jars/bottles or other reusable materials). Set up a table to use as a project centre.

 2. Make sure to supply extra trash items for those students who need them. Instruct the students to design and build times using that trash. Let the students display their completed products and

explain them to the class.

explain them to the class.
Follow-up:
Discusse with students what they thought about building something from waste. Encourage students to thirk about what other items that could be reused at homes and share their new ideas to the class. Link this exercise with the messages from the previous components of the Ecology Notes such as waste problems in the city and the ways to reduce waste through SR Encourage students to imagine, if every piece of trash we used a second time, we could cut the amount of solid waste we throw away in half.

Art. Science



• MEMO •