

Guidance Manual
for the
Green School
Project
of Mauritius

Contents

[The Manual Overview](#)

Part - 1

[The Green Schools Project](#)

[1.1 The need for Green Schools](#)

[1.1 Green Schools Proproject worldwide- a quick review](#)

[1.2 The Mauritius Green Schools Project](#)

Part - 2

[The Green Schools Project of NPCC](#)

[2.1 Green Productivity & Green Schools Project](#)

[2.2 Green Schools Project implementation](#)

[2.3 Green Schools Project Methodology](#)

Part - 3

[The Green Schools Project Tools and Techniques](#)

[3.1 Building Material](#)

[3.2 Use of renewable energy](#)

[3.3 Recycling of solids and waste water](#)

[3.4 Rainwater Harvesting](#)

[3.5 Energy Efficiency](#)

Part - 4

The Manual Overview

The manual has been designed to explain to the various stake holders the concept of Green Schools Project being proposed by the **National Productivity and Competitiveness Council** (NPCC) of Mauritius. The Project based on the fundamentals of Green Productivity has been designed to develop a process in the schools participating which helps the student to learn to be environmentally sensitive through a structured Project.

The Project based on the premise of “practice what you preach” has incorporated an approach where the environmental innovativeness is reflected in the school structure as well. This has been envisaged not through the involvement of a hand few of teachers and students but through effective involvement of the school management, the teachers, the parents and the students.

This manual is divided into 3 parts.

- **Part 1** introduces the concept of Green Schools elaborating on its need & benefits as well as the Mauritian context. This section also includes a review of some of the Green Schools Project worldwide.
- **Part 2** introduces the NPCC’s Green Schools Project for Mauritius. The incorporation of the Green Productivity approach for the Project is explained which has been used to explain the implementation approach as well as the methodology proposed to be adopted for the Project.
- **Part 3** of the manual talks about various tools and techniques which could be used for the implementation of the Project. However, it should be noted that these are only meant to be examples

and it is expected that further elaboration of this section would happen based on the experiences gained

The Green Schools Project envisages self-assessment of the environmental practices of the school and promoting the use of environmental friendly technologies in the school. Full external support Projects often fail as there is no commitment and sense of ownership. Therefore this Project is expected to have participation from the school management as well as the parents.

The NPCC will be spearheading this Project. The role NPCC is envisaged to play is that of facilitator as well as the depository of information generated during the course of the Project. NPCC to start with would be publicising the Project and may conduct training Project for the interested schools based on this manual. NPCC would also supervise the Project progress in the participating schools. From time to time NPCC would organise interaction sessions for the participating schools for information sharing and dissemination. The NPCC, with the involvement of educationists (*from UoM and other institutions*) who have experience of GP as well of training and educating, school teachers, and concerned representatives from the Ministry could expand the Project content as well as the richness.

In order to facilitate the implementation of technological options related to the Green Schools Project the NPCC would identify local consultants and technology providers and update them on the requirements of the green schools Project.

At an opportune time NPCC may propose to institutionalise an award on the Green Schools Project.

The Green Schools Project

Mauritius, one of the most beautiful island nations, has in the past been an agricultural and fisheries based economy. However in the last couple of decades of the last century the economy of the country has been buoyant and this has reflected in the standard of living of the population. Mauritius is now classified as a middle income country. The change also has been reflected in the consumption pattern. Also the population growth rate has been high in this period. The corollary to this growth has been the increasing environmental stress both in terms of resource demand as well as in the form of waste disposed in the environment. The increased economic activity and the increased economic wellbeing are reflected most vividly as the increased quantum of waste generation and the associated disposal load. Overall the demands from the environment have increased.

1.1 The need for Green Schools

There is an immediate need to sensitize the citizens of the country. While several approaches have to be taken to spread the message of environmental consciousness and responsible behaviour, the need to address the issue through the children cannot be denied. After all “*Today’s children are tomorrow’s citizens*” – and grooming the next generation to be responsible towards the environment is probably the best way to achieve sustainable development. This generation has to realise the environmental impacts of their activity and has to be a generation who would be consciously act to improve the surroundings (and this surrounding extends to the global system). Also it can be expected that the children can even influence the present generation through their sphere of influence at home and community and thus move towards a sustainable future.

But to create this generation, today’s children have to be sensitised on sustainability issues (see Box 1.1). Sustainability is closely linked to the management of natural resources, and this includes the neighbourhood and the markets. The priority areas in the context of the children are therefore Sustainable Consumption with a view to adopt Green Productivity and Resource Optimization especially in the use of Energy and

Water.

Box 1.1: Sustainability

A widely-used and accepted international definition of sustainable development is:

'Development which meets the needs of the present without compromising the ability of future generations to meet their own needs'.

Unless we start to make real progress toward reconciling these contradictions, we all, wherever we live, face a future that is less certain and less secure than what we enjoyed over the past fifty years. We need to make a decisive move toward more sustainable development - because it is the right thing to do - and because it is in our own long-term best interests.

It offers the best hope for securing the future.

The classrooms have to become laboratories for encouraging the children to participate in learning and spreading the learning of protection and conservation of nature. **The Green Schools Project could be the major contributor to this.**

1.1 Green Schools Project worldwide- a quick review

There have been various efforts across the world to promote the concept of Green Schools. Each of them has a unique dimension in terms of mechanism to promote the concept. Across the world, a review indicates that the concept has been more popular in the developed countries with very few examples coming from the developing world. In the US, one of the most popular Projects is through the “*The Green Schools Initiative*”, a project of EarthWays Foundation, a non-profit organization. The focus of this Project has been on recycling, providing a toxic free surrounding and resource conservation (see Box 1.2). Similar other initiatives from the US include the Oregon Green Schools Recognition Project, the Collaborative for High Performance Schools in California, etc. In Europe, the National Trust for Ireland has published a Green Schools Handbook incorporating implementation of the Project as well as an award scheme. One of the

biggest initiatives in the Europe is from the Foundation for Environmental Education (FEE). The initiatives under this have been recognised either as Eco-schools or Green Schools based on the country of implementation. It is reported that by the end of 2004 over 13,000 schools were participating in the Project across the world.

Box 1.2: The Green Schools Initiative of the US

Schools can provide a healthy environment for students and staff, while promoting ecological sustainability, by using alternatives to toxic chemicals, pursuing green building and maintenance practices, changing their resource consumption patterns, serving nutritious food, and teaching students to be stewards of their communities, the earth and its resources, thus states the opening section of the manual Thinking Big from the Green Schools initiative. The Project stresses on the following as the for building blocks to the Project:

- *Pillar one: Strive to be toxics free*
- *Pillar two: Use resources sustainably*
- *Pillar three: Create a green and healthy space*
- *Pillar four: Teach, learn, engage!*

Source: <http://www.greenschools.net/>

Since there are various green schools initiatives, the obvious question that arises is does the green schools Project make a difference? The Green Schools Handbook of the National Trust for Ireland has documented a research which brings out that green schools Project does have significant effect on environmental behaviour and attitudes (see Box 1.3).

Box 1.3: Green Schools Research Project:

“Does Green Schools make a difference?”

Over 1,300 4th and 5th class students from awarded Green-Schools and schools that were not participating in the Project were surveyed across Ireland in 2001. The aim was to accurately record and measure the performance of the Green Schools Project. The results of this work are as follows:

- *Awareness and knowledge levels of the environment were very similar among both types of student (i.e. Green-Schools and non-Green-Schools).*
- *Behaviour towards the environment was significantly different. Students from awarded Green-Schools drop less litter, take part in more local environmental projects, conserve more water and more electricity, and are more conscious of the environment when making a purchase than their non-Green-Schools counterparts.*
- *Green-Schools students are better “opinion leaders” for the environment, i.e. they discuss the environment with more people and in more settings, particularly the classroom, and provide more encouragement to their peers than their non-Green-Schools counterparts.*
- *Green-Schools students indicated that their teachers were their main source of information and motivation regarding environmental issues.*
- *Recycling levels of glass, paper, cardboard, and aluminium, as well as the levels of home composting were significantly higher within the homes of Green-Schools students.*
- *A total of 91% of students within non-Green-Schools felt they could do something about the state of the environment. However, this concern was even higher among Green-Schools students at a level of 96%.*
- *The main environmental concern indicated by both types of student was litter.*

Source: *Green Schools- Towards a sustainable lifestyle produced by the Green-Schools Office, Environmental Education Unit, Dublin*

1.2 The Mauritius Green Schools Project

Green schools Project in Mauritius should not be a teaching-learning transaction alone. It has to be permeated as a way of life not only in the school but beyond it to the community as well. In order to achieve such an impact approach should be reflected both in the physical environment of the school (e.g., *water and sanitation facilities, garbage management, green school campuses, energy conservation, etc.*) and also in the attitudes and actions of all those who are part of the school education system - the teachers, the parents, the administrative staff and the management.

The Green Schools Project also envisages including self-assessment of the environmental practices of the school and improving upon it. Promoting the use of environmental friendly technologies in the school would be another important key step of demonstrating the applicability of such approaches.

A properly designed and promoted Green Schools Project in Mauritius can be expected to build a generation of environmentally conscious citizens of the future. However, beyond this long term expectation, the Green Schools Project would have various immediate direct as well as indirect benefits. Following is a listing of few such benefits:

- The children are expected to learn better as the approach is learning by doing. Therefore the knowledge retention would be much higher.
- The confidence levels of the children are expected to be higher and in the long run would support better decision making power
- To link with other schools in Mauritius and may be in the future link internationally
- To reduce the resource usage (water, energy, paper, etc.) in the school
- Improvement in the school environment
- School saves financially.

Therefore, Green Schools in the Mauritian context would be such schools where environmental education would be imparted through demonstrations and field activities and the schools in itself would adopt and demonstrate eco-friendly techniques and technologies.

The Green Schools Project of NPCC

Every country has a distinct nature and Mauritius is no exception. Like elsewhere in the World, the Mauritian population also realises the importance of being sustainable. To this end various Projects have been run. However a holistic and continual Project for the schools to convert them to Green Schools needs to be promoted. The needs are to look beyond the ‘garbage can’ or ‘a garden’ in the school. The need is to imbibe in the children a level of consciousness on ecological sustainability, which will get reflected in their attitude.

2.1 Green Productivity & Green Schools Project

National Productivity and Competitiveness Council’s (NPCC) Green Productivity (GP) Programme can probably be the right tool in this direction (refer Box 2.1). Because of the intrinsic nature of GP which promotes productivity and environmental performance simultaneously for overall socio-economic development, the approach ideally is suited to guide the Green Schools Project. Besides NPCC’s past efforts¹ of promoting the productivity tools for problem solving and other activities amongst school children also provides NPCC a platform well tested and tried to take up the concept of GP to mould a Green Schools Project.

The Green Schools Project of NPCC is designed to provide the various dimensions of environmental impact mitigation. The green schools Project has been identified as a GP intervention with multiple objectives in mind:

Box 2.1: NPCC’s Green Productivity Programme

In line with the Vision and Mission of NPCC, productivity and competitiveness are the focus areas for Mauritius. Green Productivity or GP is a strategy that makes the productivity ‘sustainable’ by providing a

¹ Civic Action Teams, CATs; Innovation for the Education Sector, InnovEd; etc. – refer <http://www.npccmauritius.com/> for details of these Projects

framework to mainstream environment, economic and social considerations in business and community. GP transcends adopting clean technology (through technology development and transfer) and further encompasses altering the attitudes of all stakeholders, (both producers and consumers). This leads to 'sustainable consumption' and 'sustainable production'. This change has to be brought among the people involved in the chain mainly from decision-makers to workers, consumers and communities without which GP cannot be implemented. The consumer demand for responsible producer and eco-sensitive products will bring about a better change than what legislation can.

Given this context, it is evident that GP should be addressed by NPCC as the principal driver as a Programme to progress towards the goal of sustainability

- To facilitate the conversion of schools and institutional structures to green buildings (*institutions that incorporate cleaner materials, practice green procurement, operate keeping energy and resource efficiency in mind and think of ways to minimize / recycle their wastes and thus follow GP principles*)
- To bring together school management, teachers, educationists, students and the community at large on a common platform that could also facilitate participation and consensus in many other areas of governance and business
- To also create a success story cases for new schools and institutions to design and plan their establishments using a GP approach
- Eventually, create a third party certification Project on Green Schools
- To develop in parallel, a practical and meaningful content based on Green Productivity (*in theory and in practice*) for the educational system and thus plant seeds for a more GP conscious professional community in the years to come. This will enable mainstreaming of environment into core business functions to achieve triple bottom line improvement in Mauritius

Green schools Project, therefore, aims at cognitive and effective behaviour modification amongst the children. This is an action-oriented, project-centred and participatory process leading to development of self-confidence, positive attitudes and personal commitment to environmental protection and its improvement. Furthermore, the process

needs to be implemented through an interdisciplinary approach.

The content of the Green Schools Project has been designed to bring out the concept of 'man-nature interdependence'. The various interventions and activities which could be undertaken under this project is wide, however the basic focus of the activities should be to commensurate to students level of understanding based on their age groups. The plausible approaches for content development have done based on the following premise:

- Understanding of the local biodiversity
- Understanding environment and the impacts on it from various human actions
- Ability to assess the outcomes of environmental action and initiatives
- Skill development for environmental problem solving

The content developed is a dynamic process. While this manual includes some of the technologies and activities which could be used for the continuing learning, over time there has to be new additions. This would happen through continuous feedback from the students as well as the teachers, parents and the institutional heads.

Green schools are not about only teaching-learning transaction. It is about the process to make environmental sensitivity as a way of life for all the stakeholders in the school as well as the community. Therefore, the process needs to permeate the school system and be reflected both in the physical environment of the school (e.g., *water and sanitation facilities, garbage management, green school campuses, energy conservation, etc.*).

But aren't green school design expensive? Well not necessarily, provided prioritisation is made based on the resources available and involving skilled designers. Green schools would be energy and resource efficient and thus would cost less to operate.

2.2 Green Schools Project implementation

In order to facilitate the Project in a smooth manner, and to allow the participating schools to choose from the various possible interventions, the approach has been made flexible. The participating school based on the level of interest, available resource and the expected benefits can choose the components.

The key requirement of Effective implementation of Green Schools Project

would require development of a comprehensive support system both within the school and outside the school system. This would include professional preparation of teachers, head masters and other functionaries; involvement of community, NGOs, media and institutions / organisations dealing with areas and elements of environment.

The school management will also have to be committed to the approach. In order to provide the atmosphere for a Green School, the management could implement some of the features of green building (*see next section*). By providing features of green building, the management will not only demonstrate their commitment but also would be benefited. This means direct involvement and supervision of the management is critical for the Project. Most important is the conviction. The seriousness has to be reflected in Projects and actions, not merely in words.

While the management's involvement in decision making and propelling Green Schools Project activities is essential, ultimately the implementation and field activities have to be carried out by the teachers and the students. It is therefore important that right from the stage of formulating and launching a Green Schools Project, the teachers should be actively involved. The involvement and innovativeness of the teachers is of great help in identifying and implementing activities for Green Schools.

For Green schools Project to be effective and sustaining, it is essential that an organised approach is formulated and adopted. Initially, it may be tempting to work on piecemeal basis. However, the interest soon drops if long-term sustainable benefits are not realised. If some time and effort is spent on this approach, it would be more than paid back. An organised approach in assigning responsibility, fixing targets, reviewing progress and timely implementation would enable to establish the Project as a continuous activity and develop a culture of doing better.

The requirements for implementing a green schools Project is presented in figure 3.1.

Figure 3.1: The ingredients for the Green Schools Project

2.3 Green Schools Project Methodology

For Green Schools Project to be effective and self-sustaining, it is essential to adopt structured approach. Working on piece-meal basis might produce short-term immediate gains but it may not sustain if long-term benefits are

not realised. The approach to be adopted for the exploitation of the maximum potential should be a systematic, step-by-step approach. The approach must be flexible enough to adapt to unexpected circumstances. The methodology is presented as figure and is explained below.

Figure 3.2: The Green Schools Project implementation methodology

Step – 1: Green Schools Team formation

A Green School Team is formed to co-ordinate the Project, get the various Green School technological measures implemented, conduct & continuously enhance the student activities and bear the overall responsibility.

A select group of teachers who have interest for environmental activities would have to be brought together to form a core team to run the Project. Besides, the involvement of the head of school and parents should also be encouraged. It will also be important to seek support from the neighbouring institutions to be the catalyst for the Project. A local authority representative or an environmentalist could also be co-opted in the team.

Another key component of the Green School team is the students. Students from the higher classes, where ever possible, should be encouraged to participate in the team.

The selection of all team members, be it teachers or students, should be voluntary so that the enthusiasm levels are high as well as ownership develops for the Project.

A Green School Project **Champion** should be identified based on the level of enthusiasm and dedication for the Project. The champion essentially provides leadership for the Project.

Step – 2: Walk Through Survey

The walk through survey is conducted to understand the environmental interactions of the school. This provides the school an opportunity to understand the current state of the school in terms of environmental interactions and performance. This approach would also help to draw out the positive activities or practices which the school might have already

implemented and might need to be reinforced.

The school walk through should be conducted with an open mind involving every team member. This exercise can be used to identify critical areas from the environmental angle like the points of water usage, the solid waste disposal points, etc. The information availability can also be assessed at this stage.

It is a good idea to have a briefing *before* the walk-through. The briefing should cover the scope, provide a basic description of school, points of emphasis and the time schedule.

A **lay out of the school** could be used to mark the following:

- Water usage points,
- solid waste generation point with types (and possibly sources),
- waste storage areas, water supply lines, drainage channels, etc.

During this process information should also be solicited regarding the waste management practices like those related to any segregation practices, solid waste disposal, waste water disposal, etc.

Also information related to the use of chemical fertilisers in the garden, any ozone depleting substances (ODS) in the school premises, the type of transportation used, etc. could also be reviewed.

Step 3: Resource Utilisation Assessment

At this stage, assessment of the resource utilised in the school should be conducted. The assessment is conducted for **water usage and disposal, air pollution, paper usage, energy usage and waste generation** from the school. The step is critical for the Project since they make it possible to identify and quantify previously unknown losses or emissions.

For water usage and disposal assessment, it is important to understand the total water consumption for the school. The source of water being used should also be noted. Based on the data regarding the number of students, teachers, staff, etc. and the hours of operation of the school the per capita water consumption can be ascertained and recorded.

If the school practices rainwater harvesting, the same should be noted. Important criteria to check for rainwater harvesting system is regarding the quantum of rainwater which could be collected in the existing system but most important criteria is to check the rain water utilisation post

collection.

All water recycling / reuse practices adopted needs to understood, reviewed and documented.

Air pollution in the school context arises from sources like the vehicle use. Though actual monitoring could be difficult, it could be interesting to assess the types of vehicles used and their fuel efficiencies (fuel efficiency is the distance travelled by the vehicle per unit of fuel used). Another measure could be evaluate the number of students travelling to and from the school by various modes of transport provided by the school and compare these with the fuel efficiencies. This will provide information regarding the optimum usage of vehicles. This indirect mechanism brings out the efficient usage of vehicle and therefore works as an indicator for the air pollution generated due to the burning of the fuel.

Paper is probably the most widely used resource for a school. Papers, such as stationery, book paper, photocopier paper, computer paper, old magazines, old newspaper, etc. are generated from the school. It is useful to record the waste generation sources and to attempt segregation and quantification of the various types old paper wastes. Using a simple weighing balance and recording the paper waste quantities is a good practice to adopt. Reflecting the paper usage with respect to the school strength could indicator to reflect the paper waste generation intensity of the school.

Energy consumption in a school would mostly be as electricity. Other forms of energy usage in school should also be explored. This may include usage of LPG in the school canteen, fuel used for running the school vehicle fleet, etc. The school electricity usage could be recorded from the electricity bills. Use this data to establish the energy intensity of the school as per capita usage. Any usage of nonconventional energy sources like solar applications or use of energy efficient lighting practices should also be recorded. A survey to observe and record the use of electrical lights during the day time would indicate areas where day light usage is inefficient.

Waste generation from school comprises of various types. It is advisable to have a brain storming amongst the GSP team members to identify all types of wastes being generated from the school. Remember to take into consideration wastes which are occasionally generated like those during school painting.

Note the level of segregation practiced in the school.

Guidance Manual for the Green Schools Project

Use a waste audit form to be comprehensive in the assessment. An indicative waste audit form is given in figure 3.3.

Sl. No.	Room assessed	Types of waste	Approx. quantity per week	Disposal Practices	3R Potential	Comments
1	Computer room	CP	2 kg	Disposed as waste	Making scribbling pads	One side printed paper
		PC		Disposed as waste	Refilling for reuse	
		...				
2	Canteen	PP	2.4 kg	Disposed as waste		Needs to be segregated and sent for recovery
		FW	12 kg	Sent to landfill	Can be composted	Presently disposed with other waste
		WW	800 lit	Discharged in sewer	Overflow from drinking area can be separately taken for gardening	
		...				
Key:						

<ul style="list-style-type: none">• Spent Printer Cartridge – PC• Computer Paper – CP• Ledger Paper – LP• Old Magazine - OM• Old newspaper – ON• Corrugated Cardboard – CC	<ul style="list-style-type: none">• Hard plastics – HP• PVC Plastics – PP• Garden waste – GW• Food Waste – FW• Wastewater – WW• ...
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Figure 3.3: Waste Audit Form

The waste generated could be segregated as biodegradable and non-biodegradable waste and presented accordingly. Such approach also will facilitate to look at recovery options for the school at a latter stage.

Step – 4: Green Schools Opportunity Assessment

The data generated in the above steps should be compiled to represent the environmental performance of the school. For observations where there are substantial resource consumption or waste generation above the normal practices a ‘cause analysis’ should be conducted to locate and pinpoint the causes for these aberrations. These causes would subsequently become the tools for evolving the measures for Green School. There could be a wide variety of causes for disproportionate resource consumption and waste generation ranging from simple lapses of housekeeping to complex technological reasons.

Once the origin and causes are known, the assessment process enters the creative phase. The team, ready with data and causes should now start looking for possible methods of reducing waste. This is also the stage to device activities for students to practice green school. The measure and activities should be relevant to the school. Finding potential opportunities and devising activities depends on the knowledge and creativity of team members, much of which comes from their education and work experience. The process of finding green school opportunities and activities should take place in an environment, which stimulates creativity

and independent thinking. There should be no ambiguity or bias.

The opportunities and activities need to be planned with adequate resource allocation as well as with time schedules. Post implementation evaluation criteria should also be designed at this stage.

Step – 5: Sustaining Green Schools Project

Sustaining Green Schools Project is a challenge. The euphoria of a Green Schools Project may die out very soon and the situation could return to where it started. The zeal and tempo of the team may also wane off due to other routine work pressures. Backing out from commitment, predominance of teaching, absence of rewards and appreciation to performers, and shifting priorities could be some of the reasons encountered that should be checked and avoided. Involvement of as large a number of students and staff as possible, and rewarding the deserving ones, is a sure key to long-term sustenance. But probably the best way to succeed is to incorporate Green Schools Project in a way that is intertwined with the regular activities of the school.

The Green School Project Tools and Techniques

The societies in which the children of today are growing up do not bring out encouraging examples on environmental consciousness. Increasing use of plastics and other packaging materials and the resultant garbage generation are just examples. Then there are issues related to over usage of electrical energy or increasing vehicular usage and the resultant pollution. Children generally do not have examples to emulate, and if it's there, it is too few for them to notice.

School is a place in which the children spend a major part of their day. Probably school also is the place from where many of the habits are inculcated amongst the children. It is therefore appropriate to assume that school is the place from where the children would be moulded to act in environmentally friendly way in the future. The Green Schools Project is designed to cater to this expectation.

The Green Schools Project envisages “*practice what you preach*” approach to sensitise the children and in turn catalyse the transformation in the society. For this there is a need to demonstrate that alternatives for eco-friendly practices exist and being sensitive to nature does not mean compromising on the needs of the society.

As discussed in the previous section, the Project implementation is proposed through a rounded methodology, utilising a systematic approach. In order to sustain the Project, a selection of activities and opportunities for Green Schools Project implementation is explained in this section of the manual. The targeted technologies and practices includes, but not limited to, implementation in the schools - *Rain water harvesting, Green Procurement, Waste composting, Using renewable energy, Energy efficient lighting, Waste minimization and recycling (paper, metal etc.)*.

The above is presented in the following sections

The most environmentally sustainable buildings are the ones which have never been built! Buildings always mean a stress on the environment. The stress either is as the resource utilisation during the construction phase or

is exerted during the entire life time of the building or in the use phase. While the construction phase could be said to be one time stress, the use phase stress is very much exerted by the design of the building and arising due to use of energy, water, material and waste disposals. However, buildings and infrastructure of different kinds are highly needed, and to be able to build ecological and sustainable, knowledge in these matters and good planning are required.

This is true for the school buildings as well. The building construction can be looked at in two ways in the environmental perspective –

- *Environmental adapted building*
- *Ecological building*

The big difference in these two conceptions is that the ‘environmental adapted building’ uses well known techniques and is a step in the right direction to maximisation of the prevention of the environmental impacts, while ‘ecological building’ is a pioneer in the field and requires lots of engagement from the users, aiming actually at a state where the building in itself is good for the environment.

The logical approach therefore is to aim at having an *environmental adapted building* built on eco-friendly principles. Constructions based on eco-friendly principles are designed, built and used in an ecological and resource efficient way, from materials and construction techniques to renewable energy resources and water recycling. They also provide a healthy indoor environment.

School buildings built or adapted to this approach can be termed as “Green School Buildings” and will be available to the students as an example to emulate.

The components of a Green School Building could be woven around the following four basic approaches:

- *Building Materials*
- *Use of Renewable Energy,*
- *Recycling of Solids and Wastewater,*
- *Rainwater Harvesting*
- *Energy Efficiency*

The following sections elaborate the above approaches and their applications for the Green School.

3.1 Building Material

The building material used for construction includes wood, brick, Cement, Concrete, Steel, Aluminium, Plastic, Paint, Polished stones, Ceramic products, etc. The choice of material is very much dependent on their availability and the cost issues. It should be noted that the use of these material for an environmentally adapted building is driven by a judicious mix based on the local conditions. The factors of the kept in view include the embedded energy of the building material due to the production operation and even the actual construction.

The eco-friendly building material can include (but not limited to) the following approaches:

- *Using Renewable resources*
- *Reusing of waste*
- *Low energy content while producing*
- *Locally available material*
- *Providing for better indoor and outdoor environment in use phase*
- *Easily disposable and degradable*
- *Less maintenance costs in the use phase*
- *Length of useful life*
- *Higher reusing potential*

Using the building material with the above approaches in view would reduce the environmental stress of the overall construction. This will include designing the school building keeping these considerations and also to extract the maximum possible advantages from the local conditions.

3.2 Use of renewable energy

Techniques for harvesting renewable energy on-site for building operations should be closely investigated and implemented. Renewable energy is a naturally occurring and indepletable source of energy that encompasses but is not limited to solar, wind, tidal, hydropower, biomass etc. Each of these sources of renewable energy have their own set of intrinsic nature which has to be understood in order to effectively capture and incorporate them into the building designs. And the advantages are many.

The most common application of renewable energy resource is solar and wind based. These are more readily available to be harvested or captured and integrated with buildings. The solar energy harvested can be

categorized into two applications: electricity production and heating process.

Solar photovoltaic system can be used for generate electricity to supplement the building's current electricity supply. Solar water heating system can be used to provide hot water. Figure 3.1 presents some key facts on Solar applications.

Figure 3.1: Facts on Solar applications in Green Schools

Wind can be used in building application to power natural ventilation in the building or can be used to generate power to drive small appliances.

At the design stage itself, passive solar design can be used for achieving space cooling during the use phase of the building.

3.3 Recycling of solids and waste water

Recycling can be promoted by incorporating adequate facilities for recycling solids and wastewater. The biodegradable solid waste generated from the school building during its use phase should be facilitated for composting. The required facilities for composting should be incorporated during the construction stage itself.

For schools which already exist can also incorporate composting facility.

Organised composting can be developed for the organic waste generated in the school. Figure 3.2 presents some key facts on Composting.

Figure 3.2: Facts on composting

Recycling of wastewater can also be planned. This will require segregated collection of the wastewater to be incorporated in school plan to collect the washing area, kitchen and overflow from drinking area to be collected and used. This water can be used for purposes such as gardening, flushing of toilets and other cleaning activities.

The amount of wastewater generated depends on the total freshwater consumed. Typically 75% to 80% of the fresh water consumed is passed of as wastewater. Generally, a biological treatment process using specific type of micro-organisms (bacteria) is used for the removal of contaminants from the wastewater. This treated water then can be reused for domestic

purposes.

Box 3.1: Wastewater recycling from kitchen and overflow from drinking area

The wastewater from kitchen and overflow from drinking area is directed to a channelized flow that traps suspended food particles and other impurities by a sieve and allows relatively clear soap water to pass through. This water is then gradually passed through a biological filter. Biological filtration is nothing but passing of water through the roots of specific plant species (Root Zone technology). These species break down complex chemicals and other impurities in the water, making the water fit for purposes such as gardening. This type of system can be very easily installed in a school with a garden area.

3.4 Rainwater Harvesting

Good amount of water can be collected through rainwater harvesting. Rainwater harvesting is a system that collects rainwater falling on rooftops, land surfaces and rock catchments diverts it to a channelized system that stores, purifies and redistributes water for use. In its most simple form, rainwater harvesting is a simple system of rooftop rainwater collection using simple techniques such as pots, jars and drum. The basic steps to assess the potential for rainwater harvesting are explained in box.

Box 3.2: Basic steps to assess the potential for harvesting rainwater

- Check the terrace area, slopes of storm drainage, etc.
- Assess if you can divert the terrace /rooftop water into single channels that will lead down to the ground level. The collections system should ensure that impurities such as leaves and other dirt do not enter the rainwater harvesting system.
- Next check for options, either to store and use the water for purposes such as cleaning and gardening or recharging the groundwater through bore wells.
- All these are scientific assessments and respective consultants should be consulted before installation.
- Keep records of rainwater harvested every monsoon season.

Figure 3.3 presents some key facts on Rain water harvesting

Figure 3.3: Facts on rain water harvesting

3.5 Energy Efficiency

The importance of energy efficiency has probably never been so intensely felt as in the present times. While on one hand the availability of energy sources has been a concern, on the other energy usage has been identified as the major contributor to the global warming. In such situation being energy efficient is in the best interest of all.

Schools can be energy efficient by incorporating features promoting energy efficiency in the design and construction phase. Functioning schools also can benefit by retrofit certain energy efficiency features. Box incorporates some of the energy efficiency approaches which could be adopted by the schools.

Box 3.3: Energy efficiency measures for Schools

- Reduction of Solar Heat Gain through Glass Windows and Glass Doors by External Shading
- Coating the exposed glass with heat reflecting film for Windows and

Doors exposed to the sun

- Providing insulation and Lighter Colours for Roof and Walls
- Using high efficiency bulbs and by replacing incandescent light bulbs with fluorescent tubes (which would give more light for a given consumption of electricity and can last longer).

While such technologies and practices are implemented, there has to be a graded approach of using these as teaching aids around which the awareness building and sensitization can be done. Teachers should use the above applications to explain to the children about the environmentally useful applications mentioned above. However the grade of the recipient students should be considered. This could be a mix of classroom and field activity. Following box explains the use of composting practiced in the school to educate students in various age groups.

Box- 3.4: Composting as a teaching tool

Composting is the complex biological process of the decomposition of organic materials into a nutrient rich soil conditioner.

Students in the **classes of 1 to 3** should be explained about the fact that composting occurs naturally and regularly in nature as a way of replenishing soil and recycling energy. Also children could be explained the benefit of composting by planting few similar saplings in pots with some having compost used as substrate and the others with out compost (only soil). With regular watering by the children to the children and over a period of time the better growth achieved with compost should be explained to the children.

Students in the **classes of 4 to 6** should be asked to keep biodegradable waste in a closed container for couple of days. Subsequently, opening the container, the matter would have started petrifying emanating foul smell. Explain to the children about how large quantities of waste being generated from household are going to the landfill for disposal and how such a condition is getting created at the landfill. Also on emptying the container, children can be shown dark coloured liquate (lechte) coming out. Explain that at the landfill, this goes into the land and contaminates the ground water which we use. Children could be demonstrated the benefits of segregation by conducting composting of segregated organic wastes and the wastes in mix forms parallelly. As the output quality varies substantially, the students can be explained the benefits of segregation. The students can carry home and to the community the message of waste segregation and composting, through posters or other forms of communications.

Students in the **Secondary cycle** can actually do the composting. They can be demonstrated the process by taking to a place where large scale composting is practiced. The students can then be divided in groups and each group assigned a composting pit. Here the children may be encouraged to put their organic waste for composting. In consultation with parents, students could bring small amounts of organic waste from their homes which could also be added to the compost pits. Explain to the children the composting techniques and harvesting over time. The key factors like moisture content or the temperature inside the compost pile could also be measured and recorded. Children can then prepare there own observation sheets. These children could also be take for a visit around the landfill site to

realise the mess created due to improper segregation and combined dumping. The official figures of waste generation and there disposal vis-à-vis the segregated waste collection with composting involved could be calculated to reflect the reduction in waste disposal possible at the landfill.

The Green Schools KPIs

The Green School Project has a tremendous opportunity for children to learn about ecological sustainability, environmental health, nutrition, personal responsibility, and leadership through their hands-on participation in making their own schools healthier, more efficient, sustainable, and pleasant centres for learning. The Project, a mix of demonstration through projects being implemented at school level and getting the students involved on a regular basis, supports in continual learning.

Due to the interface with Green Productivity, this Project is expected to grow through development of projects and activities. While the manual indicates the starting points to choose from for the Green Schools Project for the various participating schools, it is imperative there will be adaptations as well as new projects getting evolved.

As discussed in Part – II, the objectives of the Green Schools Project are many. It would be essential for NPCC to measure the achievement of these targets. The initial measures of success would be the increasing levels of involvement among the students, increasing awareness levels and reduction in the resource usage. On the long run the financial gains of the initiative will also have to be gauged. In order to assess the effectiveness of the Project it would therefore be important to establish the Key Performance Indicators (KPIs) for the Project.

The adoption of Green building approach by the schools will be at two levels. While the new schools or those which are undertaking modifications or building additional structures can incorporate cleaner materials for the construction or energy efficient electrical fittings, the existing schools may use Projectmatic approach to achieve energy and resource efficiency and minimize / recycle their wastes.

The NPCC as the nodal agency would continually improve the Project and will seek the support and involvement of school management, teachers, educationists, students and the community. A feedback mechanism for this can be incorporated. This will also give NPCC the opportunity to understand the impact of the Project in the neighbourhood or the society

at large.

It is expected that all schools participating in the Green Schools Project would be using a combination of tools and techniques or an adaptation of the same. These approaches need to be documented as case studies based on the various models used. These would then be the resources for new schools and institutions to design and plan their approach.

Over time, the experience gained and the resource developed will become the database, which can be used to devise a certification scheme for Green Schools. Also the database could be used to develop content on Green Productivity for the educational system.

With the above in perspective, the KPIs for the Green Schools Project are being proposed for the NPCC to measure the success of the Project. The KPIs have been selected to return numbers, which can be measured over the years to assess the involvement in the Project.

The KPIs will be divided in two groups, the 1st being a measure of spread being quantified through numbers and the other through qualitative measure of environmental impacts. The KPIs are presented under these groups in table 1.

Table 1: KPIs for the Green Schools Project

Sl. No.	KPI	Description
Appreciation of Green Schools Project		
1	Number of schools participating in the Project	<i>All schools who participate in the Project</i>
2	Number of students being exposed to the Project	<i>Based on the classes involved directly in projects and activities on Green School, the total number of students being exposed to the Project.</i>
3	Projects incorporating use of green	<i>Number of projects taken up by various</i>

	construction material	<i>schools incorporating Green construction material for renovation or for new construction.</i>
4	Projects incorporating efficient technologies	<i>Schools adopting (through replacement or by new installations) energy efficient electrical fittings</i>
5	Projects based on renewable energy	<i>Projects undertaken by schools using solar or other forms of renewable energy</i>
6	Projects on rainwater harvesting	<i>Projects undertaken by schools on rain water harvesting</i>
7	Projects based on improving the resource efficiency	<i>Projects undertaken by schools on reduction of resources through recycling / reuse (e.g. – paper, other stationary material)</i>
8	Projects based on waste management	<i>Projects undertaken by schools on reduction of garbage or on composting</i>
9	Adult involvement in Green Schools Project	<i>Teachers, educationists, parents directly involved in the Green Schools Project</i>
10	Projects involving community beyond the schools	<i>Projects which have been developed as an offshoot of the schools</i>

		<i>Project using support from the school</i>
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Environmental Impacts of Green Schools Project

11	Total energy conservation achieved	<i>Energy conserved by utilising renewable energy or due to energy efficient electrical fittings due the projects in Green Schools</i>
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12	Total waste reduction achieved	<i>Cumulative waste diverted from disposal due the projects in Green Schools</i>
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13	Total water conserved	<i>Cumulative water saved due the projects in Green Schools</i>
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14	Monetary savings achieved	<i>Cumulative monetary savings due the projects in Green Schools</i>
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Green School Project Worksheet

Annex to the
NPCC Guidance Manual for the Green School Project

I: Green School Team Formation

Name of school:

Name of Green school Team:

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Composition of Green School Team:

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Facilitator(s) :

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Address of School:

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Phone

No:.....

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Email:

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II. Walk-Through Survey Observations

II.a. List of Issues observed

II.B. Green School Opportunity Assessment

[Categorise above issues in Themes and Identify issues which require further investigation and data collection]

Use separate sheets for recording data collected, including analysis made

Themes to Explore	Specific Observations	Further Data Collection	Remarks
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II.C. Prioritise Actions

[From above Themes and actions identified, apply criteria and decide on which actions to start with]

Setting Priorities (Rate from 1-5)

1=Strongly Agree 2= Agree 3= Not sure 4= Disagree 5= Strongly Disagree

Apply score to criteria. Team can start with actions having Lowest score.

Theme:

Possible Actions	Ease of Implementati on	Readily Available Competencie s/Knowledge/ Expertise	Stakeholders ready to cooperate	Requires small funding	Total
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III. Action Planning

Theme :

What to do?	When to do?	Who will do?	Requirements	Indicators	Status
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V: Linking with Curriculum

[Increasing the knowledge base]

Actions Taken

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VI: Informing and Involving

[How does the Team involve others in the project, including students, parents, business operators, or any other stakeholders etc]

Actions Taken

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VIII: Results Achieved

[Give a brief summary of the results – tangible and intangible – achieved by the Green School Team]

Achievements

Remarks

Results)

Glossary of terms

Green Productivity (GP)	a strategy for enhancing productivity and environmental performance for overall socio-economic development. It is the application of appropriate productivity and environmental management tools, techniques, technologies to reduce the environmental impact of organization's activities, goods and services.
Cleaner Production	the continuous application of an integrated preventive environmental

	strategy applied to processes, products and services to increase overall efficiency, and reduce risks to humans and the environment.
Sustainable Consumption	the use of services and products which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of Future Generations.
SCP	the production and use of services and products which respond to basic needs and bring a better quality of life while minimizing the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as to not jeopardize the needs of future generations.
Global Warming	an increase in the average near surface temperature of the Earth. Usually used to describe the predicted rise in this temperature due to the increase in emissions of greenhouse gases.
Non-renewable resources	Natural resources that are not naturally replenished once they have been harvested. Non-renewable resources can be used up completely or else used up to such a degree that it is economically impractical to obtain any more of them. Fossil fuels and metal

	ores are examples of non-renewable resources.
Renewable resources	Natural resources that have the capacity to be naturally replenished despite being harvested (e.g., forests, fish). The supply of natural resources can, in theory, never be exhausted, usually because it is continuously produced.
Energy efficiency	using less energy to provide the same level of energy service.
Renewable energy	energy from sources that are naturally replenished such as water, sunlight or wind. Includes sustainable biofuels.
An energy audit	an inspection, survey and analysis of energy flows in a building, process or system with the objective of understanding the energy dynamics of the system under study and seek opportunities to reduce the amount of energy input into the system without negatively affecting the output(s).
Effluent	The discharge of industrial or urban waste material into the environment; the outflow from a lake or river.
Emissions	The release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time.
Biogas	Gas formed by digestion of organic

	materials. Typically dominated by methane and carbon dioxide in a landfill.
Waste	Unwanted materials left over from any human activity.
Hazardous waste	Refuse that could present dangers through the contamination and pollution of the environment. It requires special disposal techniques to make it harmless or less dangerous.
Composting	The natural biological decomposition of organic material in the presence of aerobic bacteria to form a rich, dark soil fertilizer.
Recyclable	Refers to such products as paper, glass, plastic, oil and metals that can be reprocessed into products again instead of being disposed of as waste
Biodegradable	Capable of decomposing rapidly by microorganisms under natural conditions (aerobic and/or anaerobic). Most organic materials, such as food scraps and paper are biodegradable.
Green Productivity Opportunity Assessment (GPOA)	a management tool consisting of a systematic and objective review of manufacturing processes, products and services. It is designed to identify opportunities for increasing productivity and profitability, while reducing the environmental impacts and associated risks to the enterprise.

Ecological footprint	an indicator of sustainability as against the earth's carrying capacity, in terms of population's consumption and waste generation. It measures the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and render harmless the corresponding waste.
Environmental Audit	An independent assessment of the current status of a party's compliance with applicable environmental requirements or of a party's environmental compliance policies, practices and controls.
3Rs (Reduce, re-use, recycle)	These activities are the basis for reducing waste and process optimization. Reduce means using fewer inputs including raw materials and energy so that the pressure on environment will be less. This also leads to the production of less waste. Recycle means returning part of the waste stream to the system, either to be used for the same type of product for which it was originally manufactured, or to be remanufactured into something new. Reuse means returning a part of the waste stream of a product to be used repeatedly for the same purpose.

It could be interesting to get the water quality analysed of the water being supplied in the school.

Maintaining the school vehicles as per the emission norms of the country indicates efficient

vehicle condition.

Biodegradable waste is a type of waste, typically originating from plant or animal sources, which may be broken down by other living organisms. Wastes that cannot be broken down by other living organisms are called **non-biodegradable**.

Techniques like “brainstorming”, “group discussions” etc. might be applied to boost Green School option generation.

External sources, such as teachers from other schools, equipment supplier & consulting engineers could also be involved.

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