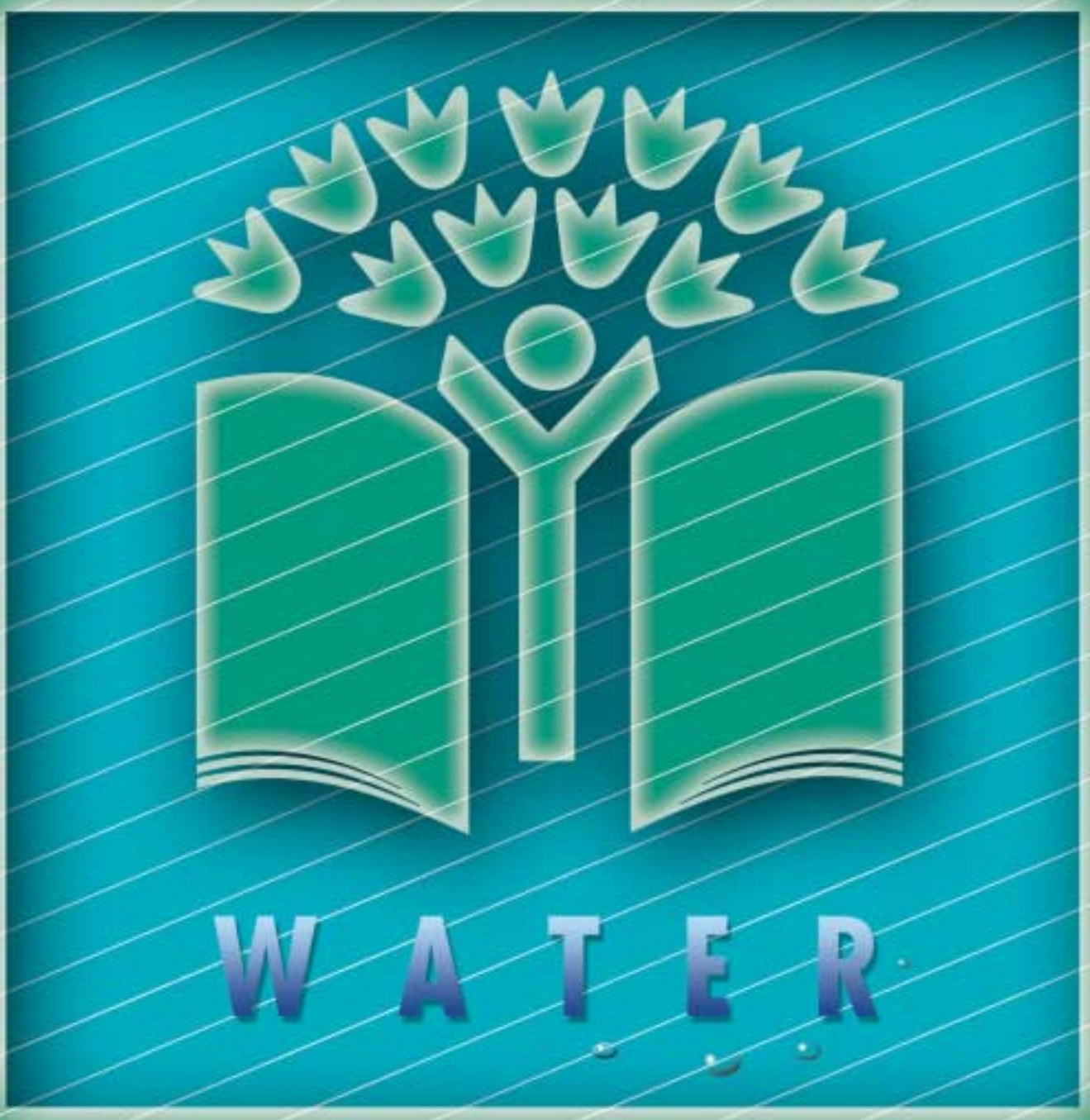
Green-Schools

Towards a sustainable lifestyle



An Taisce – The National Trust for Ireland is the foremost environmental organisation in Ireland. Its range of interests extends from the natural heritage of land, air, water, flora and fauna, to the heritage of buildings and gardens.

Through its local, national and international networks, it seeks to educate, inform and lead public opinion on the environment and influence policy and development. Strategies to achieve these aims include awareness and education projects, for example:

• Green-Schools: an international programme promoting responsible behaviour among school children and the wider community towards the environment. It is also a learning resource raising awareness of environmental issues through activities that link curriculum subjects.

• Blue Flag: Co-ordinating the International Blue Flag Awards campaign in Ireland. The goal of Blue Flag in this regard would be towards integrated coastal zone management and sustainable development in coastal areas.

• Young Reporters for the Environment: a European educational programme which helps schools to train responsible and environmentally aware citizens, endowed with the will to act and to take independent and critical initiatives regarding local environmental issues.

• Learning About Forests (LEAF): The goal of LEAF is to inspire participating countries to help students and teachers of primary schools to use the forests as an outdoor learning facility and learn to appreciate the forests as part of modern society.

• National Spring Clean: A yearly campaign promoted by An Taisce with the aim of encouraging and assisting clean-ups during the month of April, as well as increasing awareness of litter and waste issues and to promote sustained practical involvement in the environment.

FEE (*The Foundation for Environmental Education*) – seeks to promote environmental education by carrying out campaigns and improving awareness of the importance of environmental education. It is composed of a network of organisations which undertake individual projects in their own countries and participate in international efforts. An Taisce as the Irish member of FEE co-ordinates these campaigns in Ireland.

As Ireland's leading integrated waste management company, *GREENSTAR* is proud to be the lead sponsor of *Green-Schools*. By working with *Green-Schools* we are committed to educating, influencing, and improving environmental awareness of young people and the wider community. Together we can promote greater awareness to improve and protect our precious and rich environment.

Green-Schools is proudly supported in Ireland by Coca-Cola. This sponsorship is part of Coca-Cola's ongoing commitment to developing awareness of a range of environmental issues. Coca-Cola has a strong relationship with Irish schools through its Plant Visit Programme, National Spring Clean and its various sports sponsorships.

The **Wrigley** Company Ltd. is delighted to support the *Green-Schools* Programme as part of their on-going commitment to promote anti-littering strategies. Other examples of their commitment to schools and young people include sponsorship of ECO UNESCO's CD Rom and web management system and Foróige's Citizenship Programme Awards. All these programmes are designed to promote proper disposal of chewing gum within the overall context of anti-littering strategies and environmental education initiatives.

An Taisce operates *Green-Schools* in Ireland in partnership with Local Authorities. Local Authorities not only provide funding for the programme but also provide an excellent on the ground support network for schools through their Environmental Education and Awareness Officers. This partnership is seen as the key to the success of the *Green-Schools* programme in Ireland.

*M*aterials for *Green-Schools* were developed by Rob Stephenson and Cherry Mares of the Tidy Britain Group, Schools Research Project. An Taisce are grateful to the Tidy Britain Group (now EMCAMS) for permission to reproduce all Eco-Schools materials. This original booklet was written by Jane Bickerstaff of Industry Council for Packaging and the Environment (INCPEN).

Green-Schools Water

Green-Schools materials produced by

Green-Schools Office
Environmental Education Unit
An Taisce
Unit 5A
Swift's Alley
Francis Street
Dublin 8

Telephone: (01) 4002222
Fax: (01) 4002285
Email: greenschools@antaisce.org
www.greenschoolsireland.org

This booklet is designed as a resource for teachers and students aiming to inform and guide the successful implementation of the *Green-Schools* programme in relation to water. The booklet is divided into 5 main sections:

Section 1 reviews the reasons for choosing Water as a topic to be undertaken by the *Green-Schools* programme and examines the possible links that can be made to the curriculum through the programme;

Section 2 provides facts and figures about the use of water in Ireland, examining the various sources of water in this country and the different types of legislation associated with water quality and protection;

Section 3 looks more specifically at water in schools and provides examples as to how water consumption may be measured while suggesting practical methods and actions to reduce the rate of water consumption both within the school and the wider community;

Section 4 provides an example of a detailed environmental review for water;

Section 5, finally, looks at water as a global resource and the impacts of non-renewable water resources. Worksheets on the theme of water are also provided.

CONTENTS

Section 1 INTRODUCTION

As described in the Handbook that accompanies the themed booklets, there are seven elements to the *Green-Schools* programme: Committee, Environmental Review, Action Plan, Monitoring and Evaluation, Curriculum Work, Informing and Involving, and Green Code. This booklet aims to contribute particularly to the Environmental Review, Action Plan, and Monitoring and Evaluation stages of the programme in relation to the topic of Water.

Green-Schools covers many different aspects of the environment. Water was chosen as a topic because:

- The subject slots easily into the curriculum in both primary and secondary schools.
- Water is an important resource that is becoming increasingly scarce, a situation that is likely to continue into the near future.
- Simple steps and tips can lead to large reductions in water consumption both in the school and in the home.

It is recognised, however, that water is not a topic to study in isolation. For example, there are many links with other aspects of the environmental performance of schools, such as energy consumption, waste and recycling. It is assumed that teachers will make these links wherever possible.

To successfully implement the *Green-Schools* programme for Water, you will be expected to establish the seven elements of the scheme as described in the Handbook, and to have made progress in reducing water consumption in the school. *Remember, as for the previous themes, the activity ideas described in the booklet are just a starting point – it is quite probable you will develop some interesting and innovative ideas of your own.*

Information and Activity Worksheets

Further information and examples of activities for the school that are outside the remit of this booklet can be obtained from a variety of sources, such as ENFO (Environmental Information Service) and the EPA (Environmental Protection Agency). A list of contacts where such information can be acquired is given at the end of this booklet.

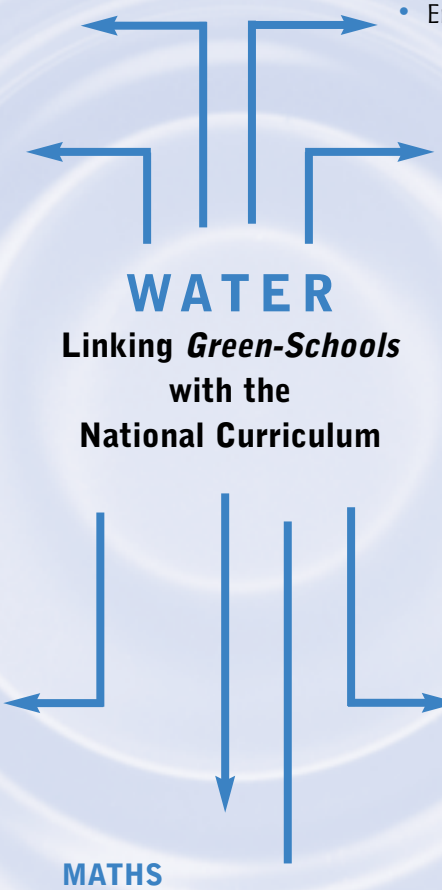
The following page provides an outline as to how the Green-Schools programme can be integrated with subjects throughout both the primary and secondary curricula.

SPHE (Primary)

- Promote personal development and well being.
- Develop citizenship and a sense of personal and social responsibility.
- Promote communication, co-operation, and working with others.
- Encourage media awareness.

CSPE (Secondary)

- Recognised as a suitable Action Project for Junior Certificate classes.
- Develop citizenship and a sense of personal and social responsibility.
- Promote communication, co-operation, and working with others.
- Encourage media awareness.



SCIENCE

- Study of the many uses of water and its properties.
- Develop a scientific approach to problem-solving.
- Encourage responsibility for the environment and promote sustainable development.
- Promote communication of ideas, report writing, and presentation.

GEOGRAPHY

- Develop a critical understanding of environmental issues relating to water at local and global level.
- Study of human and natural environments (water use, sustainable management of resources, etc.).
- Promote communication of ideas, report writing, and presentation.

LANGUAGES

- Source of topics for essays, poetry, etc.
- Promote communication skills, public speaking, debates.
- Potential for many activities involving speaking and writing.

ART

- Creation of posters/murals/ fashion to aid the awareness of the importance of water.
- The use of water as a medium for art.

MATHS

- Provide real life situations for mathematical analysis (calculate water consumption).
- Use of charts and graphs.
- Introduction to database management.

Also:

HISTORY

- Examination of change in water consumption and quality over time.
- Relate to change in lifestyles and society.

1.1 Why Conserve Water?

It's about how we want to live

Saving water is not just about saving money. Water is an important resource and a sufficient supply of clean water is essential to the health of both people and the environment. The raw material may appear to be plentiful, but world-wide, and even in parts of Ireland (particularly at certain times of year), it is an increasingly scarce resource.

Water is fascinating stuff

Water has unique properties that have enabled life as we know it to develop on this planet (a field-day for science here!). How fully we are able to involve young people in the issues and challenges that a decent water supply poses will depend on whether we can raise water from the mundane and everyday – to the vital, compelling, and extraordinary topic it surely is.

1.2 What You Can Do – Introductory Tips for Teachers

Introducing water

As an introduction to the general topic of water, students could be invited to think about the number of times a day they use water, both directly (washing, flushing toilets, etc.) and indirectly (in bottled drinks, foods, or in manufacturing processes and the production of crops). This might be extended to the idea of producing a 'water diary', and then considering ways in which water could be used more efficiently at home.

Younger students can be asked to come up with water uses for each letter of the alphabet (not as hard as it sounds – 'A' for 'angling' or even 'adding to orange squash'). Older students can be challenged to think and write about life without water or where water is a very scarce resource (this could be linked with comparative work with other countries).

The main aim is to get students to understand that water is not only a vital resource but interesting too. Many basic science experiments on the properties of water, such as evaporation, condensation and freezing, temperature changes, solubility, buoyancy, etc., can be made fascinating to students. Opportunities to compare the filtering efficiency of different materials abound. Modelling river courses in sand on a gently sloping drainpipe can bring about spectacular (and realistic) land formations.

Section 2 WATER IN IRELAND

Most of us are guilty to some extent of taking water for granted. Water comes out of taps; it goes down drains; in between we use it to brush our teeth or to do the dishes. However, water is a crucial aspect of our lives, not only for drinking and washing, but also for use in industry, agriculture, and making almost any kind of product – from hamburgers and tin cans to newspapers and cars.

Our demand for water has grown to the point that the natural water cycle can no longer keep up. Pollution – mainly caused by sewage leaks and chemical discharges – has made clean water a rare and valuable commodity. Climate change may also contribute to making fresh water more scarce. That means that the managing, treating, and distribution of water supplies is of vital importance to make sure that our demand for clean, fresh water is satisfied. But this process is expensive – and will become more so as our demand for water grows.

Facts and Figures

- 99% of the world's water cannot be used because it is either saline or is locked up in glaciers and ice sheets.
- Most of the remaining water is present in rocks as groundwater (approx. 0.6%), while just over 0.3% is present in rivers and lakes.
- Rapid expansion in urban populations has resulted in increased pressure on Local Authority waste water treatment facilities and, in many instances, the inability to cope with the increasing volumes of waste generated.
- A person uses about 145 litres of clean treated water per day in an average household, while a school uses about 35 litres of water per student per day.
- A tap dripping once a second wastes about 10,000 litres of water a year.

- Leaving the tap on while brushing your teeth wastes approximately 11,000 litres of water per year.
- A hosepipe or sprinkler can use 1,000 litres (or 1 tonne) of water per hour. This is as much as a family of four would normally use in two days!
- Our own bodies are two thirds water and our brains are at least 85% water!
- A person can survive a month without food, but can only survive 5 or 6 days without water.

Green-Schools Objectives

- To raise awareness that simple actions can cut down water use substantially.
- To help students and the wider community understand that conserving water is vital to our future.
- To show students the link between water use and financial cost – and how it impacts on home as well as school life.
- To monitor water use wherever and whenever possible.
- To use data for curriculum work.

Teaching Objectives

- To learn about managing water sustainably.
- To learn about the water cycle.
- To carry out calculations using suitable number strategies and techniques.
- To collect, interpret, and present data in different forms, using information and communication technology where appropriate.
- To present findings to others in a way that will persuade them to change their attitudes or behaviour.
- To work co-operatively with others.

2.1 Sources of Water

Water can be a liquid, a solid (ice), or a gas (water vapour), depending on factors such as temperature and pressure. As its name implies, the water cycle is continually moving. Water evaporates from the surface of the Earth and rises into the atmosphere where it condenses to form clouds. It falls to Earth again as rain, hail, sleet, or snow. Then the cycle begins again (see diagram below).

This water cycle is a natural process and has been going on for millions of years - purifying water and dealing with natural waste. The water cycle is what's called a "closed system" - in other words, there is no more water now than when the world began. We use the same water that was used by dinosaurs millions of years ago!

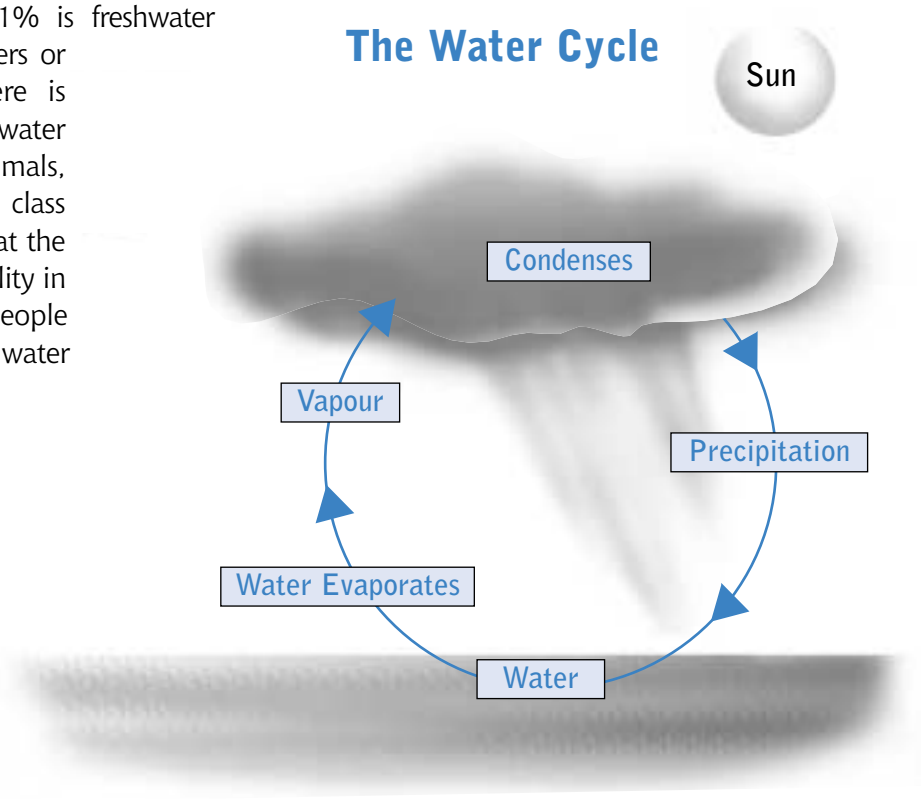
Of all the water on the earth, the vast majority of it cannot be used as it is either saline (97%) or is frozen in the polar ice caps and glaciers (2%). The remaining 1% is freshwater which is found in lakes and rivers or trapped underground. So there is really only a small amount of water available to keep people, animals, and plants alive. Maybe your class can carry out a project looking at the different levels of water availability in different countries? How do people and animals cope with limited water supplies?

Precipitation

All water is essentially derived from the three main forms of precipitation; rain, hail, or snow. Some rainfall will evaporate soon after it falls, while the rest will either run off the ground to join streams and rivers, or will seep through the ground to join underground water supplies. Sources of water supply will therefore consist of surface water and groundwater.

i) Surface water includes water collected from roofs and paved areas as well as streams, rivers, lakes, and reservoirs. The most significant sources of contamination of surface waters in Ireland are of diffuse agricultural origin and municipal sewage, which cause eutrophication of the waters. Almost 30% of our rivers remain affected by this form of pollution. These same rivers are usually expected to supply fresh water for towns and villages.

ii) Groundwater consists of rain that seeps through the ground reaching an impervious layer, where it may be held in a reservoir, or it may flow like an underground stream on top of the impervious layer. This may be collected by sinking boreholes (wells), or it may emerge in the form of springs. The main sources of groundwater pollution in Ireland are septic tanks, farmyards, and urban areas. Other sources, such as waste disposal sites, industrial spills, and leakages have detrimental impacts on a local scale.



2.2 Water Organisations in Ireland

Our requirement for water means that the natural water cycle can no longer keep up with our everyday needs. The demand on, and for, water and sewerage services has increased significantly since the mid 1990's; most of this surge in demand is a result of unprecedented growth in the economy. The tourist industry also places a major demand on this infrastructure: the number of foreign tourists visiting Ireland has doubled to over 5 million per year in the last decade. Population increase and immigration have, as one would expect, contributed to the demand for water and sewerage services.

Capital water schemes

In Ireland, public water mains are administered and maintained by Local Authorities. This water is supplied to homes and businesses in urban areas. Although the water charge for domestic water supply was abolished in 1997, charges to schools may be imposed by Local Authorities. In some cases a flat rate is applied and in others the water is monitored using a meter. Such charges will vary between different schools and different Local Authorities. The funding for maintaining and improving the water supply infrastructure (pipes, filtration, and disinfection systems) comes jointly from the Department of the Environment, Heritage and Local Government, and EU Structural Funds. The Local Authority administers the actual building of approved water supply projects. Stringent water testing is carried out on all public waters by Local Authorities and health boards.

Group water schemes

Almost 200,000 of the one million households in Ireland are not connected to a public water supply. Many of these are served by what are known as group water schemes. These schemes are formed by a number of households (two or more) coming together to provide their own common water supply. The group elects trustees who act on behalf of the group members in all dealings with the Local Authority, including applying to the Local Authority for approval in setting up their scheme. Group schemes can be found in different areas. A scheme may be set up in an area that could be served by extending the existing Local Authority mains.

Usually, group schemes are established in areas where the Local Authority either does not intend to install a water supply system, or has plans to install one at some stage in the future, but not immediately. Group water schemes can get water supplies from the public mains (if possible) or a private source (well or lake, etc.). National reports on the quality of drinking water in Ireland indicate that poorly treated or untreated private group water supplies are most at risk from pollution.

Many who are not part of a group scheme bore their own well drawing out groundwater to supply their needs. When the well is drilled, it must be disinfected and sealed against pollution. After a few days, a sample of disinfected water is sent from the well to the local health board for testing.

2.3 Water and the Law

There is a wide variety of both national and European legislation that deal with water quality in Ireland. The high availability of fresh water is one of the key economic resources of the State and efforts are being made at all levels to continually improve water quality for the benefit of local communities, aquatic life, tourism, and recreation.

The main responsibility for water management and protection lies with the Local Authorities under the Water Pollution Acts (1977 and 1990). Along with other powers, these acts enable Local Authorities to:

- Prosecute for water pollution offences.
- Attach appropriate pollution control conditions in the licensing of effluent discharges from industry.
- Prepare water quality management plans for any waters in or adjoining their functional areas.
- Issue notices requiring farmers to prepare nutrient management plans to help avoid water pollution.

Urban Waste Water Treatment

The Urban Waste Water Treatment (UWWT) Regulations place a responsibility on sanitary authorities (i.e. the Local Authorities) to provide treatment of urban waste water, to monitor discharges from communities, and to transmit the results of such monitoring to the Environmental Protection Agency (EPA). Communities with populations greater than 10,000 discharging into sensitive waters or into the catchment of sensitive waters were required to have nutrient reduction facilities in addition to secondary treatment by December 31, 1998. A major programme has involved the investment of over €1.6 billion in sewerage infrastructure by the end of 2005. Particular emphasis was placed on the catchment areas of waters which were designated as sensitive under the UWWT Directive.

The EPA is also required to report every two years on the quality of effluents being discharged from treatment plants, sewers, or drainage pipes under the responsibility of Local Authorities.

The EU Water Framework Directive (WFD)

The WFD sets out common objectives, principles, and basic measures for the comprehensive management of water resources in the European Union. It addresses inland surface waters, estuarine and coastal waters, and groundwater. The fundamental aim of the WFD is the maintenance of "high status" waters where they exist, the prevention of any deterioration in the existing status of waters, and the achievement of at least "good status" in relation to all waters by 2015.

The main methods for the implementation of the WFD will take place in the context of *River Basin Management Projects* led by the Local Authorities. The river basin projects will attempt to establish an integrated monitoring and management system for all waters within a River Basin District through a River Basin Management Plan, which will be continually updated.

Ireland is generally in a good position to implement the Directive. Since 1997 Ireland has promoted a catchment-based, national strategy to combat eutrophication in rivers and lakes. Major catchment-based initiatives have been carried out in respect of Loughs Derg, Ree and Leane, and the Rivers Suir, Boyne, and Liffey, linked to a major programme of investment in sewerage infrastructure in these catchments. The work done in the context of these projects will be carried forward and developed in the context of River Basin Management Projects.

Water quality in Ireland is generally good and compares very favourably with other EU Member States. The main challenge for water quality in this country is to deal with eutrophication arising from excess inputs of phosphorous from all sources. The extent of eutrophication in the river system has been increasing persistently since the 1970's and has been identified by the EPA as probably the most serious environmental pollution problem in Ireland.

2.4 Water Treatment

All water that is supplied to residents and businesses in Ireland, irrespective of the source, (e.g. lakes, rivers, streams, springs, boreholes) will almost certainly have to go through some form of treatment to make it safe to drink. Factors such as high rainfall, soil type, and topography (i.e. "lie of the land") can all have an impact on water quality. All water supplies that are used for human consumption must meet certain standards, which have been laid down by the EU. They have to be free from micro-organisms, parasites, and from any substances that may be a danger to public health if present in sufficient numbers or concentrations.

There are four main techniques used in the treatment of water:

Storage: Water is stored in reservoirs where contaminants/impurities settle to the bottom (sedimentation). Coagulants may also be added causing contaminants to form clumps and also settle to the bottom. Pathogenic bacteria (i.e. disease producing) find it difficult to survive in storage and will gradually die out, while bleaching effects of sunlight helps to reduce any colour in the water.

Filtration: The purpose of filtration is to remove fine, non-settleable particles from the water. Water is passed through sand or a fine wire mesh to remove particles. Rapid sand filters act as a physical filter, leaving the water in need of chemical treatment, while slow sand filters provide both physical and chemical action. In a slow sand filter, fine particles, micro-organisms, and microscopic plant life are retained in the sand bed as the water slowly percolates down through the sand. The slow sand filter produces high quality water, which needs little further processing.

Sterilisation:

Water must be sterilised to remove any pathogenic or disease producing organisms. This is best achieved by chemical methods. Chlorine is added to the water for public supply, but this isn't always feasible for small installations. For smaller installations water is passed through a very fine filter capable of removing the bacteria. Other methods of sterilisation include ozone gas and ultra violet radiation.

Softening:

Hard water is recommended for drinking but it has disadvantages. The hardness can precipitate as unwanted scale in hot water pipes and boilers, and a great deal of soap is required to make a lather with the water. Hard water is essentially caused by the presence of salts of calcium and magnesium. Softening of the water involves the removal of these salts.

Pollutants

There are many sources of water pollution in Ireland, including:

Fertilisers – cause problems when used in excess and are washed off the land by rainfall and into a river or stream resulting in oxygen reduction and suffocation of fish (a process known as eutrophication);

Pesticides and herbicides – again may also cause problems if large amounts run off the land and collect in a river or stream resulting in death of fish and animals higher up the food chain;

Farm slurry – can cause similar problems to fertilisers;

Salt – may get into the rivers when it is put onto the roads in winter, and cause serious damage to local ecosystems;

Factory pollution – may be accidentally released into rivers without proper treatment;

Leaching – where chemicals are washed (or leached) out of a landfill and carried into surface waters and/or groundwater;

Detergents – contain phosphates which can be poisonous to aquatic life if present in sufficient quantities, e.g. phosphates can severely damage the gills of fish and kill fish eggs.

2.5 Environmental Aspects of Water Supply

Students may have opportunities to study local water courses and be able to make observations in relation to water quality. These can include colour, smell, pH, suspended solids, dissolved oxygen, temperature, and flow rate. Most of these can be carried out by students to some degree. Local Authorities (and the EPA) also monitor parameters such as bio-chemical oxygen demand (BOD), ammonia, and nitrate levels.

The types and numbers of animals found in different rivers and streams can also be an indication of the quality of water, or at least of oxygen levels. Generally speaking, a wide variety of species indicates good quality water. As certain species have varying oxygen requirements, their presence or absence is also a very useful indicator of water quality.

Pond life is generally better adapted to low oxygen levels than river or stream life. Students may be able to study adaptations of animals to reduced oxygen conditions, using a local pond as an example.

Students can also look for other features that are damaging to water courses. This could include harmful litter such as plastics and fishing tackle, or obvious signs of water pollution such as fish kills or oil on the water surface.

Recreation

A feature of many aquatic sites is that they are multi-purpose locations. Frequently there is a potential clash of interests involving different recreational and other groups. For example, the interests of conservationists and water-skiers may appear to be mutually exclusive. Such potential conflicts can lead to a number of useful simulations and role play activities. Class debates can be organised to examine possible solutions and/or compromises between such groups.

Seas and Coasts

Some schools have relatively easy access to coastlines. Bathing water quality and standards are defined by European legislation such as the European Bathing Water Directive. Due to an increasing demand by environmental organisations and the general public for cleaner rivers and lakes, groundwater, and coastal beaches, the EU has made water protection one of the priorities of its work. The introduction of the Water Framework Directive (see Section 2.3), which provides a new overall objective of good status for all waters, combined with high profile international campaigns, such as Blue Flag (www.antaisce/blueflag.ie) and growing campaigns, such as Clean Coast (www.antaisce.org/projects/cleancoasts/), has resulted in a significant improvement in the quality of bathing water around the Irish coast in recent years. Litter and other debris on beaches, however, is becoming a greater problem and can be hazardous to marine life and people alike.

Older students could make observations of beach litter and assess the litter in terms of potential harm to humans and wildlife. They could also make observations of sewage outfalls, taking note of warning signs. However not all outfalls on coasts are related to sewage. The majority are land drains, draining rain and ground water (which can also be polluted!) into the sea.

Section 3 WHAT YOU CAN DO

Most schools pay little, if any, attention to the amount of water they consume. However, implementing a few simple ideas for conserving water can dramatically reduce the annual water consumption per student within the school. There are four stages to tackling the *Green-Schools* theme of water conservation in schools outlined in the table below:

Points for discussion

- Simple steps that can be taken to conserve water both in the school and in the home (without requiring financial investment).
- The water cycle and its importance.
- The difference in the availability (and quality) of water in other countries and the impacts this may have.
- The importance of water to sustain all forms of life.

Turn off the tap while brushing your teeth

Curriculum links

- Using maps and plans, co-ordinates, symbols and keys.
- Drawing sketch maps.
- Describing uses and properties of water.
- Understanding how people affect the environment and how they can improve it.
- Planning and carrying out investigations.
- Measuring and quantifying.
- Handling numbers, converting into graphical forms.
- Using spreadsheets.

1 Analyse the problem

Before you even start to think about the solution you need to find out more about the problem. What are the main uses of water in the school? What areas have the greatest potential for wastage of water? Use the water survey described on the next page to find out where water consumption is highest and where possible improvements may be made.

2 Devise an action plan

Once you understand the problem you have to think of ways to solve it. Try to involve as many people as possible. Have a brainstorming session where everybody comes up with lots of ideas, however crazy they may seem. Your action plan should say what your targets are and how you are going to achieve them.

3 Measuring success

You must plan from the beginning how you will measure the success of your water action plan. This will involve some method of comparing the amount of water used after the implementation of your action plan with the initial findings. Adjustments to your action plan may then be made if necessary.

4 Maintenance

The most difficult thing will be to keep the rate of water consumption in the school permanently low. In order to achieve this, your water action plan should be ongoing. You will need to monitor water consumption regularly and make sure any sudden increases are noted and acted upon where possible.

3.1 Water Survey (All Ages)

Getting Support

When organising your committee to tackle the Water theme, don't forget – although students should make up the core of your committee, it may be useful to get assistance from some or all of the following:

Caretakers: Caretakers are normally responsible for the maintenance of the water supply and heating systems in the school but are rarely asked to share their knowledge!

Teaching Staff: Those with a technical background will have a good understanding of the basic workings of water circulation systems, cisterns, pumps, and heat exchange, even if they are not familiar with the system in the school itself.

Parents and others: Often a source of hidden expertise, they may be plumbers, architects, or engineers. Many parents may be happy to offer their time if they are asked appropriately, feel they will be adequately supported, and that their contribution will be valued.

Local Authorities: Will have engineers or other officers who may be able to help, or at least advise on the system in the school.

The table below looks at the questions that should be asked to examine all aspects of water in the school and could be used in conjunction with the Environmental Review as detailed in Section 4.

1 Water Source	2 Water Usage	3 Waste Water
• From where is school water sourced? (i.e. well/group scheme/mains) • How is the water treated before it reaches the school? • What quantity of water is treated each month/year and how many people in your area rely on this water? • Can your local water treatment plant be visited by students to find out more?	• Is there a water meter in the school? Can you calculate the average water consumption per day/week/month/year? (and per student?) • Where is the water used? How many taps/toilets/radiators/etc. are present in the school? • If there is no meter, perhaps you can estimate the rate of water usage from counting number of taps/toilets/etc.	• Where does the schools waste water go? • How is this waste water treated before it re-enters the water cycle? • What is the quality of the water in your local rivers/streams/ponds?

3.2 Excerpt of Sample Action Plan for Water

Goal 1: ***To ensure entire School is fully aware of the Green-Schools Water programme and to encourage full participation in the programme***

Action	Person/Group Responsible	Time Frame
Design posters to promote the results of the Water environmental review to put up on *Green-Schools* notice board.	*Green-Schools* committee.	Within the next two weeks.
Organise a "Turn off taps" campaign, with posters in both Irish and English in every classroom to remind students and teachers. Include other tips for the reduction of water consumption both in the school and in the home.	Posters to be designed with help of teachers in 4th, 5th and 6th classes. Posters to be laminated by co-ordinating teacher and put in classrooms by committee.	Posters to be put up in every room by 2nd week in February at the latest.
Organise a "Water Action Day" for November 21st for whole school participation and awareness-raising. Inform the school of plans over intercom, school assemblies and posters in classrooms and on *Green-Schools* noticeboard.	Principal to inform school over intercom; committee members to speak at school assemblies, and design promotional posters.	Posters to be put up by start of November. Reminders over intercom and during assemblies to be ongoing up to the 21st of November.
Inform parents of aims and efforts of Water programme through newsletter. Include "top tips" for reducing water consumption in the home.	Information to be written up by committee in co-operation with newsletter team.	Information to be written up and prepared by 1st week in March in time for next newsletter.

Goal 2: To reduce rate of water consumption by 15% through "low cost" and "no cost" methods within 12 months of programme implementation

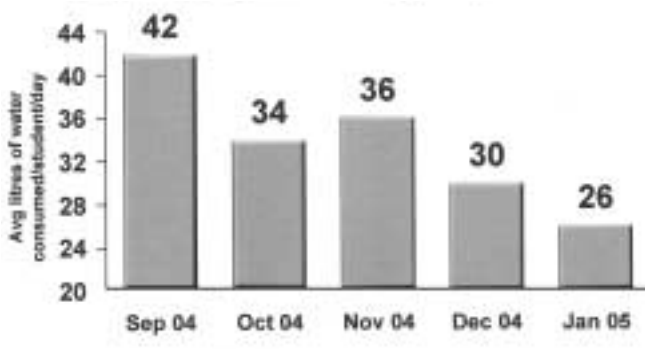
Action	Person/Group Responsible	Time Frame
Read water meter daily and formulate weekly or monthly graphs on water consumption. Highlight and assess any sudden increases recorded during day, week, month, or year.	Rotate responsibility among student committee members with help from caretaker. 5th and 6th classes to create graphs.	Ongoing.
Form "water squad" (with volunteers from each class – not committee members) to ensure "turn it off" campaign for taps is being fully implemented and to report any leaking taps.	Each teacher to organise and rotate responsibility within classroom.	To be up and running by last week in October.
Compare monthly rate of water consumption after 6 months of the implementation of the programme with water consumption rates at the beginning of the programme.	Committee members (students and teachers) to carry out calculations.	Comparisons to be carried out continually, but target for 15% reduction within 12 months.
Publicise results of monitoring and evaluation and make adjustments as required.	*Green-Schools* committee.	Ongoing from February.

3.3 Monitoring and Evaluation

Some schools will have meters that record the volume of water used. These can give accurate and extremely informative data over relatively short periods about how much water the school is using at any particular time.

Meters are both a source of information about water consumption and of readily workable data that lends itself to a number of presentations such as graphs, bar charts, time/use diagrams, and calculations in terms of volumes, flow rates, and cost.

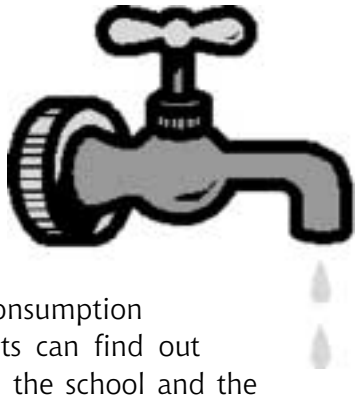
Water Consumption Monthly Comparison



Recordings can be made at a variety of times during the day to determine peak times of use as well as total amount used in a day. This can then be correlated with various activities, such as the end of games, lessons, meal times, lab activities, breaks (heavy use of toilets), and so on. If there is co-ordinated teaching, it may be possible for different groups to get data throughout the day. It may otherwise be necessary to ask caretaking staff to co-operate, or assign responsibility to particular students for the day if circumstances permit. Always get two students to take measurements so that they can corroborate each other's results! Data can then be displayed as bar charts and graphs.

Longer term monitoring can reveal interesting weekly, monthly, or even yearly differences. The longer the time period over which monitoring takes place, the fewer the measurements will be needed.

No meter?



Many schools in Ireland are charged a flat rate for their water supply and, as such, may not have a meter. However, it is still possible to come up with meaningful data about water consumption and wastage. Students can find out the number of taps in the school and the approximate volume of water used per tap over a specified period of time. Approximate volumes of cisterns can also be estimated from internal measurements and the amount of water used during the day for toilets and urinals can then be calculated. Similar estimates can be made for showers and other major water users. The amount of water lost through dripping or running taps can easily be calculated using a measuring cylinder and a stop watch.

Questionnaires

Students can use a questionnaire to examine people's attitudes to water consumption alongside the water survey. Discuss the proposed questionnaire in class and agree on its purpose. Questionnaires should be designed to take into account the age and ability of the user, the patience of the respondent, and the intended outcome. Students can ensure that the questionnaire works by testing it on each other.

Make it public

Publicise the results of surveys and questionnaires in the school. If the findings are likely to be of wider relevance, try to interest the local newspaper or radio.

3.4 Ideas for Conserving Water

It has been shown that careful water management, coupled with an effective education programme, can reduce water use from 12 cubic metres (12 tonnes!) per student per year to 4 cubic metres a year. The following points list some of the many ways in which you can make sure your school is using water carefully and efficiently.

Leaks and drips

Any leakage occurring in pipes on the school's property will waste water. As already stated, a tap leaking at one drip a second wastes about 10,000 litres a year. Leaking taps can usually be repaired simply by replacing worn washers. Students can make a valuable contribution to the everyday saving of water by promptly reporting drips, leaks, jammed or faulty taps, and other problems. This needs to be developed as part of the *Green-Schools* ethos and seen as a whole-school responsibility.

Washroom Taps

Apart from drips, taps can be a source of water loss – or saving – in a number of other ways:

Water flow: is the maximum flow rate of the taps too strong? If so, can it be adjusted to 'just adequate'? It may not be possible to adjust individual taps, but most individual buildings will be governed by a stop cock or other control mechanism.

Self-closing taps (press taps): taps left running can waste enormous amounts of water. There are various types of self-closing, press operation taps that cut the supply shortly after use. Some models also have an adjustable flow rate restrictor which can be set to deliver a lower flow rate than conventional taps. They can waste water if they jam in the 'on' position and so need to be inspected and maintained regularly.

Spray taps: taps with spray heads can reduce water consumption by up to 50%. As with push taps, spray taps need regular maintenance to ensure that the head does not become blocked with soap, grease, or limescale.

Toilets

Urinals: most urinals are flushed by an automatic system that controls the flow of water at a minimum set rate per hour when in use. This rate will depend on the number of urinals and the volume of the cistern. It may be possible to save water by reducing the flow volume (but still insuring effective flushing).

Many older schools, however, do not have control devices on their urinal cisterns. Various devices can be fitted to control water during these periods, with most controllers having a 'hygienic flush' every 12 hours.

Toilet cisterns: most modern cisterns have a small overall volume (7.5 litres). You can install devices to reduce cistern volume but any reductions in volume depend on the toilet pan design and should not be carried out at the expense of effective flushing. Ball valves and overflows on toilet cisterns should be checked regularly.

Hot Water Supplies

Hot water taps and showers can be a big source of water and energy loss. If pipes are too long or poorly lagged, huge amounts of cold or tepid water may be lost before hot water comes through. Similarly, if poorly lagged hot water pipes run alongside drinking water pipes, students wanting a refreshing drink may run the tap for several minutes before the water cools down. Although most water in schools is heated from one or more central boilers, it is worth considering the installation of small, point-of-use heaters where very long pipe-runs would otherwise be necessary.

Frost Protection

Adequate frost protection is vital to prevent burst pipes and leaks. Caretaking staff should always visit the school when frost is expected, especially during weekends and holidays. External and internal thermostats can be set to start heating systems and pumps at appropriate temperatures.

Outside the School

Water butts: can be used to collect rainwater from downpipes such as building guttering. In any one year, 3,600,000 litres of rain falls on to a typical primary school roof (4,000 square metres) – enough to fill almost 19,000 water butts!* Rainfall, which is better for plants, can be captured all year round by placing a water butt by sheds, greenhouses, and conservatories. Although not necessarily contributing huge amounts to overall savings in the school, the application of water saving ideas to school gardens can help develop good life-long habits and raise awareness of the value and role of water for life. *It is important however to always be concerned with safety when dealing with water butts.*

* Students can work out how much rainwater can be collected from your school roof by calculating the area of the roof in metres and multiplying this by the annual rainfall in millimetres for your area. This will give them the total volume of water in litres per year. They then need to deduct 30% from this figure to alow for evaporation to give them the final figure.

Organic Mulch: can be applied around plants and on borders. This helps conserve water by reducing surface evaporation and keeping down competition from weeds and other plants. Used tea leaves or tea bags make good mulch – roses in particular like cold tea.

Water Pollution

There are three main areas that can be addressed in schools:

Cleaning practices: the use of environmentally friendly detergents and washing-up liquids are becoming more widespread and is a practice that can be relatively easy to introduce to the school.

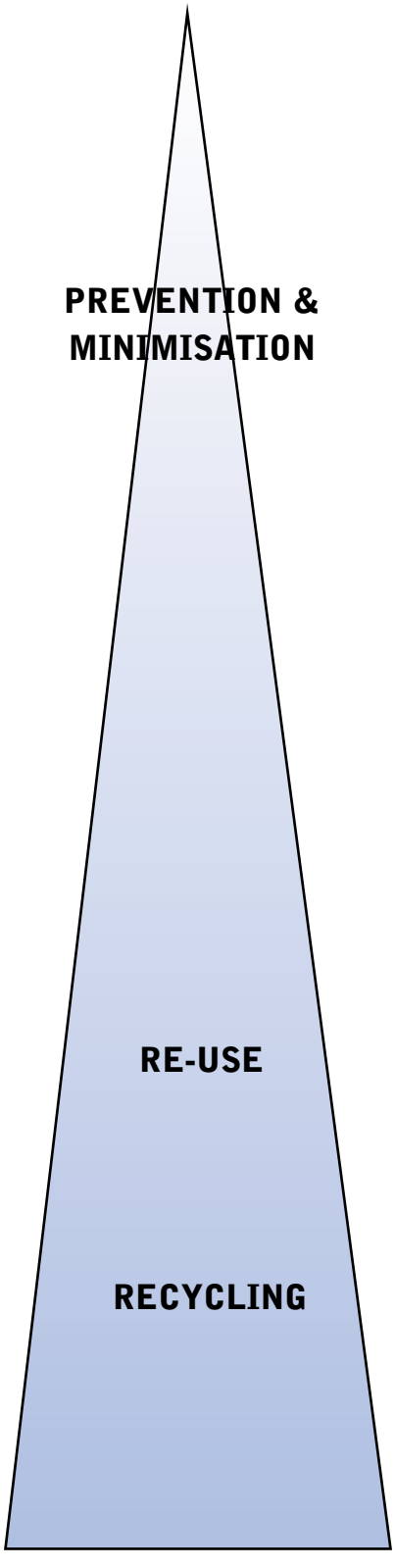
Toilets: urinals and toilets are convenient and tempting places to flush things down. Blocked or otherwise dysfunctional toilets are one of the worst advertisements for your school, yet they often receive the least attention.

Laboratories: advice on disposal of chemicals and other potentially harmful materials is available from your Local Authority. The basic rule is that everything that goes down the sink should be treated (e.g. neutralised) to non-harmful levels before disposal.

***Finally** . . . There is a danger of looking at water in schools in isolation from the process by which it is obtained and recycled. Students should also understand where the school's water comes from before it gets into the system and where it goes once it's been used. Visits to facilities such as reservoirs, water supply, and waste water treatment works can also be very worthwhile.*

3.5 Saving Water – A Summary

We can use a hierarchy similar to that used for waste management (see the booklet for *Litter and Waste*) and energy conservation (see booklet on *Energy*) to help us catagorise the many methods of water conservation.



Water Management Hierarchy

Defined as the prevention of waste of water at source or the minimisation of water use. Most methods of reducing the amount of water used by an individual, house, or school will fall under the category of prevention or minimisation. Here is a list of some of the most effective tips for saving water:

No/Low Cost

- Can you have a shower instead of a bath? This will use much less water. However, "power showers" used for 10 minutes use up the same water as 3 baths.
- Turn off the tap while you brush your teeth.
- Make regular checks of taps and repair any leaks. All students should be encouraged to save water by using plugs in basins and turning off taps properly.

Higher Cost

- Self-closing or percussion taps that close automatically after a preset period could be used instead of conventional screw taps to effectively reduce water consumption.
- Ensure that urinal cisterns flush at the minimum frequency required and consider installing control devices.
- Keep runs of pipework short and lag pipes properly. This helps insure hot water comes through after a short period of time.

For example: Rainwater harvesting is the collecting and storing of this water for later use. Rainwater can even be used for drinking, with proper treatment. But, the easiest way to use stored rainwater is for the watering of plants. Water butts collect rainwater from downpipes such as building guttering.

For example: Greywater recycling is the collecting of wastewater from baths, showers, and washbasins and treating it to be used for toilet flushing.

Section 4 ENVIRONMENTAL REVIEW

The terms 'environmental review' and 'environmental audit' are becoming increasingly common as more companies and Local Authorities commission or carry out surveys to assess the environmental impact of their activities. A comprehensive survey of such serious intent is usually accompanied by a statement that specifies planned improvements, their timescales, and also an administrative structure to allocate responsibilities, monitor progress over time, and evaluate success *(i.e. an Action Plan!)*.

The Green-Schools environmental review is an open-ended checklist of all aspects of a school's impact on the environment, in this case looking at water. The review also has an educational function, whereby the process of gathering data raises awareness and gives you a basis for developing your action plan.

The checklist

As for reviews of previous topics (i.e. litter and waste, energy) each question in the checklist can be answered 'yes' or 'no'. 'No' indicates that improvement is possible. Subsequently, areas can be highlighted for action and targets for improvement can be set and monitored.

Full quantification can be difficult or impossible but it is often easier to give actions a preferred timescale, such as 'immediate', 'this term', or 'review next year'. This is a useful planning tool. Space is available on the right of each question for making notes on the timescale.

After the checklist

The checklist includes some ideas for action. These are not intended to be comprehensive; they are starting points for further planning. The questions themselves will also suggest further ideas.

Remember, it is vital not to take on too much. Small and successful actions build confidence and encourage more success. The checklist will raise many issues and indicate a wide choice of areas that need attention, but they should be discussed widely, put in the context of other factors (time, money, skills), and grouped by priority. You should allocate responsibilities and monitor and publicise progress. The selected goals will have a much greater chance of success and can then be fitted into the curriculum.

	YES/NO	ACTION NOTES: WATER
Does the school have a policy on water and water conservation?		
Does the school have a water meter?		
If so, is the water meter read regularly?		
Have you reviewed the number of taps/ urinals/toilets in the school?		
Does the school have an estimate of the breakdown of water usage for the whole building?		

	YES/NO	ACTION NOTES: WATER
Do you know where the school's water comes from? Do you know where the wastewater goes? (See Water Survey Section 3.1)		
Are dripping taps reported and repaired quickly?		
Is the water pressure adjusted to be enough without being excessive?		
Have students visited the local water treatment facility?		
Is the school near a beach or marina? If so, has the beach/marina got a Blue Flag? Is your community involved in "Clean Coast"? Does the school ever visit the local beach/marina?		
Is there a pond/lake/river near the school suitable for school visits and/or study?		
Do the students know where their water comes from (i.e. public, group, private, etc.) at home? Could a survey be carried out?		
Does the school have a policy for the use of non-hazardous cleaning products?		
Is rainwater collected for watering plants?		

Ideas for Action

- Encourage students to save water by using plugs in basins and turning off taps properly (have the art class create posters to help remind students).
- Carry out a survey of the school to check for and report leaking or dripping taps. Is the maximum water pressure of taps in the school sufficient? Could it be reduced? Such checks can be carried out on a regular basis.
- If the school has a water meter, monitor water consumption by reading the meter regularly. Act quickly if there is any increase, or if the meter stops working.
- Set up some method of collecting rainwater to be used for watering plants in the classroom and school grounds.
- "Adopt" a local beach or river/lake to help clean as part of National Spring Clean.
- Chemistry students (secondary) can carry out simple water quality tests of local river or stream for pH, Biochemical Oxygen demand, (BOD), etc.

Worksheet 1

How to "make" water!

Water is a chemical. It's made of two gases, hydrogen and oxygen. Water acts like a gas sometimes (when it evaporates) but we usually think of water as a liquid – something wet. You can make hydrogen and oxygen join to form water. Here's how.

You will need:

- **a small candle (like a birthday candle)**
- **a plate or bowl**
- **a clear drinking glass**
- **a match or lighter**

1. Set the candle on the plate and light it (younger students should be supervised).
2. Cover the burning candle with the clear glass (it should be large enough to cover the whole candle).
3. When the candle goes out, look closely at the inside of the glass. What do you see?

The tiny drops of liquid inside the glass are water! The hydrogen in the candle joined with the oxygen in the air to form water. The candle flame went out when all of the oxygen in the air inside the glass was used up.

Wood, paper, natural gas, heating oil, and gasoline all contain hydrogen, which joins with the oxygen in the air as they burn. Do you think burning any of these fuels will form water?

You can pull water out of thin air!

Water can be a gas (water vapour) that's part of the air around us. You can't see it, so how do you know it's there? Try this.

You will need:

- **a drinking glass**
- **water**
- **ice cubes**

1. Fill a dry glass with ice cubes and water.
2. Go and do something else for about 15 minutes.
3. When you come back, look at the outside of the glass.
4. Run your finger over the outside of the glass. What do you feel?

The tiny drops on the outside of the glass are water that has *condensed* from the air. Some of the water vapour in the air changed to liquid when it touched the cold glass. What do you think will happen if you empty the glass and let it stand? Where does the water in a puddle go when the sun comes out?

Worksheet 2

How to make your own rain gauge!

Sometimes you may hear on the weather forecast how much rain fell during a storm, or that 15mm of rain may fall tomorrow. A rain gauge is a tool that measures the amount of rain that falls. You can make a rain gauge to find out how much water falls in the school yard (or anywhere else!) the next time it rains.

You will need:

- **a clear plastic bottle**
- **a pair of scissors**
- **a permanent marker with a sharp point**
- **small stones or aquarium gravel**
- **water**
- **ruler**

1. Cut off the top part of the bottle (younger students should be supervised).
2. Fill the curved part of the bottom of the bottle with small stones or aquarium gravel. This will weight your rain gauge to keep it from falling over.
3. Pour enough water into the bottle to cover the stones. Use the marker to draw a line at the top surface of the water.
4. Mark a "0" next to the line. This is your baseline.
5. Use the ruler and marker to measure 1cm, 2cm, and 3cm up the bottle from the baseline. Draw a line at each inch mark and label the lines. (Tip: you may want to empty the water out of the bottle before doing this, so you can lay the bottle on its side to measure.)
6. If you want to make your rain gauge more accurate, use the ruler and marker to measure and mark 1/2 cm, 1 1/2 cm, 2 1/2 cm etc. on the bottle.
7. Wait for rain!
8. When the weather forecast predicts rain, or rain starts falling, add water to your rain gauge up to the baseline. Put the rain gauge outside to catch the rainwater.
9. When the rain stops, check to see how many centimetres of rain fell into your rain gauge!

You may want to make a chart to keep track of how much rain falls in a week or a month. On the chart, list the date it rained and how many centimetres of rain fell. Add up the rainfall at the end of the week or month.

Important! Be sure the rain gauge is filled to the baseline before you begin collecting.

Section 5 WATER AS A GLOBAL RESOURCE

Background Information

Water-borne diseases, such as cholera, dysentery, malaria, and bilharzia are still major killers worldwide. Water shortages and drought are a day-to-day reality for perhaps a third of the world's population. When working on the topic of water, it is important that students understand the wider context in which issues about water take place. Whatever difficulties people in Ireland face in relation to water supply, they are not usually life-threatening. In many parts of the world, water is literally a matter of life and death.

However, it is too simplistic to make direct comparisons between situations in Ireland and in parts of Africa or Asia. The fact that we use perhaps 20 times as much water per day as many people in other parts of the world reflects as much on our consumption and lifestyle patterns as it does on absolute shortages elsewhere. Similarly, the fact that in highly developed countries water of the highest drinking water standards is used for a huge variety of 'non-drinking' purposes. This however reflects on our way of doing things. Much of the work of agencies working overseas, and of local scientists and engineers, is on small scale, low technology projects that serve local communities in appropriate ways and in which people (the consumers) are closely involved.

The more developed countries have gone down a hi-tech, high investment route in which higher and higher standards are demanded by consumers. Yet we literally often treat the symptoms (e.g. pollution, water shortages, etc.) rather than look for solutions (e.g. less intensive farming methods, less reliance on complex chemicals in industrial and agricultural processes, lower water consumption, and less wastage). In comparing our own situation with those elsewhere in an educational context, we also have to compare our lifestyles, our expectations, and our way of looking at the world.

What you can do

Developing links

There are many excellent resources and ideas for activities on the web produced by various development agencies (don't forget to also check web pages such as www.eco-schools.org, which provides good examples for working on the Water theme). One way to develop realistic views of day-to-day water issues faced by other countries is to form links with other schools in those countries. This has numerous benefits that go far beyond the topic of water itself. These school links can be facilitated through agencies such as those mentioned above, or through the "international linking" of the Green-Schools programme (www.eco-schools.net).

Remember, understanding water in a global context is as much about understanding different cultures as it is about understanding the resource itself.

Water Terminology

Ammonia (NH_3)
Form of nitrogen found in organic materials and many fertilizers. It is the first form of nitrogen released when organic matter decays. It can be used by most aquatic plants and is therefore an important nutrient. It converts rapidly to nitrate (NO_3) if oxygen is present. Ammonia is toxic to fish at relatively low concentrations in pH-neutral or alkaline water.

Biochemical Oxygen Demand (BOD)
The concentration of oxygen dissolved in water, which is required by micro-organisms to break down the organic matter present in the water. It is a measure of the polluting strength of a sample. BOD levels are indicative of the effect of the discarded waste or effluent on fish and other aquatic life which require oxygen to live.

Dissolved Oxygen
Microscopic bubbles of oxygen that are mixed in the water and occur between water molecules. Dissolved oxygen is necessary for healthy lakes, rivers, and estuaries. Most aquatic plants and animals need oxygen to survive. Fish will drown in water when the dissolved oxygen levels get too low. The absence of dissolved oxygen in water is a sign of possible pollution.

Eutrophication
Degradation of water quality due to enrichment by nutrients, primarily nitrogen (N) and phosphorus (P), which results in excessive plant (principally algae) growth and decay. Low dissolved oxygen in the water is a common consequence.

Nitrate (NO_3)
Nitrate levels are usually only found in small amounts naturally, but an increase in nitrate levels can come from many man-made sources such as septic systems, fertiliser runoff, and improperly treated wastewater. As nitrates increase, they act as a plant nutrient and cause an increase in plant growth. As the plant material dies and decomposes, dissolved oxygen levels decrease.

Nutrients
Compounds of nitrogen and phosphorus dissolved in water which are essential to both plants and animals. Too much nitrogen and phosphorus act as pollutants and can lead to unwanted consequences – primarily algal blooms that cloud the water and rob it of oxygen critical to most forms of aquatic life. Sewage treatment plants, industries, vehicle exhaust, acid rain, and runoff from agricultural, residential and urban areas are sources of nutrients entering surface water and groundwater resources.

pH
Measure of hydrogen concentration in water and is presented on a scale from 0 to 14. Water with a pH of 7 is neutral; lower pH levels indicate increasing acidity, while pH levels higher than 7 indicate increasingly basic solutions.

Phosphate
Phosphate levels may increase with an increase in nitrate levels. As phosphates increase and the growth of aquatic plants is encouraged, algal blooms can occur. With the increase in algal growth and decomposition, the dissolved oxygen levels will decrease. Sources of phosphates include septic tanks, runoff from feedlots, runoff from agriculture, and waste water treatment plants. In addition, detergents with phosphates were a prime source before manufacturers developed phosphate-free alternatives.

Salinity
A measure of the salt concentration of water. Higher salinity means more dissolved salts. Usually measured in parts per thousand (ppt).

Sewage and sewerage
Sewage is the waste carried in our sewers. Sewerage is the system of pipes, pumps, and treatment plants to manage sewage.

Suspended solids
Organic and inorganic solids that float on the surface or are suspended in water, and which are largely removable by filtering.

Useful Contacts

ENFO
Environmental Information Service
17 St. Andrew Street, Dublin 2
Telephone: (01) 888 2001
LoCall: 1890 200 191
Fax: (01) 888 3946
Email: info@enfo.ie
Website: www.enfo.ie

Department of Environment, Heritage and Local Government
Custom House, Dublin 1
Telephone: (01) 8882000
LoCall: 1890 20 20 21
Website: www.environ.ie

Department of Communications, Marine & Natural Resources
29-31 Adelaide Road, Dublin 2
Telephone: (01) 6782000
Locall: 1890 44 99 00
Fax: (01) 6782449
Email: webmaster@dcmnr.gov.ie
Website: www.dcmnr.gov.ie

EPA
Environmental Protection Agency
PO Box 3000
Johnstown Castle Estate
Co. Wexford
Telephone: (053) 60600
LoCall: 1890 335599
Website: www.epa.ie

The Central Fisheries Board
Unit 4, Swords Business Campus
Balheary Road, Swords
Co. Dublin
Telephone: (01) 8842 600
Fax: (01) 8360 060
Email: info@cfb.ie
Web: www.cfb.ie

Marine Institute Headquarters
Galway Technology Park
Parkmore
Galway
Telephone: (091) 730 400
Fax: (091) 730 470
Email: institute.mail@marine.ie
Website: www.marine.ie

or

Marine Institute
80 Harcourt Street
Dublin 2
Telephone: (01) 476 6500
Fax: (01) 478 4988

Heritage Council
Rothe House
Kilkenny
Telephone: (056) 777 0777
Fax: (056) 777 0788
Email: mail@heritagecouncil.ie
Website: www.heritagecouncil.ie

National Federation of Group Water Schemes
24 Old Cross Square
Monaghan
Telephone: (047) 72766
Fax: (047) 72788
Email: sean@nfgws.iol.ie

Geological Survey of Ireland
(Groundwater Section)
Beggars Bush
Haddington Road
Dublin 4
Telephone: (01) 678 2782
Fax: (01) 678 2659
Email: Groundwaterinfo@gsi.ie
Website: www.gsi.ie

The Sustainable Water Network
9 Upper Mount Street
Dublin 2
Telephone: (01) 6425583
Email: info@swanireland.ie
Website: www.swanireland.ie

Irish Water Safety
The Long Walk
Galway
Telephone: (091) 564400
LoCall: 1890 420 202 (24 Hours)
Fax: (091) 564700
Email: info@iws.ie

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