



Tata Steel Foundation-TERI Initiative

A Handbook for Schools on Biodiversity Mapping and Electricity Consumption Audit



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About Handbook

“Do you want to help create a healthier and more environmentally sustainable society? Do you want to empower yourself and want others to do the same? Do you want to make your school more climate-friendly?” If so, this activity handbook is for you!

The adolescents of India are the custodians of the future, and the vision of *Atmanirbhar Bharat* can be realized only by encouraging their leadership. We believe that adolescents can engage in societal life and solve many environmental challenges when empowered with the necessary training.

The handbook allows students and teachers to indulge in sustainable action by ‘doing their part’. The publication will also help students and teachers comprehend the Sustainable Development Goals (SDGs 3, 4, 6, 7, 12, and 13 linked with good life and well-being, quality education, clean water and sanitation, clean and affordable energy, sustainable consumption, and climate change), address them, and receive the essential guide for activity-based solutions. The most effective strategy for helping students learn and grasp non-trivial concepts more quickly is activity-based instruction. This is the reason it includes an explanation of biodiversity mapping and electricity consumption audit, and a few suggested activities that can be used at home or at school to close the sustainability gaps.

This handbook has considered National Education Policy (NEP) 2020 and the need to restructure curriculum and pedagogy in schools to make them Empowering, Engaging, and Promoting such that learning is based on play, discovery, and activities. The handbook also outlines innovative and creative teaching methods that can be utilized for arousing students’ interest.

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1. Biodiversity Mapping

Introduction



Biodiversity mapping encompasses a variety of techniques used to represent and analyse biodiversity patterns for environmental conservation. Biodiversity is important for the continued survival of life on Earth. It provides us with food, clean water, and other resources that we rely on for our everyday needs. Biodiversity also helps to regulate the Earth's climate and our planet's ecosystems.

A biodiversity mapping will help students to identify various species of plants and animals within a respective area around school premises. This mapping not only

facilitates a deeper understanding of the diverse ecosystem but also encourages students to explore and appreciate the richness of their natural surroundings. Through this immersive experience, students not only increase their ecological knowledge but also develop a strong connection with the vast and vibrant tapestry of life that thrives in their surrounding environment.

Objectives

- » To sensitize school students on the importance of biodiversity
- » To identify and map wide varieties of animals (ranging from mammals, reptiles, birds, insects, etc., showcasing incredible biodiversity in terms of their shape, size, habitat, etc., and plants species (ranging from giant trees such as sequoias to delicate flowers like orchids, vast plant kingdom of grasses, succulent plants like cactus, mosses or ferns or aquatic plants like water lily, etc.)

- » To document the existing biodiversity in the location

Expected Outcomes

- » Generate understanding of biodiversity
- » Informed group of students who can be the Green Buddies of biodiversity conservation

Resources

- » Data collection sheets, chart papers, papers, and seed balls

Biodiversity Mapping Steps

Prior to the Biodiversity Mapping

The EMC¹ will be responsible for conducting and implementing biodiversity mapping. EMC will work under the direct guidance of the Green Advisor and Green Coach, and the Green School Team from Tata Steel Foundation and TERI.

1. Divide the Green Buddies, who will be mainly implementing the biodiversity mapping, and allot them the following responsibilities and roles:
 - a. Counters: Students who will count the number of birds, and different types of plants and animals (wild or domesticated)
 - b. Makers: Students who will make collage, stage a play, and make posters
 - c. Planters: Students who will plant seeds in the school ground
 - d. Environmental Review Recorder: Students who will record the number of plants, animals, and birds present in the vicinity. They will also prepare a report containing inferences and recommendations on the primary data.
2. Prepare the datasheet format: Prepare the data sheet as per the given format below (Annexure 1).

¹ To know more about EMC, refer to Environment Management Committee Guidelines. Regarding EIR, refer to A handbook on Environment Impact Review for Schools

On the Day of the Biodiversity Mapping

1. **Role Allocation:**
Confirm that all team members are assigned to their designated roles.
2. **Data Collection:**
Start with your quantitative data collection processes.
3. **Mapping Exploration:**
Develop a map highlighting nearby parks, natural lakes/ponds, forests, plants and animals, and the diverse flora and fauna.
4. **Season, Date, and Time:**
While mapping, keep the activity date, season, winter or summer, and the time for conducting the mapping.
5. **Thorough Mapping:**
Visit the site and count the number of birds, animals, and plant species.
6. **On-Site Visit:**
Conduct a field visit to quantify the number of birds, animals, and plant species.
7. **Data Sheet Completion:**
Documentary/film screening/session on the importance of biodiversity and complete the data collection sheet with the gathered information.
8. **Quantitative Analysis:**
Conduction of quantitative analysis to map the existing biodiversity in the region.
9. **Illustrate:**
Take pictures if you can, as they will be helpful for reports and sharing your findings.
Promoting awareness using collage, poster and teaching adolescents on the importance of trees, plants, and recycling.

Annexure 1

Biodiversity Mapping Checklist

SCHOOL PROFILE	
Name of the School	
Type of School	
Total Boys	
Total Girls	
Name of Nodal Teacher	
Group's Name	
Name of Resource Persons from Local Community	
COMMUNITY PROFILE	
Name (Resource person on locally available trees and medicinal plants)	
Address	
Phone number	
Name (Resource person on locally available fruits, vegetables and crops)	
Address	
Phone number	
Name (Resource person on locally available flower and orchid plants)	
Address	
Phone number	
Name (Resource person on locally available domestic animals and birds)	
Address	
Phone number	
Name (Resource person on locally available wild animals and bird of prey)	
Address	
Phone number	
Name (Resource person on locally available aquatic animals and plants)	
Address	
Phone number	

FLORA											
S. No	Panchayat/ Village/ Hamlet Name	Plant Type (Tree/Herb/ Shrub)	Local Name	Scientific Name	Variety	Location/ Habitat	Local Status - high / low	Month of Flowering	Month of Fruiting	Uses (if any)	Associated Traditional Knowledge (If any)
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

FAUNA

S. No	Panchayat/ Village / Hamlet Name	Local Name	Scientific Name	Type of Animals (Mammals / Birds / Fish / Insect etc.)	Location/ Habitat	Remarks (Rare / Common etc.)	Local Status - high / low	Month of Flowering	Month of Fruiting	Uses (if any)	Associated Traditional Knowledge (If any)
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

FOOD CROP													
S. no	Panchayat/ Village/ Hamlet Name	Crop Name	Scientific Name	Local Name	Variety	Location / Habitat	Local Status - high / low	Cropping season	Uses	Associated TK (If any)	Other details	Source of Seeds/ Plants	Community/ Knowledge Holder
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													

MEDICINAL												
S. no	Panchayat/ Village/ Hamlet Name	Plant Type	Local Name	Scientific Name	Variety	Location / Habitat	Local Status - high / low	Uses (usage)	Part used	Associated TK	Other details market/own use	Community/ Know. Holders
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Consultation with School Staff

1. How would you spread the importance of biodiversity conservation in school and community? Have you taken any initiatives? If yes, please specify.

Note: The questions are just for reference, and the school/students can customize as per their need.

Structure of Analysis Report

Develop the report as per the suggested below format. Make the report brief and pictorial by attaching as many pictures as possible to support the contents.

Section 1: Background and Introduction (in brief)

Section 2: Biodiversity mapping (mapping the collected data: quantitative in the form of the map)

Section 3: Add most enjoyable moments while performing the biodiversity mapping such as the most soothing bird's voice, the tastier fruit, beautiful flower, and many others.

The winter months present a perfect opportunity to discover and relish various native fruits and observe beautiful flowers across Odisha and Jharkhand such as Kusum, Jamun, Mahua, Kudrum, Kendu, etc., which is integral to culture and diversity. You can also identify these indigenous fruits/flowers in your location.

2. Electricity Consumption Audit

Introduction



Energy Audit is defined as “the verification, monitoring, and analysis of the use of electricity including submission of technical report containing recommendations for improving energy efficiency with cost-benefit analysis and an action plan to reduce energy consumption. (Energy Conservation Act, 2001).

An electricity consumption audit helps to determine the amount of electricity that has been consumed at the school/household level and by implementing these measures at the state and national levels, this not only fosters energy efficiency but also contributes significantly to environmental conservation efforts.

Here for the benefit of students, we will be conducting an audit of electrical appliances that are installed at the school/household level.

The energy audit process comprised of identification of:

- » Electricity-consuming devices in a facility
- » Determination of its rate of electricity consumption and
- » The consumption in a day (i.e., 24 hours)

Once the electricity-consuming devices are established, the next step is to find out the electrical load of the connected devices. The same could be determined by looking at the name plate data of the devices and finding out the power input in W or kW.

Objectives

- » To record the connected load and the actual consumption data of devices
- » To analyse the data and identify or develop strategies to ensure energy savings
- » To come up with an action point for quantifying readings and savings in electricity consumption

Activities Involved

- » Indulge the students in hands-on learning data analysis activity
- » Develop an understanding of efficient use of electric device

Expected Outcomes

- » Electricity conservation in schools and household levels
- » Efficient use of electrical devices

Resources

Data collection sheets and pencils, monthly electricity bill, calculator

Energy Audit with Respect to Electricity Consumption Steps

Prior to the Electricity Consumption Audit

The EMC³ will be responsible for conducting and implementing electricity consumption audit. EMC will work under the direct guidance of the Green Advisor, Green Coach, and the Green School Team from Tata Steel Foundation and TERI.

1. Divide the Green Buddies, who will be mainly implementing the electricity consumption audit, and allot them the following responsibilities and roles:
 - a. Finders: Students who will find and categorize electricity-consuming devices.

³ To know more about EMC, refer to Environment Management Committee Guidelines. Regarding EIR, refer to A handbook on Environment Impact Review for Schools

- b. **Data Collectors:** Students who will engage with the facilitators and stakeholders for understanding the concept of running hours for the appliances. Further, students will determine a load of electric appliances by looking at the nameplate data of the devices and finding out the power input in W or kW.
 - c. **Environmental Review Recorder:** Students will record the data and calculate monthly bills. They will also prepare a report containing inferences and recommendations on the primary data. Additionally, after filling the sheet, students will be encouraged to take photograph for tallying the quantitative analysis with electrical appliances sheet for effective verification record.
2. **Fill the datasheet format:** Fill the electricity consumption audit sheet as per the given format below (Annexure 2).

On the Day of the Audit

1. Ensure that everyone has been allocated to their specific roles.
2. Start with your quantitative and qualitative data collection.
3. Categorize electric-consuming devices into different categories:
 - a. Cooling appliances
 - b. Lighting lamps
 - c. Heating appliances
 - d. Other gadgets
4. Look at the nameplate data of the devices and find out the power input in W or kW using an electric usage monitor.
5. Try and evaluate ways for the students who can have a copy to procure it and take it as a mathematical activity.
6. Students are encouraged to share their calculations.
7. Calculate the monthly bill by adding up Fixed Charges, Energy charges, and Electricity tax.
8. In case any students face difficulty accessing the electricity bill, the students are motivated to use the calculation template attached below. (Annexure 2)

9. After conducting the quantitative analysis, start with a qualitative evaluation by interviewing the school administration/principal to fill out the checklist.
10. Take pictures if you can, as they will be helpful for reports and sharing your findings.
11. Record the results.
12. Promote awareness of tips on electricity saving in the school using posters.

Post Audit

- » **Electricity Conservation Action Plan:** Once we know the baseline consumption, we can estimate the reduction in energy consumption by replacing the existing devices with energy-efficient devices. A simple measure to gauge the efficiency of any device is to check whether it is star-rated or not. The higher the star-rating the higher the energy efficiency and the lower the electricity consumption (saving in energy costs).
- » **Analysis Report:** Prepare an analysis report with recommendations/activities to improve and identify options for reducing electricity consumption and thus pave the way not only to save money but also the environment and share it with all through various modes like conducting interactive sessions, school notice boards, etc. (a few suggestive activities are mentioned in the next section). The report should also include the future monitoring action plan.
- » **Share your story:** Share your experience of doing an audit and actions you took to reduce the electricity consumption in school/home with your community through the school's media avenues.

Annexure 2

Energy Audit (Electricity Consumption)

Quantitative Evaluation

a. Electric load collection sheet

Note: This sheet is prepared for the day of audit/activity implementation.

Category	Appliances	Capacity (W) (a)	Total number of fixtures (b)	Number of operating hours (hr) in a day (c)	Consumption in a day [(a X b X c)/1000] (kWhr) (d)	Consumption in a month (dX number of days appliance is used in a month)(kWhr) (e)
Cooling Appliances	Room Air Conditioner					
	Water Cooler					
	Air Cooler					
	Ceiling Fan					
	Table Fan					
	Pedestal Fan					
	Exhaust Fan					
	Refrigerator					

Lighting Lamps	Incandescent Bulb						
	Fluorescent Bulb						
	Slim Tube						
	Compact Fluorescent Lamp (CFL)						
	Tube Light						
	LED						
Heating Appliances	Iron						
	Electric Kettle						
	Toaster						
	Electric Oven						
Other Gadgets	Computer/ Laptop						
	Television						
	Printer						
	Photocopiers						
	Inverter						
NOTE: Students can add appliances as per their school/home							
Total units consumed per month							

Monthly Bill Collection Sheet

Note: In case any students face difficulty accessing the electricity bill, the students are motivated to use the calculation template attached below.

Calculation of monthly bill: The electricity bill has three components:

1. Fixed Charges (refer to your electricity bill, let's assume—INR 100)
2. Energy Charges (this is slab-wise and varies from state to state) = Slab rate x total units consumed per month
3. Electricity Tax—10% of the electricity charge

Template for Calculation

Name	
Address	
District	
Zone	
Mobile/Telephone no.	
Bill Date	
Billing Period	
Meter Reading	
Bill No.	
Meter No.	
Units	

Meter No	Units	Billed Consumption (Current)		Billed Consumption (Previous)		Multiplication Factor	Current Consumption
		Date of Meter Reading	Reading	Date of Meter Reading	Reading		

Components	Cost	Calculations	Bill amount
Fixed charges	INR 100	1X100	100
Slab-wise Electricity Charges	0–150: INR 5.50 per unit 151–300: INR 6.00 per unit 301–500: INR 6.50 per unit 501–above: INR 7.00 per unit		
Tax	18%		

Summary Sheet	
Bill Amount	
Billing Date	
Current Payable Amount	
Amount Payable Pending	
Total Amount Payable on Due Date	
Due Date Late Payment Surcharge	
Total Amount Payable After Due Date	

Qualitative Evaluation

Electricity Consumption Calculation

Use this checklist to see how well your school is conserving energy

Questions	Yes	No	Notes, if any
Do you Switch off all lights and fans of the classroom when going out?			
Do you Switch off all gadgets in the laboratory, once the experiments have been performed?			
Do you leave computers in the standby mode?			
Do we use energy-efficient appliances?			
Are awareness sessions on energy and its conservation organized at regular intervals?			

Note: The questions are just for reference, and the school/students can customize as per their need.

Energy Conservation Tips

1. Switch off all lights and fans of the classroom when going out—put up posters for reminding people to turn off the lights and fans.
2. Switch off all gadgets in the laboratory, once the experiments have been performed.
3. Do not leave computers in the stand-by mode.
4. Change ordinary lighting fixtures like bulbs and tube lights to CFLs and LEDs.
5. Plant more trees around the campus to ensure shade and keep the surroundings cool.
6. Avoid using big halls/auditoriums for small gatherings.
7. Install electrical appliances with higher BEE star ratings.
8. De-dust lighting fixtures to maintain illumination.
9. Use natural lights instead of lights whenever feasible.
10. Install small biomass boilers at school level for heating requirements.
11. Encourage energy-efficient LED lights in the school premises.
12. Take energy efficiency initiatives and spread awareness regarding energy conservation at school premises.
13. Install solar panels at school level for encouraging renewable energy consumption.
14. Advocate for carpooling among neighbours as well as parents and teachers.
15. Conduct a recycling programme.
16. Take an audit for high energy-consuming devices and try to replace them with efficiency energy usage strategies.
17. Shifting towards electric vehicles (EVs) to lower the usage of fossil fuels.

18. If on a particular day, fewer students are present, sit together so that a few lights/fans can be switched off.
19. Do not use motors to pump water during morning/evening peak electricity consumption hours.
20. Look for daily/annual power consumption which will help in comparing the actual energy use between different models.

Consultation with School Staff

1. How is electricity consumption audited in your school? Why do you think that this is the best possible method?
2. What are the running hours for the appliances?
3. How often do you organize awareness programmes in school regarding energy conservation?
4. How would you spread the message of energy conservation to others in the school and community? Have you taken any initiatives? If yes, please specify.

Note: The questions are just for reference, and the school/students can customize them as per their needs.

Structure of Analysis Report

Develop the report as per the suggested format below. Make the report brief and pictorial by attaching as many pictures as possible to support the contents.

Section 1: Background and Introduction (in brief)

Section 2: Electricity Consumption Audit (analyzing the collected data: both quantitative and qualitative in the format mentioned in Annexure 2)

Section 3: Reduce your daily energy consumption by applying the stated points or by identifying any other energy conserving tips.

