NDP
National Development Plan
Transforming Ireland

CGPP
Cleaner Greener Production Programme

HOW TO GREEN YOUR CAMPUS OR WORKPLACE

A STEP BY STEP GUIDE

epa
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil
National Waste Prevention Programme

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DISCLAIMER

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CIT Institiúid Teicneolaíochta Chorcaí
Cork Institute of Technology

Contents

GREENING YOUR CAMPUS OR WORKPLACE

why?

WHAT IS THE PRINCIPAL AIM OF THIS BOOKLET?

This guide aims to answer three major questions:

1. WHY?

Why should you green your campus or workplace? What are the benefits: environmental and economic, of taking the green approach to how we carry out our daily work duties? We will try to give some good reasons.

2. HOW?

How can you green your workplace, in particular your campus or school? What are the steps you can take, where should you focus your activities and how can you spread the message? We will explain this.

3. WHAT?

What have we done in CIT to green our campus and what steps have been taken elsewhere? Which areas did we focus on and what kinds of results did we achieve? What were the major achievements in other campuses and workplaces? We will let you know about what has been done - to show you it can be done.

This guide will help readers to initiate and maintain their own programmes related to a sustainable campus or workplace. It can be used as a start-up tool for individual projects and can also be used as a reference guide as these projects mature.

A Sustainable Campus Programme is an integrated programme combining the involvement and education of the student and staff bodies to help reduce resource consumption and the generation of waste and emissions on campus.

Implementing a Sustainable Campus Programme has both economic and environmental benefits as well as awareness raising advantages. The sustainability message can be disseminated to a broad audience of staff and students. Any successful sustainable programme should integrate and combine the involvement and education of the student and staff body to help reduce the campus footprint.

Environmental education, rather than imposing more facts and figures on people, will result in positive sustainable activities that are more meaningful to the individual. Through on-going learning by doing, individuals gain an understanding and increased knowledge of why they are pursuing a particular action, rather than viewing it as a task imposed on them by legislation or local authorities.

WHO IS THE BOOKLET AIMED AT?

The information contained within this guide is primarily aimed at third-level education facilities but its messages and methodologies can equally be applied to any workplace – in particular public and private sector organisations such as schools, hospitals, prisons, local authorities, etc.

WHY - WHY NOT?

A great deal of work to improve the environmental performance of educational campuses is underway worldwide. Many organisations have been set up to promote these initiatives, including the International Sustainable Campus Network[1]. In Ireland, several third-level institutions have begun to pay attention to their environmental behaviour - and they are achieving significant results, both in terms of the environment and the economy. Major costs savings can be made by organisations who carry out a systematic consideration of their consumption patterns and how they deal with their wastes and emissions.

Having received funding under the Environmental Protection Agency's Cleaner Greener Production Programme (CGPP)[2], Cork Institute of Technology (CIT) has raised the bar in sustainability for third-level campuses and developed a Sustainable Campus Programme[3] that can be applied to any campus or work place. CIT has demonstrated the potential for on-campus environmental improvements which can be adopted and adapted by others – both within and beyond the third level education sector. Other potential beneficiaries from this information include schools (primary and second-level), colleges, local authorities, hotels, restaurants, factories, and hospitals, among others.

Improving the sustainability of all aspects of our lives (and not just those of conventional production processes in industry) is critically important. All campuses should endeavour to operate in the most sustainable fashion possible and take the opportunity to promulgate the message widely. Third-level institutions have substantial potential to catalyse and accelerate societal transitions towards sustainability (Stephens *et al.*, 2008). They can have an enormous influence on the future of industry and research, producing large numbers of graduates every year to enter the workplace for many years to come. These institutions, often large, therefore have a moral obligation to act responsibly with regard to the environment and to instil and spread the value of sustainability. CIT has shown that it can be done and now we want to share that message.

1 International Sustainable Campus Network www.international-sustainable-campus-network.org/
2 Cleaner Greener Production Programme (CGPP) www.cleanerproduction.ie
3 Green Campus CIT www.greencampuscit.ie

THE CIT GREEN CAMPUS PROGRAMME

What we did

The CIT Sustainable Campus Programme was funded by the EPA under the Science, Technology, Research and Innovation for the Environment (STRIVE) Programme 2007 - 2013; under Phase 4 of the Environmental Protection Agency (EPA) Cleaner Greener Production Programme (CGPP).

The CIT Sustainable Campus Programme was created as part of an on-going process which is being gradually developed and continuously updated. Our programme involves five major steps:

1. **Baseline auditing,**
2. **Installation of appropriate monitoring equipment,**
3. **Prevention opportunity assessment,**
4. **Options generation, and**
5. **Projects implementation and review.**

and this approach is recommended in any workplace.

The ethos of "waste prevention" is applied throughout the programme, with the efficient use of resources emphasised, while also addressing the management and operational practices in place in CIT. Reducing the use of material, water and energy resources in order to reduce waste generation resulted in environmental, economic and awareness raising benefits in the Institute. This led to an improved working environment, better staff and student morale while at the same time reducing our wastes and emissions without affecting our core educational aims and activities.

Monitoring and gathering baseline data is a prerequisite for all cleaner production interventions and was integral to the work carried out in CIT. Targeting strategies to particular areas helped us to identify unique problem areas. These often require different strategies to other areas. Full and overt management commitment is essential for a successful programme, and this was a key element of the success in CIT.

Addressing technical issues alone in any workplace will not lead to a more sustainable production and consumption regime. Therefore the involvement and motivation of the 'human dimension' is seen as invaluable in the success of a Sustainable Campus Programme – and this was a core element of the greening of the CIT campus.

Some of the key achievements of the Sustainable Campus Programme in CIT to date include the following:

SAVINGS MADE

- Implementation of separate food waste bins well in advance of the Food Waste Regulations (diverting 39 tonnes of food waste from landfill in 2010);
- Reduction of solid waste by almost 8% despite the increase in student numbers by 5%;
- Increased recyclable recovery rate by 17%;
- Campus BER rating improved by a full grade from a D1 in 2009 to C1 in 2010;
- A reduction of 1293 t CO_2 emissions (54%) to the atmosphere compared to the previous year;
- Electricity bills were significantly reduced (€353,885)*;
  *Much of these savings were made by switching to a different supplier with cheaper rates.

4 Green Hospitality Programme http://www.greenhospitality.ie
5 http://www.seai.ie/
6 http://www.greenawards.ie/

ACTIONS TO PRODUCE SAVINGS

- Many old inefficient lights were replaced in corridors with energy efficient fittings and sensors installed;
- Student Centre lighting replaced 44 x 400W metal halide fittings with 22 x 90W and 22 x 30W frontline LED fittings (saving €15,040 annually, 15 kWh per hour, 3 kg CO_2 every hour);
- 63 timers were fitted to heaters, extraction and light fittings;
- 100 LED flood lights (90W) replaced the old 400W flood lights around campus;
- Following the installation of a boiler control system for intelligent load compensating and sequence control and improvements to the BMS system CIT's gas bills reduced by 36% with a financial saving of €4624 in the first 3 months (February to April 2011);
- A major upgrade of the BMS and energy metering system was carried out to improve data compilation and analysis (45 sub metres);
- For 71 taps in one building, flow rates were reduced from an average of 32 litres per minute to an average of 7 litres per minute (80% reduction);
- Waterless urinal trials were conducted at two locations on campus;
- Urinal sensors were installed at 12 locations on campus.

RECOGNITION FOR THE PROGRAMME

- Achieving two Green Hospitality Awards (GHA)[4];
- Reaching the final stages in the Sustainable Energy Awards 2010 (SEAI)[5];
- Being shortlisted for the Green Awards 2011[6];
- Green Campus CIT featured on the RTE television programme Eco-Eye.

OTHER ACTIVITIES

- Waste awareness day was held in October 2010;
- Zero waste meal was prepared by the students as part of the European Week for Waste Reduction (EWWR) events reducing waste generated by 35% of the industry norm;
- Developing a new uniform recycling system across campus;
- Installation of an electronic vehicle point on campus (a first for Irish third-level).

ACADEMIC ACTIVITIES

- Introduction of a new sustainability module for fourth year students at CIT in Environmental Management.

Cork Institute of Technology
Bishopstown Campus

4 Green Hospitality Programme http://www.greenhospitality.ie
5 http://www.seai.ie/
6 http://www.greenawards.ie/

This ‘cleaner production’ ethos established in the CIT has the potential for both short term environmental excellence, and a longer term viability. The implementation of a Sustainable Campus Programme is a systems approach - not a once off project. The programme is on-going with continual assessments in order to identify areas for improvement and also to monitor progress made. CIT now incorporate sustainability into the core of campus life by introducing such courses into the curriculum. CIT’s Department of Tourism & Hospitality Studies in association with the Clean Technology Centre developed a new course in Environmental Management (Hospitality Resource Efficiency) for fourth year students which will be introduced in September 2011. This course, along with many other sustainability courses at CIT, is helping to promote the sustainability message through the curriculum.

The ethos of waste prevention is a pro-active and integrated solution that strives to eliminate or reduce pollutants at source. Types of prevention options can range from technical options to more ‘soft’ awareness measures. It has been found that clear goals and effective planning are integral in any successful process. When project goals are not clear it is difficult to plan a project efficiently. Therefore clear strategies to achieve the objectives /targets agreed upon cannot be underestimated.

Management practices and people’s behaviour/attitudes, as well as technical elements, are important aspects of a prevention based approach, particularly in third-level institutions where many improvements are dependent on the actions and attitudes of a large number of students, staff and visitors. Third level institutions and many work places can be considered similar to small towns due to the size, population and various activities on campus.

The implementation of successful prevention projects in CIT relied heavily on the attitudes and behaviour of both the staff and student bodies. Early buy-in from the staff and students was vital for us to get the most out of our Sustainable Campus Programme. A continuous awareness raising campaign was an integral element in our successful programme.

These successes and this approach can be replicated elsewhere. This guide will show you how it can be done and we will give you good examples and case studies throughout - from CIT and elsewhere to show you...

GREEN YOUR CAMPUS OR WORKPLACE

THE 9 STEP APPROACH

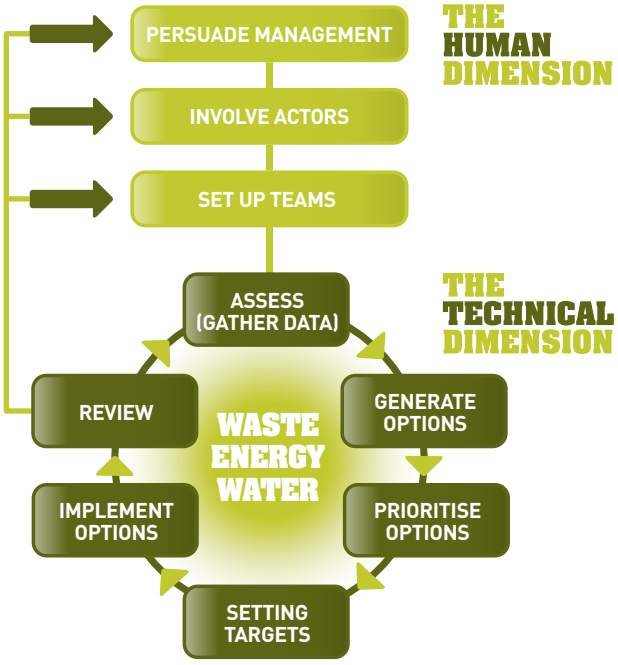
METHODOLOGY
AN INTRODUCTION

HOW TO APPROACH GREENING YOUR CAMPUS

There are **NINE** basic steps to any prevention programme.

1. Gaining support – persuading management 2. Involving actors 3. Setting up teams	THE HUMAN DIMENSION
4. Assessment phase - input/output analysis (data gathering) 5. Generating options 6. Prioritising options (including costing) 7. Setting targets 8. Implementing options 9. Reviewing progress	THE TECHNICAL DIMENSION

These steps are not part of a linear process. There are feedback loops and a constant cycle of assessment, improvements, and reviews – together with continuous awareness raising. The whole process is represented in the following diagram:



1 GAINING SUPPORT PERSUADING MANAGEMENT

(HUMAN DIMENSION)

Training and technical assistance is an important element in the fulfilment of a Sustainable Campus Programme. Unless there is an active interest from management to see the programme through and an interest in applying the findings, then the programme may be doomed from the start. For a project to be effective, top management must set the stage in order to ensure cooperation and participation of the staff members. Third-level campuses are a unique social setting where large numbers of diverse students and staff members integrate. Staff need to be on board and participate in the Sustainable Campus Programme in order to lead the way forward for students.

CIT employed a full time facilitator for the Sustainable Campus Programme to gather and monitor data, identify, prioritise and implement options and run an awareness campaign. Staff and students were kept informed through newsletters, website, events, emails, and other publications. The commitment from CIT to supply time and resources to the Sustainable Campus Programme with funding from the CGPP was an integral element in the successful programme. The Sustainable Campus Programme will now continue long term and grow into the future at CIT.

Gaining support and commitment are the first steps to a successful Sustainable Campus Programme. Opportunities must be identified and action plans and targets decided upon. The plan must then be implemented and of course constant review of actions and continuous benchmarking is important. The 5 pillars to a Sustainable Campus Programme are shown below. These five pillars can be applied to the main areas in a Sustainable Campus Programme (Awareness, Water, Waste, Energy, and key areas including; Paper, Transport, Procurement and Canteens etc.).

1. Commitment (time and resources)
2. Identification of opportunities
3. Plan (action plans and targets)
4. Action (implementing the plan)
5. Review (results of actions, continuous benchmarking)

what we did

CIT EMPLOYED A FULL TIME GREEN CAMPUS FACILITATOR FOR THE SUSTAINABLE CAMPUS PROGRAMME UNDER FUNDING BY THE EPA'S CLEANER GREENER PRODUCTION PROGRAMME.

2 INVOLVING ACTORS

(HUMAN DIMENSION)

CIT's Sustainable Campus Programme was endorsed by the Governing Body and the President and was fully supported by the Finance Department and the Head of Development. Different staff members can provide useful information and help assess the feasibility of improvement options. A well informed workforce that feels involved in the programme will be motivated to contribute and also offer time and responsibility for particular tasks. Identifying the main actors involved in a successful Sustainable Campus Programme at the beginning is important to help the programme run smoothly, but individual campuses or workplaces may identify new important or interested actors as the programme progresses and adapts to specific situations.

3 SETTING UP TEAMS

(HUMAN DIMENSION)

The programme will need a leader and the leader will need a team. Teams should consist of a variety of staff e.g. cleaners, top management, caretakers, students, finance etc. who will all have valuable contributions and insights into different aspects of sustainability on campus. Knowledge can be shared from the purchasing side of things to the daily running of the campus through to the management of solid wastes and cleaning rotas. It can be useful to include a member of the Students' Union and other student societies on the team as a voice for the student body and a link to increased knowledge and innovative ideas. Having the right mix of team members who will work together can be an important element in helping to push the Sustainable Campus Programme forward.

Why do we need a team?

- A team is stronger than one person
- A team will bring a mix of ideas and knowledge
- Responsibility can be shared
- Ideas can be shared to help stimulate innovative solutions
- Staff and students' participation is actively encouraged
- The voice of a team is louder than from a single person
- Networking potential is increased

Once the programme has the support of staff they can introduce the Sustainable Campus Programme into student projects. Also, including students' knowledge and innovative ideas into some decision making could prove very interesting.

what we did

CIT INCLUDED STUDENTS' EXPERTISE IN THE IDENTIFICATION AND TESTING OF DIFFERENT ENERGY EFFICIENT LIGHT FITTINGS FOR THE INSTITUTE

4 ASSESSMENT PHASE
INPUT / OUTPUT ANALYSIS (MATERIAL AND ENERGY BALANCES)

(TECHNICAL DIMENSION)

A material balance (often referred to as a mass balance or input/output analysis) is a fundamental tool in prevention, often used in conjunction with eco-maps and process flow diagrams.

A general survey of the site is a good place to start. This type of audit will give general data and will be a reflection on general activity on campus.

This can include the following:

- A walkthrough audit can help identify areas that will require more detailed examination;
- Conducting a material flow analysis is useful to identify the 'ins' and 'outs' of a system;
- Energy consumption measuring is useful to identify the major users (and abusers!).

A walkthrough audit is inexpensive and shows general trends rather than hard data. This information can be used to identify the requirement for further refined data and analysis. The walkthrough audit will aid assessment of the actual situation which will help identify areas for improvement and prioritise subsequent audits.

A material and energy flow analysis of a system can identify the main areas of resource use and also waste generation. Flow analysis can involve waste, water, fuel, electricity, and emissions audits. The input – output balance is based on the principle that 'what goes in must come out'.

Data evaluation extends the information from the general survey into more detail. This involves a comprehensive site inspection and input/output analysis. A list of savings opportunities can be devised based on observations and measurements.

The data must then be presented in a form that will maximise its usefulness.
The types of tools which may be useful include:

- Indicators or key performance indicators;
- Metrics - use of indicators to monitor future performance;
- Benchmarks can be generated by comparing to similar national or international standards and can be used to identify best practice.

The main goals of these analyses are to observe flows and links to trace waste/emissions/resource use to where they are produced.

Relevant benchmark normalising parameters for a college campus or other work place can include:

- Floor area basis (m^2) (kWh usage per m^2);
- Per student/staff (kg per student, m^3 per student, tonne per student etc.);
- Per cover served (relevant to canteens e.g. kg food waste per cover etc.).

5 GENERATING OPTIONS

(TECHNICAL DIMENSION)

Generating options is part of the assessment phase of a Sustainable Campus Programme. There are usually a number of prevention options obvious from initial data gathering and analysis. Many of these will be low or no cost options which will address mainly the 'low hanging fruit'. Identifying which projects are most beneficial can be more complicated. By concentrating on the priority cases there is the greatest possibility of a successful project. There are numerous means of generating options. Some of these include:

- Root cause analysis (identify the true cause of wastes and inefficiencies in the system);
- Opportunity identification (brainstorming);
- Preventative improvements – feasibility analysis.

ROOT CAUSE ANALYSIS

Identifying the reason/cause for waste is the first step in designing a prevention programme. It is designed to identify the cause of inefficiencies to devise intervention strategies. We need to find out why this is happening and implement better procedures to avoid waste. Root cause analysis looks at all potential causes of a problem, from materials and machines to work practices.

Root cause is the fundamental reason that a resource is being used, a waste is being produced or inefficiencies exist.

OPPORTUNITY IDENTIFICATION

After the root causes of a particular problem have been identified a number of remedial actions can be devised. To develop innovative solutions brainstorming and reversal are often used to generate a large number of ideas and these can then be whittled down.

Brainstorming is a process in which a group quickly generates as many ideas as it can for a particular problem with no criticism allowed. No discussion takes place during the time allocated for the brainstorming session and all ideas are noted.

Reversal works on devising the means to get the exact opposite of what you are looking for and apply the results appropriately.

FEASIBILITY ANALYSIS

When improvement options have been generated they will need to be evaluated (technically, economically and environmentally). This will identify the most beneficial options. Once the main potential options have been identified a more detailed evaluation can be performed. Technically non-feasible options and options without significant environmental benefits can be eliminated.

Technical evaluation can include:

- Availability/reliability of equipment;
- Product quality etc.

Economic evaluation can include:

- Expected costs and benefits;
- Capital investment;
- Financial savings etc.

Environmental evaluation can include:

- Expected environmental effect;
- Reductions in wastes or emissions.

6 PRIORITISING OPTIONS (INCLUDING COSTING)

(TECHNICAL DIMENSION)

Prioritising options to implement on site is influenced by the assessment phase and the generating options phase. Prioritising options will also be influenced by budget availability and other aspects, such as situational factors, aims and goals (both long term and short term) of the campus or workplace, and technology/ resources available.

Identifying the priority areas through the assessment and options generating phase in an important element in the success of such a project. Very often quick fix options will be easily identified and implemented whereas more complicated (and perhaps more expensive) options may also be important. Prioritising options will depend on the individual campus or workplace situation and the project team will be an important element in this process.

COSTING PROJECTS

Justifying waste prevention requires that all benefits and costs be clearly defined and projected over the life of each option. Costs can be analysed and calculated using various evaluation criteria. A simple pay-back period is calculated by comparison of the annual savings resulting against the initial investment (indicates the time needed to recoup the initial investment).

Cost control is managed by gathering, accumulating, analysing, reporting and managing costs continuously.

Economic evaluation of proposed projects

The costs of any new proposal must always be considered, but we should recognise that projects may fall into three (at least) categories:

- **"Must do"**: these are projects needed to satisfy legal requirements e.g. environmental or health and safety Regulations. These must be done, in a way that is "cost-effective".
- **"Should do"**: these are projects whose benefits will outweigh the costs. The benefits may be more than financial, or may have a financial benefit that is hard to quantify.
  - → Changing canteen food portions or range of food may benefit staff morale and health – but what is the monetary value for this?
  - → Putting in systems to regularly monitor and adjust room temperatures will save energy and perhaps improve working conditions, but while it may be possible to assign a monetary value to energy savings it is difficult to put a value on improved conditions.
- **"Could do"**: these are less attractive projects that have less financial gains and less obvious benefits, but are still desirable e.g. an improved waste management area would look better and would facilitate better segregation and collection of waste.

Having a clear idea of the drivers, objectives, constraints and benefits identifies the importance and urgency of a project.

In order to be **"cost-effective"** we must recognise when the costs arise, and who is responsible for them – which may not be the same as who pays for them! There are a number of costing techniques including:

- **Life cycle costing** is concerned with assessing all the costs incurred by a project, throughout its life. A project will have an initial (capital) cost and may have on-going (operating, maintenance) costs.
    - → Domestically, we realised that CFL bulbs cost more than conventional incandescent bulbs – they have a higher capital cost. However, when we consider the life-time operation of the bulbs, we realise their electricity – operational – cost is lower, and their replacement – maintenance – cost is tempered by their having a much longer life-span.
    - → Installing better insulation has a higher capital cost, but saves on energy costs over the life time of the building.
    - → Specifying a higher efficiency motor may cost more, but the gain will be in the running charges.

Therefore, be prepared to consider the longer term cost implications of a project.

- **Activity based costing** is concerned with attributing the costs of an activity specifically to the activity, rather than allocating it in a general way.
    - → A hospital will have clinical waste, food waste, laboratory and office waste. The charges for each waste type will be different but if they are not linked to the originator there will be a lack of transparency leading to poorer cost management.
    - → A college campus will have hazardous and non-hazardous waste arising from its laboratories and workshops. Segregation of the material and costs might prompt gaining a value for scrap metal and eliminating the hazardous waste when its origins are obvious.

In the past, waste and energy charges were often paid centrally. Allocation of charges to the originator identifies the cause, may prompt steps to reduce and allows distribution of the capital cost of a new project. Assigning budgets is often contentious so having a good measure of costs always helps.

ECONOMIC EVALUATION

Projects can range from several hundred to several million euros in value. As projects become larger, they will be scrutinised more, possibly requiring more sophisticated techniques e.g. Net Present Value (NPV) or Internal Rate of Return (IRR) which consider the "time-value" of money. The Department of Finance provides guidance on project appraisal and determination of value for money for large projects.

7 SETTING TARGETS

(TECHNICAL DIMENSION)

Targets help to motivate and steer a project. Setting realistic and achievable targets for the campus is an important means of generating goals (long term and short term) for the project team and the institute. Setting interim milestones can act as both a focus for the team and also serve as encouragement for further improvement. There are many elements which will drive target setting for a Sustainable Campus Programme.

These can include:

- Legislation
- Regional, national and international benchmarks
- Best practice
- Data analysis
- Aims/goals of the institution

Setting realistic targets can help steer the growth of the programme by realising 'where we are now' and also 'where we want to be'. Targets are also set through different award schemes including the Green Hospitality Programme (GHP) system where teams develop and implement measures to achieve the targets by devising action plans. Benchmarks can be used to compare against other similar institutions and international practice.

Under the European Communities (Energy End Use Efficiency and Energy Services) Regulations 2009, all the public sector will need to reduce the consumption of energy by 33% (private sectors 20%) by 2020. Therefore when devising targets for energy reductions this long term target should be taken into account. See SI:542:2009 and The National Energy Efficiency Action Plan 2009 -2020 for more details.

whatqub did

QUEENS UNIVERSITY BELFAST SET A TARGET OF 21% REDUCTION IN CO_2 EMISSIONS BY 2020 AND TO REDUCE WATER CONSUMPTION BY 3% IN 2010.

whatuc did

THE UNIVERSITY OF CALIFORNIA SET A TARGET FOR GENERATING 10 MEGAWATTS OF RENEWABLE ENERGY BY 2014, AND ACHIEVING ZERO WASTE AND CARBON NEUTRALITY BY 2020.

ENVIRONMENTAL MANAGEMENT SYSTEM

Implementing an Environmental Management System to ensure the institute prepares plans and executes a coordinated programme effectively, is a good step to implementing targets and identifying how they can be achieved. Implementing an Environmental Management System shows a commitment to good environmental practice. An integral element of an Environmental Management System is in the measurement and monitoring of environmental performance which can be used to conduct on-going action plans and performance reviews. Support from top management is fundamental for such an Environmental Management System to be implemented and run effectively.

SHARING INFORMATION

Remember we can all learn from each other and so sharing information and ideas with similar institutions will help broaden ideas and introduce new ways of doing things. Sharing benchmarks and targets with similar institutes will also help with reviewing progress. Sharing information with similar institutions will also help broaden the knowledge base and add to the innovative ideas which may be generated.

Some information from CIT's Sustainable Campus Programme is detailed below

- Waste generation at CIT reduced from 41.07 kg per full-time student in 2009 to 36.12 kg per full-time student in 2010.
- Electricity consumption at CIT reduced from 609 kWh per full-time student in 2009 to 575 kWh per student in 2010.
- Following the installation of boiler controls (M2G) for intelligent load compensating and sequence control and improvements to the BMS system CIT's gas bills reduced by 36% with a financial saving of €4624 in the first 3 months (February to April 2011).
- CO_2 emissions from electricity reduced from 314 kg per full-time student in 2009 to 122 kg per full-time student in 2010 (61% reduction).
- Water consumption in 2009 reduced from 5.1 m^3 per full-time student to 4.93 m^3 per full-time student in 2010.
- Paper sheets per student in 2009 was 1808 and in 2010 was 1734 (4% reduction).

8 IMPLEMENTING OPTIONS

(TECHNICAL DIMENSION)

Implementing options can be conducted in a number of ways and is covered in more detail in the next section for awareness raising, water management, waste management, and energy management.

9 REVIEWING PROGRESS

An important element of a Sustainable Campus Programme is reviewing progress. It is a great motivator for the project team to help see how projects are going, and it is also an effective tool to keep both staff and students motivated.

Keeping staff and students (as well as management) up to date with the project is a good way to help keep people interested in the programme. This can be carried out in a number of ways, for example, through regular newsletters, email and website updates. Constant reviewing of projects will identify any poorly performing areas (or very well performing areas) early in the project so that corrective measures can be made in a timely manner.

This part of the booklet outlines, in more detail, the methods which may be used to bring about a successful Sustainable Campus Programme. It gives methods, tips, and examples – as well as results from the CIT programme...

The methodology breaks the programme into the following areas:

→ **Awareness-Raising**

→ **Water**

→ **Waste**

→ **Energy**

Canteens are major waste producers, and as CIT is a large Institute with notable canteen facilities, we also include a section on

→ **The Canteen**

Other areas of potential environmental improvement include:

→ **Paper**

→ **Transport**

→ **Green Procurement**

HUMAN DIMENSION

AWARENESS RAISING

WHY RAISE AWARENESS?

INTRODUCTION

Awareness raising is an integral element of a Sustainable Campus Programme. Everybody on the campus is part of the problem regarding the environment, so everybody is part of the solution. What we do at all times can have an environmental impact, so improved behavioural options must be apparent for us at all times in our work, in order for us to reduce our impact from energy, water or resource usage.

For any programme of improvement to be successful, it must reach as many people as possible, as often as possible. A highly visible and identifiable programme profile, with its own specific and attractive branding is a key component for success.

Good awareness raising allows for an understanding of people's responsibilities and possibilities. Many improvements can occur from simple awareness raising through events, competitions and websites. The success of a Sustainable Campus Programme will surely depend on the attitude and actions of both the staff and student body on campus. Very often the attitude and actions of the individual depend on their knowledge and skills. Providing the knowledge in an appealing way will help improve the individual's attitude (and therefore their actions) and is hugely important. This 'knowledge – skill – attitude – action' element of human behaviour can 'rub off' on others over time.

what cit did

ALL TOURISM & HOSPITALITY STUDENTS AT CIT RECEIVE 'GREEN' TRAINING AND ELECT A GREEN CHAMPION IN EACH CLASS.

In essence, a Sustainable Campus Programme should have a marketing plan to sell its message to its target group. The message is better behaviour, but it needs to be sold to stakeholders as they will very often have a choice whether to opt in or opt out of the programme.

Waste Awareness Day at CIT, 2010

HOW TO RAISE AWARENESS?

BRANDING

A key element of any product or service that we want to sell is a good brand identity. It is vital to give any Sustainable Campus Programme a distinctive, relevant and attractive brand identity. This should be done at the very beginning of the programme. That way, all activities and tools developed for awareness raising (both inside and outside the campus or workplace) can use this brand and 'stamp' it on the psyches of the stakeholders. The brand will be used in every message and its repetition will stimulate action through association.

The name of the programme itself is important. It should be catchy, short and to the point.

A distinctive logo or set of logos/graphics should also be developed so that it gives the appropriate message of environmental protection.

The logo should be such that it can be used on electronic, paper or poster based tools, in colour and/or black or white.

GREEN CAMPUS CIT

Green Campus Logo for CIT

The logo should also be compatible with, or even incorporate, other logos (such as that of the institute – subject to terms and conditions) that will be used along with it – this gives ownership of the programme and immediately associates it closely with the institution itself, as being an inherent part of the institution's ethos, not just something separate or optional.

A landscape and portrait version would also be useful for different materials. Be sure to get copies of all logos and graphics from the graphic designer in different formats, sizes and for different uses.

European Week for Waste Reduction (EWWR) event at CIT

FOCUS

As mentioned previously, awareness raising must influence everybody on campus, including a wide target group comprising: full-time students, part-time students, younger students, mature students, administration staff, academic staff, technical staff, canteen staff, shop staff, cleaning staff, etc.

The same tools and methods of awareness raising may not be suitable or relevant for all of these groupings. For example, social media such as Facebook could be very useful for the younger people on campus, but many older people will not use Facebook. Email is a good way to communicate with academic staff during term, but not outside term. Thus a range of methods and tools must be developed and utilised, for the different target groups, at different times.

Behavioural change takes time and is difficult to stimulate, so awareness raising must be initiated before, during, and after the campaign, so that it can have maximum effect. Also, people must be made aware of 'why' they are being asked to act in a certain way, as well as 'how' they should act. It is necessary to win hearts and minds in order to convince people to change. Forcing people to do things that they might find strange or inconvenient may not be possible – they must be won over with the merits of the programme or it will not work.

Change can be pushed by 'bad' messages about the thousands of kilowatt hours of energy being used on campus at night,or the millions of sheets of paper being consumed each year. This can work and shock people into action. However, 'good' messages, especially about success stories are even more important to reinforce success and ensure continued good behaviour – making this the norm, (what we always do). Finding a balance here is very important, not to be too negative or too positive at any given time.

Wherever the message relates specifically to an action, the message should be made as close as possible to the action itself – a small poster about switching off beside a light switch or printer is more useful than one on a message board away from the switch.

what cit did

CIT'S GREEN CAMPUS PROGRAMME USED A MIXTURE OF EMAILS, WEBSITE, PUBLICATIONS, NEWSLETTERS, MEETINGS, POSTERS, EVENTS, SIGNS AND COMPETITIONS TO APPEAL TO A WIDE AND VARIED AUDIENCE.

Awareness sign located beside a tap in the Department of Tourism & Hospitality Studies, CIT

The commonly used awareness tools for other messages within the institute should also be utilised – there is no need to reinvent the wheel. Is there a magazine of college news that comes out a few times each year? Take some pages in that.

At the beginning of the campaign see which tools are currently in use and are successful and utilise these to maximum effect.

Green Campus CIT submitted articles and tips to both the 'Learning City Magazine' and the student orientated monthly magazine 'expliCIT' (CIT publications). Green Campus CIT also added information to the Institute's website.

HOW TO RAISE AWARENESS?

TOOLS AND INSTRUMENTS

There are many different tools and means of getting your message across, depending on the target groups, both external and internal. The internal groups are the most important, but it is also very useful to win some kudos outside the institute for the successes achieved – both to replicate this elsewhere and also as a promotional tool for the institute itself. Senior management especially like this, and it gives a sense of pride within the whole campus too (and the general locality) that they are leading the way.

Several tools should be used to raise and maintain awareness levels that during the campaign that will continue throughout the whole programme. These campaign elements are described in the table below:

TOOL/INSTRUMENT	DESCRIPTION
Face to Face	There is nothing like face to face meetings with people to talk about the main issues involved. The green campus facilitator must get to know as many of the stakeholders as possible, especially 'key' people who can help with the programme in different areas, such as canteens, laboratories, classrooms etc. They must develop a high profile on campus and be easily accessible and contactable. However, it's not possible to meet and talk with everybody all the time, so other tools are also necessary.
Website	The programme website is a vital starting point and it should be a long term repository of what it is about and what is being done. It will be especially useful as a starting point for anybody who wants to learn more about the programme. The logos and branding graphics should be widely incorporated into the site and it should be attractive and informative, considering the main target groups. It must be updated regularly and consideration should be given to feeds and links with social media and other tools, to keep it relevant and interesting. The site should be developed using Web2.0 tools so that interaction and multimedia elements can be incorporated easily. See www.greencampuscit.ie as an example.

what cit did

TOOL/INSTRUMENT	DESCRIPTION
Newsletter	This is an electronic newsletter that can be sent to every staff member and every student in the institution. It is easy and free to use. Consideration could be given to sending different newsletters to the staff and students for better focus. The Newsletter can help keep people up-to-date with the programme events and results.
Exhibitions	These can be held in prominent areas in the institution and the green campus campaign can 'piggy back' on more established events that will draw large numbers of staff and students. It is an opportunity to meet people and engage, as well as answer questions.
Competitions	Everybody loves to win a prize. Competitions are another way of engaging students and staff alike. Be sure to take a picture of the winner!
Publications	These can be in the form of progress reports or short manuals/guides during the course of the programme. These should be focused on specific topics and target groups.
Material Exchanges	This is a useful way for people to reuse materials rather then throw them out. CD/ book recycling, clothes swaps are also a good way for students/colleagues to change their wardrobe. A bicycle recycle facility was also run for students moving out of apartments at the end of the year. Bicycles were salvaged as parts or given a second chance.
European Week for Waste Reduction	This is held in November of each year and is a good way to raise awareness of the environment in the institute and to take part in a pan-European project.

A COMPETITION WAS HELD, `GUESS THE WEIGHT OF A BALE OF CARDBOARD'. THIS WAS A FOCAL POINT IN THE WASTE AWARENESS DAY HELD TO RAISE AWARENESS IN THE USE OF THE NEWLY INSTALLED RECYCLING SYSTEM.

A FOOD WASTE QUIZ DURING THE EUROPEAN WEEK FOR WASTE REDUCTION (EWWR) WAS HELD TO RAISE AWARENESS WITH BOTH A STAFF AND STUDENT MEMBER WINNING A RESTAURANT VOUCHER

CIT MAGAZINES: `THE LEARNING CITY' AND 'EXPLICIT' WERE USED TO DISSEMINATE INFORMATION REGULARLY

A LOCAL PRIMARY SCHOOL WAS INVITED TO THE COMPOST EXHIBITION HELD DURING EWWR TO BRING AWARENESS INTO THE COMMUNITY.

TOOL/INSTRUMENT	DESCRIPTION
Green Week/Awareness Day	This is a focused Week/Day of activity and interaction in the institute. It is important to have a wide range of events and activities involving as many different target groups as possible. It should be well flagged in advance and if it is held in the same week each year it can be included in the institute's calendar or diary at the beginning of the year. An awareness day for a specific topic (such as Waste Awareness Day) is another good way of raising the profile of that individual element of the programme.
Catchy Slogans and Launches	Compiling catchy slogans and having launches for different elements can help appeal to a wider audience. For example the CIT Energy Focus slogan 'Switch Off – Plug Out' was used as a message to both staff and students to conserve energy.
Student Induction	Student induction is the first interaction that students will have with the institute, on the first days of their course. This is a very useful time to inform them of the programme and how to participate and behave in accordance with best environmental practice. The programme should get prominent mention in the student handbook each year and 'gifts' such as a USB stick, reusable bag, travel mug etc. could be given to first years to raise awareness.
Pull-Ups/Large Posters	Pull-ups are standalone large posters and these are a very useful tool to move around to different areas of the institute or to show at events inside and outside the campus. A range of these should be developed: on water, waste, energy, food, and on the overall programme itself. They are very useful for photo opportunities and the logos and graphics etc. of the programme can be prominently displayed. Because they can be reused so often, they are quite cost effective.
Signage	Signage in relation to specific topics (waste, water, energy) is covered in more detail in the relevant sections. It is vital to have prominent signage to keep the profile of the programme and the specific topic high. The signage should be clear and consistent and placed at the point of potential waste, e.g. at waste bins, taps, light switches, printers, computers etc. Graphics as well as text should be used to encourage people to read them.

what tcd did

TRINITY COLLEGE DUBLIN HELD A GREEN WEEK 21ST – 25TH FEBRUARY 2011, WHICH WAS A WEEK FILLED WITH EVENTS AND TALKS IN RELATION TO SUSTAINABILITY.

TOOL/INSTRUMENT	DESCRIPTION
Emails	Emails are used widely on campus and there are other news type electronic methods for general institute news – these should be utilised but not over utilised, or else people will 'switch off' and not read them. Don't send messages just for their own sake. Timing of emails can be important, for example sending emails just before coffee break or lunch might initiate interesting conversations between colleagues. Or reminder emails to switch off electrical items in the evenings will be more effective after lunch than early in the morning.
Students' Union	The Students' Union should be involved in the programme as much as possible - the greater the involvement of students, the better the programme will work. One way of ensuring that is to gain SU trust and involvement as early and as often as possible. The Students' Union may have some good innovative ideas for the programme and will serve as a useful feedback source from the students.
Social Media	These are especially useful for students as they use social media such as Facebook very intensively. It may be possible to advertise on Facebook for example, for all students who have listed the institute as their college. Twitter can also be useful for developing a profile inside and outside the campus. More and more people are following Twitter and other groups within the institute will also be tweeting - you can retweet their messages and vice versa to get maximum delivery. YouTube is very useful and consideration should be given to producing a video or videos explaining what the programme is about and what is being done. A blog could also be a good means of dissemination if it is done correctly – it gives an informal and engaging narrative about all the work being done and the findings and successes. Photos and graphics are a vital communication tool and as many photographs of events should be taken during the programme as possible. These photos can then be uploaded onto Facebook, or Flickr or some such application. They can also be used in the Newsletter, put on the Website etc. Social media are interactive and this allows people in the institute to discuss the events, give their feedback and support the work being done. Positive criticism and suggestions should also be taken on board.
International Events	Taking part in events such as Earth Hour and World Water Day can help to re-launch particular initiatives. For example CIT used Earth Hour to refresh the energy focus 'Switch Off – Plug Out' by documenting energy consumption during Earth Hour after asking people to make the extra effort to reduce energy consumption.

what cit did

CIT JOINED ORGANISATIONS WORLDWIDE TO TAKE PART IN EARTH HOUR 2011. CIT REDUCED THE ELECTRICITY USAGE BY 45% DURING EARTH HOUR AS COMPARED TO A TYPICAL WEEK DAY.

The range of tools used to convey any specific message or messages depends on the target group. Not all tools in any campaign will work for every target group. For example: the cleaning staff or other contract staff may not use the institute email system, so other means are necessary to reach that group; Facebook will be more useful to reach students than older staff members.

The matrix shows the different tools and where/to whom these should be applied. This indicates the range of tools and which target group they can most/least impact upon, with xxx being the most impact and x being the least.

It was found that the use of visual (graphic) signs on bins was extremely useful in helping people identify the recycling system for all staff and student profiles. The use of emails as a communication tool was found to be useful for both students and staff members. However, this means of communication was less useful for the canteen, shop and cleaning staff as many did not use email regularly. Similarly for this reason electronic Newsletters had little impact on these staff members. Direct contact (through meetings etc.) with canteen, shop and cleaning staff proved more useful. Information dissemination through websites proved useful for both students and staff members. Students carrying out projects related to sustainability found the Green Campus CIT website a useful source of information. Signs had more impact on the staff members but were useful to students as well once they were constantly refreshed and changed. Information published in different publications was a useful means of information dissemination and project marketing. Different publications targeted to particular audiences had varying effects.

Facebook is widely used by the younger generation and a useful tool to convey messages to the student body. YouTube and blogs are also useful social media to help reach a wider audience. Exhibitions, when well advertised and managed well can be a useful means of spreading the message to a wide and varied audience. Running competitions (often in association with exhibitions or other events) will help to draw student and staff attentions and refresh the sustainability message as an element of campus life.

A successful campaign will have a mix of the tools listed in the table over in order to reach as many people as possible in the diverse population of a college campus or other workplace.

Tools and target groups

	Signs	Publications	Website	Pop-ups	Facebook	YouTube	Blogs	Bin signs	Exhibitions	Competitions	Newsletters	Emails	Direct Contact	Green Week
Full-time Students	xx	x	xxx	xx	xxx	xx	xx	xxx	xx	xx	xx	xxx	xx	xxx
Part-Time Students	xx	x	xx	xx	xx	x	x	xxx	x	x	xx	xxx	x	xx
Mature Students	xx	x	xx	xx	x	x	x	xxx	xx	x	xx	xx	xx	xx
Younger Students	xx	x	xx	xx	xxx	xx	x	xxx	xx	xx	xx	xxx	x	xx
Admin Staff	xxx	xx	xxx	xx	x	xx	xx	xxx	x	xx	xx	xxx	xx	xx
Technical Staff	xxx	xxx	xxx	xx	x	xx	x	xxx	x	xx	xx	xxx	xxx	xx
Academic Staff	xxx	xx	xxx	xx	xx	xx	xx	xxx	xx	xx	xx	xxx	xx	xx
Canteen Staff	xxx	x	x	xx	x	x	x	xxx	x	xx	x	x	xxx	xx
Shop Staff	xxx	x	x	xx	x	x	x	xxx	x	xx	x	x	xxx	xx
Cleaning Staff	xxx	x	x	xx	x	x	x	xxx	x	x	x	x	xxx	xx

x= least impact
xxx = most impact

TECHNICAL DIMENSION

Water MANAGEMENT

WHY DO IT?

OVERVIEW

Increasing water costs are an on-going concern for business both private and public institutions. For large campuses, where there are many different buildings and often unknown distribution networks, the potential for leaks can be large. As water bills are often only received quarterly, the time lag between a leak occurring and bills being paid can result in significant leak related costs. Therefore, regular examination of water metres (on a weekly or daily basis) is essential.

Most large commercial or public sites in Ireland will have more than one local authority metre, as new metres are often installed as sites evolve. In some cases it has been found that older metres are actually redundant yet they are still using water and sites are still being charged. It is therefore very important from the outset of any Water Management Programme that a detailed appreciation of the water distribution network be known.

what a regional airport did

TWO WATER METRES RUNNING ONSITE (AND BEING CHARGED FOR) WERE INVESTIGATED. ONE WAS TURNED OFF COMPLETELY WITH NO EFFECT ON THE SUPPLY, SAVING THEM CHARGES FROM A REDUNDANT METRE!

Another traditional problem with water management in Ireland is the lack of sub-metres would be able to do this based on experience. However, through strategic sub-metering and internal measuring, a high level of control and knowledge of water use around a large campus can be realised with significant associated financial savings.

Once the distribution of water on a campus has been optimised, further savings can be made through improved fixtures and fittings. Water efficient fittings and devices are constantly evolving and retro-fitting these can be a cost effective element of a Water Management Programme. In any new areas of construction on a campus such fittings should be given high priority.

remember

WHEN IT COMES TO WATER MANAGEMENT, FIRST CONTROL WHAT YOU ARE BEING SUPPLIED WITH AND SECONDLY IMPROVE HOW YOU USE WATER AROUND YOUR SITE.

HOW TO DO IT?

As with all prevention programmes, and as detailed earlier, the basic principles of a prevention programme should be followed.

These are:

1. Initial assessment
2. Option generation based on findings from the assessment
3. Prioritising options based on costs and opportunity
4. Implementing options
5. Review of results

1 INITIAL ASSESSMENT

WATER BILLING & METERING

Metering water to identify where (and when) water is being used within your campus is a very useful tool in devising strategies to reduce the consumption of water for individual buildings/departments and the campus as a whole. There are two key aspects to water metering – monitoring and assessing your mains water supply and, internal sub-metering within your site.

A first step for any large campus is to be aware of all your local authority metres, where internal pump houses or wells are located, and to regularly monitor these. Regular monitoring of these, whether manually or through a data logging system, ensures quick responses to leaks should they occur and prevent the possibility of excessive leak related bills. In the case of on-site well water supply, the costs of running these systems is often overlooked. However, wastewater charges may apply as well as pumping and/or treatment costs so these should also be considered.

Sub-metering is an excellent way to determine where and when water is used on your campus. Installing sub-meters in key areas such as canteens, laboratories, sports areas, and individual buildings can help build up a knowledge base of patterns of water consumption on campus (rather than one metre which shows the overall water usage of the campus). If you have multiple local authority metres, this can act as a form of sub-metering - provided you have knowledge of the distribution network associated with each meter. However, there are annual charges associated with each local authority metre so if these metres are close to each other it may be better to consolidate and then metre internally.

Example of 3 local authority metres consolidated into one. (There was a leak found during this work as well!)

GATHERING ON-SITE INFORMATION

Gathering information on water use from your metres can be done manually or electronically these days electronically using data loggers. Whichever method is used, make sure that readings are analysed at least weekly or ideally on a Friday and Monday – this will ensure that issues that occur on weekends are flagged early. If you do not have a data logging facility on your site, then a regular metre-reading schedule should be implemented.

Water metre

For **manual readings** ensure that a person is assigned this task. Recording this information manually is facilitated by having easy to use templates (for example an easy to use excel file). Data should be recorded and the values graphed to show trends and identify potential leaks. If you have multiple metres, note which metre is being read, record your reading and examine trends for any major anomalies.

what cit did

PRIOR TO THIS GREEN CAMPUS PROGRAMME WATER USE WAS NOT MONITORED ON A REGULAR BASIS. A FIRST STEP WAS TO DATA LOG WATER USE INFORMATION FOR 2 MONTHS TO PROVIDE SITE WIDE DATA. CIT REDUCED THE WATER CONSUMPTION BY 4% PER STUDENT IN 2009 THROUGH IDENTIFYING HIGH USE AREA AND RETROFITTING APPROPRIATELY.

In large, spread-out institutions, using **electronic data loggers** makes it much easier to record water use and to identify water use patterns. Data loggers are non-invasive and clamp on to existing metres, with the data being sent directly to a computer or to your Building Management System (BMS). These provide real time water flow readings, and modern systems can have multiple metres being recorded.

As they record data in real time, and as most systems have in-built alarms which will send email and text alerts to a designated person if spurious readings occur, they are ideal for promptly identifying leaks/pipe bursts should they occur.

Example of online water monitoring information from an electronic data logger

If you have a well sub-metered site, data logging all metres will provide a very detailed assessment of all water flows throughout the site. This can help identify problem areas (or times) and to focus attention where targeted intervention strategies would be most beneficial. Where high use areas or buildings are logged (e.g. canteen or sports arenas) examining peaks in water use will provide information on water use patterns and these can subsequently be further investigated for prevention opportunities.

what cit did

LEAK DETECTION AND DATA LOGGING TO IDENTIFY CONSUMPTION AND THE MINIMUM NIGHT FLOW (MNF) WAS CONDUCTED ON SITE. INITIALLY THE MNF WAS CALCULATED AT 29 LITRES/MINUTE AND FOLLOWING ADJUSTMENTS TO URINALS AND MENDING A LEAKING SHOWER ON SITE THE MNF WAS REDUCED TO 3 LITRES/MINUTE. THIS ACTION COULD LEAD TO POTENTIAL SAVINGS OF €36,000.

A good initial exercise is to examine the minimum night flow in an area once daily activity has stopped – this is often referred to as **Night Flow Monitoring.** This will give you a baseline water use value and if there is a leak or other wasteful practices occurring, for example, urinals running constantly, these can then be targeted. The night-time test can be performed manually or using data logging equipment.

Water surveys are an essential element of a Water Management Programme. These examine the flow rates from fixtures and fittings and these can then be compared with best practice volumes. For example, a flow rate of 3 litres/minute from a hand wash tap is considered very good. This is especially important for hot water taps which have an associated heating cost as well.

what cit did

ALL TAPS THROUGHOUT CIT WERE SURVEYED FOR FLOW RATES. 761 TAPS WERE EXAMINED AND THE LOWEST FLOW RATE WAS 2 LITRES/MINUTE AND THE HIGHEST 35 LITRES/MINUTE. 72 SHOWERS WERE ALSO EXAMINED WITH FLOW RATES RANGING FROM 4 LITRES/MINUTE TO 9 LITRES/MINUTE. RETRO-FITTING WAS CARRIED OUT - PRIORITY WAS GIVEN TO HIGH USE AREAS.

Determining flow rates from taps, showers etc. can easily be conducted with **flow cups** or the 'bucket and stop watch' method. These will identify how your fittings perform compared with best practice. Simple flow restrictors and tap aerators can be installed (retrospectively) to lower the flow rates on taps without compromising the feeling of high flow.

Replacing older showerheads with modern fittings can significantly reduce water use in showers. These fittings use a pulse mechanism that reduces water consumption without diminishing the 'power' of the shower!

Flow cup

what cit did

MOST OF THE SHOWERS IN CIT HAVE RECENTLY BEEN UPGRADED AND AVERAGE FLOW RATES OF 7.5 LITRES/MINUTE WERE RECORDED. THIS COMPARES WELL WITH BEST PRACTICE WHICH IS 12 LITRES/MINUTE.

what they did

THE AVIVA STADIUM AND THOMOND PARK HAVE INSTALLED WATERLESS URINALS ON SITE AS PART OF A TRIAL TO REDUCE WATER CONSUMPTION.

For toilets and urinals quick fixes in reducing water consumption include changing tank sizes, installing hippo bags, retro-fitting dual flush mechanisms, etc. Simple modifications to ball cocks can reduce water use on site - this is a simple no cost method of improving water consumption on campus. Waterless urinals are becoming much more common recently in large arenas like the Aviva Stadium and Thomond Park.

ON-SITE AWARENESS AND REPORTING

Staff involved throughout the site should be made aware of the on-going maintenance required to ensure efficient use of water. Any leaks should be reported to the Estates department straight away – inclusion of the staff is essential in minimising losses due to small day-to-day water issues. All tanks should be checked regularly for leaks/overflow. Regular visual inspections of on-site taps/pipes/valves/toilets can help eliminate unnecessary water loss through leaks or faults onsite not being identified quickly.

what cit did

DUE TO ON-GOING MONITORING A WATER LEAK WAS SUSPECTED AT CIT IN JULY 2010 OF 35 LITRES/MINUTE. UPON FURTHER INSPECTION IT WAS FOUND THAT A NUMBER OF WATER TANKS ON THE ROOF WERE OVERFLOWING. THESE WERE REPAIRED AND THE INSPECTION SCHEDULE REVISED.

2 OPTIONS GENERATION

Once information has been gathered from around the campus on bills, metres, patterns of use, flow rates, etc. there are many possible options to reduce water consumption. The selection of which options to pursue depends on the results of the particular assessments on your site, financial considerations and on-site expertise/resources.

OPTION GENERATION

In general, the options may be divided into a number of generic categories. These are:

REPAIR OF LEAKS	Mains underground Taps, valves, fittings, etc.
REDUCE FLOW TO TAPS	Flow restrictors Air assisted taps
TOILETS	Reduce water use in urinals Solenoid valve and timer Sensors Displacement measures Waterless urinals
REDUCE WATER USE IN CISTERN TOILETS	Dual flush (at least) Hippo bags Other displacement measures
KITCHENS/ CANTEENS	Train kitchen staff in 'washing techniques' Triggers on hoses
SHOWERS	Low flow rate showerheads

Flow restrictor on tap at CIT

Trigger hose at the Bistro kitchen, CIT

3 OPTIONS PRIORITISATION

Opportunities identified from the initial assessment phase and the option generating phase based on findings from the assessment can be prioritised depending on the findings at your campus. Prioritising options depends on the results of the particular assessments on your site, financial considerations and on-site expertise.

Different options in particular areas may offer a quick fix, for example, taps can be fitted with flow restrictors. Areas with high footfall can also be prioritised. Option prioritising may depend on:

- Finance available
- Viability of option
- Pareto - 80:20 rule (80% of effects count for 20% of causes)

Water consumption can be reduced using a range of "no" and "low cost" measures including increasing awareness of water consumption amongst staff and students, altering flow rates and mending ball-cocks etc.

4 OPTIONS IMPLEMENTATION

Implementing projects to reduce the generation of wastes in a system is a major element of a Sustainable Campus Programme. Keeping people informed of the status of different projects is a useful way to help keep people interested in the programme.

Options devised may vary from very technical projects to the more 'softer' awareness raising measures. Whatever the improvement option devised good planning and a detailed project scope will help avoid project creep. Any successful project will involve a good project brief (scope) – which will often include a time and cost schedule as well as defined risks.

what cit did

FOLLOWING A WHOLE CAMPUS WATER SURVEY AT CIT WHERE FLOW RATES WERE TAKEN FROM EVERY TAP, SHOWER, URINAL ETC. THE TOURISM & HOSPITALITY BUILDING WAS IDENTIFIED AS HAVING HIGH FLOW RATES FROM TRAINING KITCHEN TAPS (AVERAGE 32 LITRES/ MINUTE). THESE TAPS WERE FITTED WITH FLOW RESTRICTORS TO BRING THE FLOW RATES FROM THESE TAPS TO 7 LITRES/MINUTE. THAT IS AN INSTANT SAVING OF 78% IN WATER CONSUMPTION FOR THESE TAPS.

WATER USAGE FROM URINALS WAS IDENTIFIED AS SUBSTANTIAL FROM THE ASSESSMENT PHASE AND SO WATERLESS URINAL TRIALS WERE CONDUCTED ON CAMPUS. IT WAS DECIDED THAT INSTALLING SENSORS IN URINALS TO REDUCE THE WATER CONSUMPTION WOULD BE MORE SUITABLE FOR PARTICULAR AREAS AND SO 12 URINAL SENSORS WERE INSTALLED ON SITE. WHERE ONLY ONE URINAL BOWL WAS LOCATED SIMPLE PUSH BUTTONS WERE INSTALLED.

5 REVIEW OF RESULTS

A system to constantly monitor and review should be set up. Feedback from users is also useful in identifying projects that may need review. From the initial assessment gaps in the knowledge of water consumption may have been identified. Installing an easy use monitoring system including sub-metering will help to better analyse and review the Water Management Programme implemented on campus, including usage after installation of improvements.

ADDITIONAL RELEVANT INFORMATION

Human side of water conservation

As with energy conservation, the human element of water conservation is of huge importance to a successful Sustainable Campus Programme. Raising awareness and constant promotion can help improve various behavioural aspects and with people's mind-set in relation to water conservation. Simple training for example, using the sink plug for washing fruit and vegetables instead of letting the tap run, and having a system in place to report drips/leaking taps are simple measures to help conserve water on campus.

Did you know?

- A dripping tap at one drop per second = 4.8 m^3 per year (approximately €12/year)
- A faulty toilet can cost as much as €1000 a year from leaking water if not fixed, while a new ball-cock will cost no more than €15!
- Hot water can cost as much as 6-7 times more than cold water (because of the energy needed to heat it).

Replacing old or faulty fittings with high efficiency ones is an easy way to save water and money.

Leak detection

Leak detection is often a job that will need professional assistance. External contractors can use 'noise loggers' on hydrants to pick up leak noise during the night time. Substantial water loss can result from undetected leaks.

Noise logger at CIT to detect water leaks.

remember

THE CHEAPEST (AND EASIEST) WAY TO HANDLE WASTE IS TO PREVENT IT AT SOURCE!

6 inch pipe leaking 9 litres/second

Repaired pipe with flanged adapters

what cit did

DURING DATA LOGGING ON SITE, CIT IDENTIFIED A SUBSTANTIAL LEAK IN JANUARY 2010 AT 9 LITRES/SECOND. A CRACKED 6 INCH PIPE WAS REPAIRED USING FLANGED ADAPTERS.

SUMMARY

1.	Identify all metres
2.	Record water data from metres
3.	Evaluate use patterns
4.	Night test
5.	Sub-metre
6.	Fix leaks (leak detection)
7.	Internal assessment – flow cups
8.	Improve fixtures and fittings
9.	Constantly monitor and target, set up a system
10.	Promote

TECHNICAL DIMENSION

Waste MANAGEMENT

WHY DO IT?

OVERVIEW

As generators of solid waste, individuals and institutions are at the core of implementing integrated waste management systems. Waste management is a significant issue at all work places and can also be a considerable cost. The success of a Waste Management Programme depends on the actions of each person, but also on the design of facilities available and the level of awareness within the institute.

The needs of the institution must to be identified in order to generate a successful waste management system for a wide and varied range of social groups, i.e. library users, canteen users, laboratory users, office workers, visitors, sports grounds, staff, students etc. Programmes that are complicated or poorly communicated may have low participation levels compared to a system that is easy to use and well communicated. People also need to be motivated to use bins correctly and practice solid waste prevention actions in their daily campus or workplace life. This can be achieved through many awareness raising and knowledge developing techniques as mentioned in the section on awareness raising.

HOW TO DO IT?

1 INITIAL ASSESSMENT

WASTE BILLS AND REPORTS

Bills and reports from waste contractors are useful indicators of waste behaviour on site. It is important that you understand the reports and discuss the format with your contractor to ensure they are presented in an easy to understand fashion. Reports and waste bills are very useful tools to help keep an eye on waste management activities and also to track how new initiatives may be going. It may be useful to look at old bills and reports to build up an idea of waste patterns for a full year/number of years.

what cit did

CIT REDUCED OVERALL WASTE GENERATION BY 7.3% IN 2010 DESPITE THE INCREASE IN STUDENT NUMBERS ON CAMPUS BY 5%.

GATHERING ON-SITE INFORMATION

Gathering waste information on site can be carried out in a number of ways. The main way to find out exactly what waste activities are taking place and what is entering the waste stream apart from analysing waste bills is to conduct a waste audit.

Waste generation investigations – Why?

- To see where improvements can be made;
- To identify problem areas/well performing areas;
- To identify problem products (e.g. particular items entering the wrong waste stream, particular bin type not performing well etc.);
- To generate targets and set priorities for further investigation;
- To investigate facilities required e.g. new bins – better signage, additional segregation, training etc.

what cit did

A FULL DAY WASTE AUDIT WAS CONDUCTED ON CAMPUS IN OCTOBER 2010. THE AUDIT IDENTIFIED LARGE QUANTITIES OF WASTE EVERY DAY (1.2 TONNES) WITH A HIGH ORGANIC CONTENT (37%). PAPER AND CARDBOARD WASTE MADE UP 31% OF GENERAL WASTE WHILE PLASTIC COMPRISED 13%. LIQUIDS MADE UP 7%.

A **waste audit** is a very useful tool to investigate quantities of waste generation, recovery rates, success of segregation bins, contamination rates etc. An important element in conducting a waste audit is to also show where problem areas/well performing areas are located.

Facilities must be available and easy to use for optimal waste management. Signage and on-going awareness are also hugely important elements of any Waste Management Programme. A waste 'walk around' to visually check bin contents can be a useful visual indication of how bins are being used and identify any problem or very well performing areas. The presence of an individual checking bin contents can also remind people to use recycling bins correctly.

2 OPTIONS GENERATION

It can be useful to carry out a bin inventory of the campus detailing the quantity and type of different bins and mapping them to help draw a clear picture of your facility. Many institutions will have accumulated varying types, sizes, and colours of bins over the years and it may be useful to adopt a uniform bin type and colour system to ensure optimal use of a recycling system. People will become accustomed to recognising bins and how to use them if there is a uniform system in place throughout the Institution.

what cit did

A BIN INVENTORY CONDUCTED AT CIT REVEALED A CAMPUS WITH AN AD HOC SYSTEM IN PLACE - LARGE NUMBERS OF BINS OF DIFFERENT TYPE, SIZE AND COLOUR WITH RELATIVELY LITTLE SIGNAGE TO INDICATE WHAT BINS WERE FOR RECYCLING. THE INTRODUCTION OF A NEW RECYCLING SYSTEM BROUGHT A UNIFORM COLOUR CODED SET OF BINS TO HELP STUDENTS AND STAFF RECOGNISE BINS AS THEY MOVE AROUND THE CAMPUS.

Talk to different departments about their waste requirements. Laboratories will generate different waste to a general classroom, and training kitchens will generate different waste compared to offices etc.

3 OPTIONS PRIORITISING

Prioritising options for waste management will depend on the initial assessment and options generation carried out for the campus. Projects prioritisation will also be dependent on finance available. Up-coming legislation may also guide the options prioritisation.

what cit did

CIT INTRODUCED A NEW BIN SYSTEM IN THE CANTEEN IN MARCH 2010. A NEW FOOD WASTE BIN WAS INTRODUCED TO DEAL WITH THE LARGE QUANTITY OF ORGANIC WASTE IDENTIFIED IN THE WASTE AUDIT CONDUCTED ON SITE.

what cit did

CIT INTRODUCED A NEW RECYCLING BINS SYSTEM IN SEPTEMBER 2010. THIS SYSTEM INCLUDED A THREE BINS SYSTEM LOCATED IN SELECTED RECYCLING POINTS AROUND THE CAMPUS. EACH SET OF THREE BINS PROVIDED A UNIFORM STRUCTURE COLOUR CODED FOR DIFFERENT WASTE STREAMS.

Working with shops and canteens on-site to devise methods of waste prevention and choosing products that have less packaging is important, so that all sectors of the campus are working together to reduce waste generation and increase recyclables segregated. Working closely with the cleaning staff will also give a better understanding of general waste practice and ways in which it can be improved. It is easier to see what waste streams are in clear bags rather than black bags. Biodegradable bags should be used for the food waste stream that is being sent for composting.

what cit did

CIT HELD A WASTE AWARENESS DAY TO INCREASE AWARENESS. HUNDREDS OF STUDENTS VISITED THE STAND TO ENTER THE 'GUESS THE WEIGHT' OF A BALE OF CARDBOARD COMPETITION AND ASK QUESTIONS IN RELATION TO WASTE MANAGEMENT AT CIT.

recycle your bicycle

RECYCLE YOUR BICYCLE WAS HELD AT CIT IN MAY WHEN STUDENTS WERE MOVING OUT OF THEIR APARTMENTS. OLD BIKES WERE SALVAGED AND SENT FOR RECYCLING AND MANY PARTS WERE REUSED BY THE BIKE SHED IN CORK

Recyclable bin contents CIT

Recycling station at CIT

4 OPTIONS IMPLEMENTATION

As with implementing options for water management, options devised for waste management may vary from very technical projects to the more 'soft' awareness raising measures. Whatever the improvement option devised, good planning and a detailed project scope will help avoid project creep, which will often include a time and cost schedule as well as defined risks.

Once options for the improvement of waste management have been identified they need to be implemented in a clear way that will promote support from both the student and staff body. It is important to discuss any changes that will be made with the relevant people or department, particularly staff that will be dealing with waste on a regular basis, for example, the cleaners.

When implementing a new system or altering an existing waste system it is important to keep people informed of why changes are being made or why they should act in a particular way as well as how to act.

Tidy waste yards with effective signage can help deal with different workers that may have access to yard bins to dispose of waste. Tidy and clean waste yards also give a good impression to any visitors and users that waste management on site is very important.

Liquid side pod on a bin at CIT

5 REVIEW OF RESULTS

Projects implemented should constantly be reviewed and monitored. A system to constantly monitor and review should be set up. Feedback from users is also useful in identifying projects that may need review. From the initial assessment gaps in the knowledge/facilities provided or waste generation may have been identified. Installing an easy to monitor system (monthly reports, regular visual inspections, meetings with relevant on the ground staff) will help to better analyse and review the Waste Management Programme implemented on campus. Constant review of projects will help to quickly identify areas that may not be performing well and allows for early alterations to a project to ensure optimum results from a particular project.

ADDITIONAL RELEVANT INFORMATION

Waste contractor

Only licensed waste management companies should be used by your institution. They should provide you with a copy of their licence. A list of licenced contractors is available from the EPA and also your local authority. It is important to take a detailed look at waste management requirements and identify the best contractor to suit your situation. Talk to your waste contractor about your waste and how best to manage it. Important elements will include:

- Tariffs/charges for economic savings (service exchange, rental, disposal);
- Service available for recycling etc., waste segregation;
- Charges for skips, bins, compactors – rent/buy;
- Reporting facilities/reporting detail (graphs, tonnages etc.);
- Possible rebates;
- Signage and awareness raising.

Housekeeping

Bins should be kept in good condition and protected from rain. Such rain entering will make waste heavier and therefore more expensive to dispose of. Open skips available for everyone to use can result in uncontrolled usage.

Label bins/skips clearly and keep the waste yard litter-free and clean. This will make it easier to identify where different waste streams should go, and so help keep segregated or recyclable materials more organised. Ideally there should be a designated waste yard for waste storage and servicing.

Good clear signage and catchy slogans are important in raising awareness as previously discussed in the awareness raising section.

what ait did

ATHLONE INSTITUTE OF TECHNOLOGY INTRODUCED A NEW WASTE MANAGEMENT SYSTEM IN FEBRUARY 2011 TO HELP IMPROVE WASTE MANAGEMENT.

HAZARDOUS WASTE

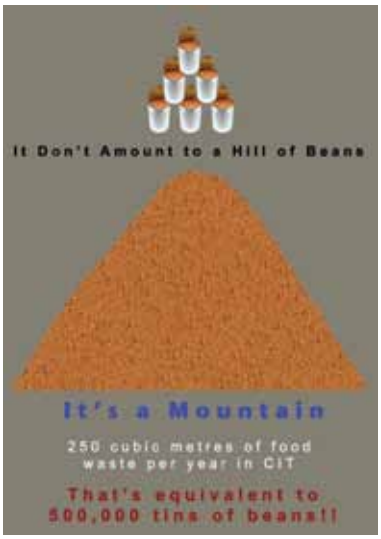
A campus or other organisation will generate hazardous waste. It is important that this waste is identified, stored safely, and disposed or recovered by contractors who are licensed to handle hazardous waste. Records of consignments are legally required to be held.

The types of hazardous waste that should be considered include:

- Batteries. Free collection and suitable collection boxes for small portable batteries are available through a producer responsibility initiative – see www.epa.ie/whatwedo/resource/battery
- Fluorescent tubes. Special boxes are available to minimise breakage.
- Aerosols, paints containing solvents, pesticides.
- Certain waste electrical equipment – e.g. fridges containing its refrigerant, CRT screens.
- Specialised waste from particular departments e.g. chemical, biological, or radiological waste from laboratories; clinical waste from healthcare centres; oils, brake fluids, lead acid batteries and end of life vehicles from automobile departments; waste machining oils; oil based paints and thinners from arts departments, and certain pigments from ceramic departments; photographic chemical waste.

SUMMARY

1. Identify waste streams
2. Record waste data
3. Evaluate generation patterns
4. Conduct detailed waste audits
5. Perform targeted assessment
6. Review facilities
7. Improve facilities
8. Constantly monitor – set up a system
9. Promote



Example of Green Campus posters used at CIT

TECHNICAL DIMENSION

energy MANAGEMENT

WHY DO IT?

OVERVIEW

Energy consumption and costs can be substantial for an institution. Due to the nature of a campus or work-place setting, (for example, large numbers of computers and other electrical equipment), energy consumption is a major issue for many institutions.

Energy management is an all-encompassing process that should include every aspect of an organisation from finance and maintenance to purchasing and planning. Energy management is not just a one-off exercise. To be effective it needs to be an on-going process. Support from both students and staff to switch off electrical items when not needed is a very important element of getting people involved in active energy conservation. An energy champion to ensure that communal printers/photocopiers/laboratory equipment are switched off in the evenings, and when not required, can be a great help to in making people more aware of energy conservation in the office/classroom.

Energy consumption investigations – Why?

- Wasting energy causes avoidable pollution
- Wasting energy increases costs
- Helps to find out what the situation is on site
- Helps to identify ways to improve it

what cit did

CIT REDUCED EMISSIONS OF CO_2 BY 54% IN 2010

what msu did

MICHIGAN STATE UNIVERSITY HELD A 'DIM DOWN' EVENT IN APRIL 2011 TO RAISE THE PROFILE OF ENERGY CONSERVATION ON CAMPUS

HOW TO DO IT?

1 INITIAL ASSESSMENT

ENERGY BILLS AND METREING

Historical energy bills are a good place to start with past energy consumption pattern investigations. Energy bills are often estimated, so taking monthly metre readings yourself can be helpful. It is also important to learn how to read your energy bills correctly. Most electricity bills are similar and will contain the same information in varying formats.

Account number
This is your unique account number (usually appears in the top corner of your bill)

MPRN
This is the Metre Point Registration Number and it identifies your connection to the network

Billing Period
The period of time your bill is for - will also be shown on the bill

Charges
A detailed breakdown of charges will be given on your bill (often on the back of your bill)

Fuel mix disclosure
The shows the amount of different fuels e.g. gas, oil, and renewables used to generate electricity. CO_2 emissions per kWh will also be indicated (usually on the back of the bill)

MIC
Maximum Import Capacity is the level of electrical capacity contracted by the account holder.

GATHERING ONSITE INFORMATION

Data analysis

It is important to find out where energy is being used and when it is being used on campus. Gathering this information can answer many questions, such as

- Are there times showing particularly high consumption peaks?
- Can they be explained?
- Where are the heavy users?
- Who are the heavy users?
- Can they be avoided?

Information can be gathered by installing an energy metering system or simply by doing a walk around the campus at different times during the day/night/weekend. An unannounced energy audit can be a useful means to see where (and by whom) electrical items are being left on unnecessarily. This can be a useful means of identifying ways of minimising consumption outside working hours e.g. downtime (evening and weekend).

The purpose of energy data collection and possible data interpretation

Collecting data (for example through surveys, energy metres, and energy bills) will mean that you have a grasp of the energy consumption patterns and a list of major energy users which will help with focusing time/resources on particular areas. Data can also serve as a basis for cost calculations to allocate the use of energy to the individual sources of consumption. Priorities for energy saving measures and purchasing guidelines can be devised.

Analysing the amounts of energy used by individual sectors or departments will enable you to set priorities for further targeted investigation and intervention. Once the major energy using areas have been identified, and where possible compared with benchmarks, then potential improvement options can be addressed. Improvement options can be devised simply by speaking with the relevant personnel and discussing simple improvement options or more technical intervention measures may be suitable should a budget be available. Registering for the Sustainable Energy Authority of Ireland SEAI Energy Map system – Advice, Mentoring & Assessments Programme can be a very good first step in setting an energy improvement system in place and putting together a list of actions to be completed within specific time frames for different cost levels.

what cit did

CIT CONDUCTED AN UNANNOUNCED WEEKEND ENERGY AUDIT IN 2009 AND FOUND THAT 34% OF COMPUTERS WERE LEFT TURNED ON WHILE 24% OF PRINTERS WERE LEFT TURNED ON OVER THE WEEKEND. THIS RESULTED IN THE SWITCH OFF – PLUG OUT CAMPAIGN TO TACKLE THE BEHAVIOURAL ASPECT OF ENERGY CONSERVATION.

Energy Audit at CIT found numerous computers and printers left on at the weekend.

Computer and accessory power consumptions were measured by the Clean Technology Centre and presented in the table below.

Item	Status	W
PC	ON	58 - 117
PC	Standby	11
PC	OFF	11
Monitor - CRT	ON	60
Monitor - CRT	Standby	16
Monitor - CRT	OFF	16
Monitor - LCD	ON	37
Monitor - LCD	Standby	7
Monitor - LCD	OFF	7
Speakers	ON	11
Speakers	OFF	9
Mac	ON	62
Mac	OFF	20
Mac Monitor	ON	20

It is interesting to note the power consumption of computers when turned off. To save energy usage computers must be switched off at the wall or plugged out. This is an example where the human attitude/behaviour element in the conservation of energy is hugely important, particularly in a third level campus, where the quantity of computers and other electrical equipment can be significant.

what cit did

CIT TOOK PART IN EARTH HOUR 2011 AND REDUCED ENERGY USAGE BY 45% COMPARED TO A TYPICAL HOUR DURING THE WEEK FROM A MIXTURE OF HUMAN ACTIONS (SWITCHING OFF ITEMS) AND TECHNICAL ELEMENTS (TIMING OFF ELECTRICAL ITEMS).

2 OPTIONS GENERATION

Depending on the results of the assessment phase, different options will be generated which are specific to your site. Once the human behavioural method has been addressed the next step can come from technology. Combining the human dimension with technology is important to achieve optimal results.

Examples of useful technology to conserve energy;

- Timers to switch off items automatically;
- Sensors on lights;
- More drastic measures to switch off power supply to particular areas at certain times;
- Energy efficient equipment;
- Energy efficient lighting fixtures.

3 OPTIONS PRIORITISING

Prioritising options for improved energy efficiency on campus will depend on the results from the assessment phase and also options generating. Finance will also be a consideration, although application for external funding may help here. The aims and targets of the institution should also be taken into consideration in implementing projects to improve energy efficiency.

4 OPTIONS IMPLEMENTATION

Keeping people informed of changes and improvements made can be an important element in helping to keep the support of staff and students that are so important in a successful energy saving programme. The human element of energy projects, such as asking people to switch off items when not required will be totally reliant on individual behaviour. On the other hand, implementing new technology that, for example, cuts the power to a computer room at a particular time, may be regarded as a more extreme measure that bypasses the reliance on human behaviour. Options devised may vary from very technical projects to the more 'soft' awareness raising measures. Whatever the improvement option devised, good planning and a detailed project scope will help avoid project creep, which will often include a time and cost schedule as well as defined risks.

what harvard did

HARVARD HELD AN EARTH MONTH IN APRIL 2011 IN SUPPORT OF EARTH DAY TO PROMOTE SUSTAINABILITY

5 REVIEW OF RESULTS

Results from implementation of energy efficiency projects can be tracked using energy bills and if a metering system has been installed to electronically record energy consumption this software can be used to review results at a small scale. Savings made in emissions as well as kWh usage and costs should be constantly reviewed. Major changes in consumption can be investigated more quickly if constant review of consumption is carried out.

ADDITIONAL RELEVANT INFORMATION

Lighting

Conducting a light audit will identify the types and quantity of lights and also help you to devise an improvement plan.

There are three main ways to reduce the amount of energy used for lighting:

- Energy efficient bulbs;
- Reflective housings;
- Lighting controls (manual, motion, time, photo-electric, mixed controls);
- Good housekeeping (clean fittings/housing regularly).

Carrying out research into different lighting systems is an important element in making the best decisions for your situation. Price, performance, lifespan and maintenance should all be addressed when devising a new lighting plan.

what we did

THE BUILDINGS & ESTATES OFFICE AT CIT CARRIED OUT EXTENSIVE RESEARCH INTO NEW LIGHTING SYSTEMS FOR THE INSTITUTE INCLUDING INPUT FROM STUDENT KNOWLEDGE BASE.

what cit did

THE CIT CANTEEN REPLACED ALL LIGHTS WITH ENERGY EFFICIENT FIXTURES SAVING MORE THAN €7000 ANNUALLY.

- Tungsten bulbs generate a lot of heat when being used. This is a waste of electricity and is why they are being phased out. Using Compact Fluorescent Lights (CFLs) will achieve the same light but generate much less heat, saving up to 70% on electricity costs.
- Fluorescent tubes can be replaced with T5 fluorescent tubes.
- Incandescent spot lights can be replaced with CFLs and Light Emitting Diodes (LEDs). Incandescent spot lights are inefficient and tend to blow often due the heat they generate. CFLs and LEDs are much more efficient and last a lot longer.
- LEDs are also available for outside floodlights and are very efficient, long-lasting, reducing maintenance requirements.
- Natural light fittings can work very well in many situations.

Newly installed lights at the Clean Technology Offices at CIT

FLOOD LIGHTS

Since 2009 CIT has installed over 100 units of LEDs floodlights. 400W lights in external areas were replaced with 90W LEDs making significant savings for CIT in load consumption and also reducing the amount of maintenance required.

Nexus Building (Student Centre)

44 units of 400W metal halide lights were replaced with 22 units of 90W LEDs and 22 units of 30W LEDs saving over 80% with a payback of less than 2 years.

The Clean Technology Centre (CTC)

The Clean Technology Centre relocated in 2010 which gave it the opportunity to install highly efficient energy units. The retro-fit of this building is next generation in office lighting. The LED light panels (a total of 44 units at 53W) are used in conjunction with natural light fittings saving 66% in energy consumption compared to the conventional proposal of 86 units of 4x18W recessed T8 modulars. These fittings contain no toxic gases and are over 90% recyclable.

Tourism & Hospitality Lecture Theatre

The main lecture theatre at CIT's Department of Tourism & Hospitality Studies has a 7m drop at the front of the room. The use of long life LED panels has resulted in low maintenance requirements and good energy performance. The lecture theatre consume 954W.

FLUORESCENT TUBES AND CFLS SHOULD NEVER GO INTO THE GENERAL WASTE AS THEY CONTAIN SMALL AMOUNTS OF MERCURY. KEEP USED ONES IN A SAFE PLACE AND DISPOSE OF APPROPRIATELY.

what harvard did

HARVARD ACHIEVED A 7% OVERALL REDUCTION IN GREENHOUSE GAS EMISSIONS 2006 - 2009

what cit did

CIT HAS SAVED BETWEEN 65% AND 80%W ON PROJECTS TO REPLACE LIGHTING WITH LED OR BY INCORPORATING LED AT DESIGN STAGE OF NEW BUILDING PROJECTS. PROJECTS INCLUDED LECTURE HALLS, COMMON AREAS, EXTERNAL LIGHTING AND OFFICE SPACE ILLUMINATION.

ENERGY SUPPLIER

It is important to take a detailed look at energy suppliers and find the best supplier to suit your requirements. Cost is likely to be the priority for the Institution but there are other important factors that should also be considered.

- Tariffs etc. for economic savings;
- Environmental emission factors;
- Night time/day time/weekend charges;
- Reporting facilities/reporting detail (graphs, on-line access, kWh detail, etc.).

IN THE BOILER HOUSE

Boilers need to have regular efficiency tests carried out. Also, the age and number/type of boilers should be reviewed with a view to eventual replacement of inefficient boilers. Consideration could also be given to the introduction of combined heat and power (CHP) plants, and to computerised control systems, which can dramatically increase actual operating efficiencies. All hot pipes, etc. should be adequately lagged. CIT has 34 boilers of differing types, sizes and ages. The two main boilers have been fitted with a control system, which is expected to yield a 20% saving. It is intended to roll out this system as and when appropriate.

APPLYING FOR GRANT AID

Gathering and recording data, for example energy usage, can be an important element of applications for grant aid. Also having a 'wish list' of projects/jobs that would help to reduce energy consumption is a good idea so that grant applications can be completed showing good research and savings benefits. Compiling a register for energy saving opportunities to have on hand is also a good idea should funds become available. A register of energy saving opportunities will help keep the team focused on new projects and will be a good reference point when applying for funding (internal and external) to improve energy efficiency.

Efficient record keeping will indicate that you are serious about carrying out improvements and data will be at hand to fill in any required forms in relation to energy consumption patterns. Also the more you measure the better your understanding will be.

what cit did

INSTALLED MONITORING/ CONTROL SOFTWARE SYSTEM ON THE 2 MAIN BOILERS

CARRIED OUT FEASIBILITY STUDY ON CHP. THIS IDENTIFIED POTENTIAL FOR A 100 KW UNIT AND A 50KW UNIT AS BEING VIABLE. THE DESIGN WILL BE BASED ON ELECTRICAL RATHER THAN THERMAL LOAD, DUE TO THE SEASONAL NATURE OF THE CAMPUS OPERATIONS.

CIT PLANS TO INCREASE AUTOMATION, AND TO IMPROVE THE BMS SYSTEM.

Lagging in boiler house

SUMMARY

1. Identify energy users
2. Record energy data
3. Evaluate consumption patterns – set up a system
4. Energy audits
5. Targeted assessments
6. Facilities review and improvement
7. Constantly monitor
8. Promote energy efficiency

THE Canteen

TECHNICAL DIMENSION

WHY DO IT?

OVERVIEW

The canteen or restaurant on campus or in other work places can be a hub of activity, particularly around lunch time. The Canteen can also be a heavy user of energy and water as well as other resources on site. It is important to make sure that the canteen area is a central part of a Sustainable Campus Programme. Having a dedicated Canteen Green Team can be a very useful element in implementing a successful Sustainable Campus Programme. Ideally the members should include a mix of staff including the manager, head chef, cleaner, finance representative and other interested workers in the canteen. The team can devise an Environmental Management Policy stating main objectives and targets.

what cit did

THE CIT CANTEEN BECAME THE FIRST COLLEGE CANTEEN IN IRELAND TO ACHIEVE THE GREEN HOSPITALITY AWARD FOR ENVIRONMENTAL EXCELLENCE IN 2010

what we did

CIT HAS A LARGE CANTEEN ON SITE AS WELL AS THE BISTRO RESTAURANT AND THE TRAINING RESTAURANT LOCATED IN THE TOURISM & HOSPITALITY BUILDING. THIS RESTAURANT CATERS FOR UP TO 40 PEOPLE. CIT'S DEPARTMENT OF TOURISM & HOSPITALITY STUDIES INTRODUCED A FOOD SALES FACILITY TO HELP REDUCE FOOD WASTE ENTERING THE WASTE STREAM AND ANY PROFITS MADE GO TO OTHER GREEN PROJECTS IN THE DEPARTMENT. THIS IS A STUDENT LED INITIATIVE AND ALL FOOD IS SOLD IN 100% COMPOSTABLE PACKAGING.

HOW TO DO IT?

1 INITIAL ASSESSMENT

Data analysis for energy, waste and water consumption ideally, should be documented monthly in order to track any progress and identify consumption patterns. It is also useful to identify typical weekly and daily consumption patterns. This may be difficult without sub-metering for water and electricity. Identifying down-time consumption patterns can be the first step in analysing the base load and how to reduce it. Carrying out a waste audit, conducting tap flow surveys, and carrying out an energy audit as discussed previously to gather information for the Canteen is the major first step in assessing the Canteen's current situation. Consumption on a per cover basis is a useful benchmark to compare improvements and to compare consumption to similar Canteens. Useful benchmarks for the Canteen are listed below:

- kg waste per cover
- kg food waste per cover
- kWh energy per cover
- m^3 water per cover

2 OPTIONS GENERATION

Action plans for each aspect (water, waste, energy) should be devised and revisited regularly to assess progress and identify any problems or very well performing areas. The canteen should be aware of the various relevant legislative elements which they must adhere to, for example - the Food Waste Regulations, or any requirements under the Institutes trade effluent licence (BOD, FOG, pH etc.). Some quick fix options will be identified in the assessment phase - such as heavy flow rates from taps, electrical items being left on unnecessarily, or large quantities of food waste entering the general waste stream.

PACKAGING

If placing more than 10 tonnes of waste packaging on the market the canteen should be members of Repak or become self-compliant by registering with the local authority. Wherever possible, waste packaging should be kept to a minimum by purchasing in bulk and speaking with suppliers in relation to reduced packaging requirements and options.

Disposable items should be avoided (such as disposable plates, cups, cutlery etc). Also single use items such as ketchup sachets, sugar packets, milk portions and individually packaged cereals should not be used. Instead provide:

- Sugar shakers
- Refillable salt and pepper shakers
- Ketchup/mayonnaise dispensers
- Pottery (reusable) cups and cutlery
- Water jugs
- Cereal dispensers
- Milk dispensers

Where a lot of takeaway coffee/tea is purchased consider the use of refilling travel mugs and using recyclable or compostable cups. Compostable packaging is available from a number of suppliers.

Cereal dispensers at the Bistro Restaurant CIT

what cit did

THE CIT CANTEEN WEIGH SALAD PLATES TO HELP REDUCE FOOD WASTE

THE CIT CANTEEN CHARGE 10 CENT LESS FOR TEA AND COFFEE PURCHASED IN REUSABLE CUPS TO PROMOTE WASTE PREVENTION

CIT INTRODUCED LIQUID SIDE PODS ON A NUMBER OF BINS IN MARCH 2011 TO HELP KEEP THE RECYCLABLES STREAM CLEAN

THE BISTRO RESTAURANT USES LARGE CEREAL DISPENSERS INSTEAD OF INDIVIDUALLY PACKAGED CEREALS TO HELP REDUCE THE QUANTITY OF WASTE GENERATED ON SITE.

FOOD WASTE IN THE CANTEEN

Food waste should be separated from the recyclables stream and the general waste stream. Bins for staff and students to separate their waste should be provided in the Canteen areas and also for staff in the Kitchen. These bins should be clearly labelled and easy to identify. Facilities should be easy to use and easy to separate waste. If liquid is a problem in the dry recyclables; consider the use of liquid side pods on bins.

Actions to prevent and reduce the quantity of food waste generated should be investigated. Food that is thrown away costs money. This waste not only costs you to dispose of, but also costs money to purchase in the first place, store in the fridge/freezer, cook and staff costs to clean away. Making people aware of food waste in the canteen can be a very worthwhile exercise. Things to consider:

- Portion size
- Portion size choice
- Plate size
- Weigh plates – pay for what you buy

what cit did

CIT CANTEEN SAVED 5040 KWH (€500) ANNUALLY SIMPLY BY SWITCHING OFF THE LARGE TOASTER AFTER THE BREAKFAST RUSH HOUR.

Clear and easy to read bin signs at the CIT Canteen

ENERGY IN THE CANTEEN

Canteen kitchens can be heavy users of energy in heating, cooling, extraction and the cooking and storage of food (e.g. freezers). Many Campus Canteens will experience heavy energy usage before lunch time with preparation and after lunch time during wash up. Installing an energy sub-metre in the canteen kitchen to monitor energy consumption patterns is a very important element of devising targeted intervention strategies to improve energy consumption.

Training staff to switch off items that are not required is important. Simple changes can make a big difference. Posters and signs reminding staff to conserve energy can also help remind staff to be aware of their energy use.

- Regularly servicing equipment is a useful method of making sure all equipment is working optimally;
- Making sure there are no leaks in fridges and freezers is also important;
- Installing light sensors in back of house areas and in storage facilities may prove a good investment;
- Timers can be used to boil water and switch items on/off as required.

REFRIGERATION

Refrigeration can be expensive for college canteens. It is important therefore to ensure that refrigeration is operated in the most efficient way. Walk in coolers can be large energy consumers so it is important to ensure that controls are set properly. Your refrigeration contractor will advise on the best settings for your refrigeration. Motion sensors and energy efficient bulbs are a good idea to reduce energy consumption. It is also important to check that door seals are in good repair and get refrigeration maintained regularly. For more detailed information on refrigeration consult the publication; Calling Time On Waste – a publican's handbook to a leaner, greener cost base (Monaghan County Council, EPA and VFI, 2009).

Refrigeration case study at CIT's Department of Tourism & Hospitality Studies

CIT's Department of Tourism & Hospitality Studies made a saving of €7,273 annually simply by improving the management of refrigeration. The department has 18 fridges between 7 kitchens and all food is returned to the central store by 5pm. At the end of the day staff and students are trained to bring all food from the kitchen fridges to the central store eliminating the need for the 18 separate fridges in the kitchens.

WATER CONSUMPTION IN THE CANTEEN

Water consumption in a canteen or restaurant can be substantial from such activities as food preparation and cooking as well as cleaning. Water usage should be investigated for the Canteen and targets set to reduce consumption.

- Only use the dishwasher when full;
- Have a system in place to report dripping or leaking taps and get these fixed promptly;
- All staff should be trained in water conservation activities;
- Use the sink plug when washing fruit and veg instead of letting the tap flow;
- Slow the flow;
- Install flow restrictors where needed;
- Trigger operated hoses can be used to wash pans.

A water metre to identify water consumption patterns is a useful tool to monitor consumption, but is also a useful tool to help recognise quickly if a leak or other fault has occurred.

what CIT did

THE BISTRO AT CIT INSTALLED LOW FLOW TRIGGER OPERATED SPRAY TAPS TO HELP CONSERVE WATER IN WASH UP.

what UC Berkeley did

UC BERKELEY HOSTED THE FIRST CERTIFIED ORGANIC KITCHEN IN A COLLEGE SETTING

3 OPTIONS PRIORITISATION

As discussed in the previous sections, opportunities identified from the initial assessment phase and the option generating phase based on findings from the assessment can be prioritised depending on the findings at your campus. Prioritising options depends on the results of the particular assessments on your site, financial considerations, on-site expertise and legislative requirements.

4 OPTIONS IMPLEMENTATION

GOOD PRACTICE IN THE KITCHEN

All Kitchen staff should be trained how to use and dispose of fats, oils and greases correctly. A dry clean-up system should be used prior to washing of equipment. This will reduce the quantity of food waste entering the drain. Making sure that all sinks have a strainer in the plughole will help prevent solids going down the drain. For more detailed information consult the publication; Less Food Waste More Profit – A guide to minimising food waste in the catering sector published by the Clean Technology Centre 2010 (Creedon *et al.*, 2010).

By joining such award systems as the Green Hospitality Awards, the Canteen can follow the requirements detailed for each level. Through joining such schemes a system is put in place which includes staff at different levels identifying opportunities and generating action plans to achieve a particular target or set of targets. A register of opportunities is devised with the team and plans on how to achieve them is discussed. Staff work together as a team to achieve the award requirements and are audited to ensure compliance. Having a Canteen 'green team' will help add innovative ideas and applications to improving the sustainability of the canteen and increase team morale.

5 REVIEW OF RESULTS

Constant monitoring and review of projects is important to help keep projects on track and also to set targets for continued improvement. Canteens can benchmark themselves against other Canteens and also against best practice. Constant monitoring and review of projects is very useful to generate reports for top management and other interested parties.

what we did

THE CIT CANTEEN INTRODUCED SEPARATE FOOD WASTE BINS IN MARCH 2010. CIT DIVERTED 46 TONNES OF FOOD WASTE FROM LANDFILL IN 12 MONTHS (MARCH 2010 TO MARCH 2011).

what we did

THE CIT DEPARTMENT OF TOURISM & HOSPITALITY STUDIES RECEIVED THE GOLD LEVEL GREEN HOSPITALITY AWARD AT THE MARCH 2010 AWARDS PRESENTED IN HAYFIELD MANOR, CORK

CIT Department of Tourism & Hospitality Studies receive the Gold level Green Hospitality Award at the March 2010 awards presented in Hayfield Manor, Cork.

Canteen staff being presented with the Green Hospitality Award (GHA) by Maurice Bergin and James Hogan of the GHA.

other areas

OF POTENTIAL ENVIRONMENTAL IMPROVEMENT

PAPER

Resource use (paper, ink cartridges,stationery, bin bags etc.) can add up to significant costs (purchase and disposal) for third-level institutes and many work places. By promoting waste prevention through reduced consumption, for example, refilling ink cartridges, printing on both sides of a page, using digital files etc. resource use (and cost) will be reduced.

Paper use at third-level institutes and offices can be substantial. Students submit numerous assignments in hard copy and many projects and assignments can be high in paper consumption. Many office tasks can also use substantial quantities of paper. Waste prevention through the promotion of digital documents and systems instead of hard copies can save on paper use and disposal.

what cit did

CIT REDUCED PAPER CONSUMPTION BY 4% PER STUDENT IN 2010

what ul did

UNIVERSITY OF LIMERICK REDUCED PAPER CONSUMPTION BY 32% IN 2009

HOW TO DO IT?

1 INITIAL ASSESSMENT

Identifying how much paper your institute consumes on an annual basis is a very worthwhile exercise. Finding out how much is spent on paper is also very interesting. Some departments can be heavy users of paper and working with the finance or purchasing department to help find out individual departments usage can help to 'shock' departments and the entire institution into preventative action. Quantifying paper usage is a great way to find out 'where we are now' and also help devise targets on 'where we would like to be'.

what cit did

CIT INTRODUCED ELECTRONIC PAYSLIPS TO REPLACE PAPER PAYSLIPS IN NOVEMBER 2010.

2 OPTIONS GENERATION

Generating options to help reduce the consumption of paper on campus is not only important to help optimise the sustainability of the institution but will also help to make financial savings through improved resource efficiency.

- Default printers and photocopiers to double sided printing for both staff and student facilities. This will remind people to use double sided printing and if they wish to print on single sided paper they will have to actively change the setting;
- Elimination of paper usage can be achieved through many means e.g. electronic payslips, online newsletters/announcements, electronic assignment submission etc.;
- Having a GOOS (Good On One Side) pile of paper in the laboratory or office for use in taking rough notes or carrying out rough calculations rather than using new paper can help in the reduction of paper use. This also helps with the reuse of paper that has not been used on both sides;
- Avoid printing emails and other documents unless really necessary;
- Always proof read documents before printing.

what cit did

CIT CARRIED OUT TRIALS TO REDUCE PAPER CONSUMPTION BY USING A NEW ONLINE TOOL FOR EXPENSE SUBMISSIONS TO REPLACE THE OLD PAPER FACILITY.

3 OPTIONS PRIORITISATION

Compiling reports to departments on their paper usage and devising targets for reduction can be a positive step in bringing attention to paper usage and waste prevention.

Prioritising projects to reduce the usage of paper on campus can depend on a number of things;

- Are alternatives in place;
- Is the technology available;
- Finance;
- Promotion.

Case study at University of Limerick and Limerick County Council	In 2009 the University of Limerick (UL) and Limerick County Council (LCC) reduced their paper bills by a combined €43,208 through waste prevention activities. UL reduced their paper consumption by 32% and LCC by 15% resulting in major financial savings. 50 tonnes of waste was diverted from landfill at UL to paper recycling. A similar roll out of the campaign has resulted in the region within both local and public authorities. Signs and posters were used and a 'paper wall' was placed in LCC to raise awareness of paper consumption. The paper wall represented the paper consumption at the offices.

4 OPTIONS IMPLEMENTATION

It is important to keep people informed of improvements made to help motivate and reward people for changes made in paper use reduction.

5 REVIEW OF RESULTS

It is important to constantly review progress of new projects in order to identify particular areas that may be performing very well (or not so well) so that strategic targeted intervention practices can be devised to help improve performance.

Paper wall at Limerick County Council to raise awareness in the consumption of paper

ADDITIONAL RELEVANT INFORMATION

Resource use tips

- Make sure you print double sided and recycle or refill your printer cartridges;
- Clean bin bags in the dry recyclable and paper waste stream can often be reused again;
- Clear bin bags will ensure that you know what type of waste is contained in the bag;
- Internal post envelopes can be used up to fifty or more times;
- Most correspondence should be carried out through digital means to cut down on paper usage – always think waste prevention;
- Purchase recycled paper as well as recycling your paper waste;
- Make the most of online facilities for notes for students and encourage students not to print them;
- Encourage the use of reusable cups and cutlery instead of disposable ones.

TRANSPORT

WHY DO IT? - OVERVIEW

Transport to and from college campus is a hugely important element in sustainable development. Due to the large numbers of staff, students and visitors commuting to and from the one location (often at the same time) congestion and road safety can be an issue. Car spaces at most third-level institutions are scarce and transport can make up a substantial element of the carbon foot print of the campus and the locality. Information on public transport should be provided to all staff and students with timetables, maps etc. easy to obtain.

what ucd did

UNIVERSITY COLLEGE DUBLIN HELD A BIKE DAY ON 13TH MAY 2010 TO PROMOTE SUSTAINABLE TRANSPORT ON CAMPUS

HOW TO DO IT?

1 INITIAL ASSESSMENT

It may be very obvious that there is a large number of cars/motorcycles commuting to and from the campus daily, particularly obvious at peak times in the day and during the academic year when a lack of car spaces become apparent.

2 OPTIONS GENERATION

Many Institutions have limited car parking spaces available and so encouraging carpooling could help save on car spaces and reduce the carbon footprint of the campus due to transport. Providing a particular set of car spaces for **carpooling** passengers could be an incentive to encourage it.

Promotions to encourage cyclists and walkers to the campus including onsite bicycle repair days, pedometer challenges etc. can help encourage cyclists and walkers but also help to promote leaving the car at home for others.

The **cycle to work scheme** is a popular scheme to help encourage staff to leave the car at home and cycle to the work place.

what ucla did

UCLA INCREASED BICYCLE USAGE BY 50% ON CAMPUS

what cit did

CIT PUT UP MOVABLE POP UP POSTERS ENCOURAGING PUBLIC TRANSPORT AND CYCLING TO THE CAMPUS. THESE POSTERS SHOWED THE BENEFITS OF CYCLING TO COLLEGE FOR YOUR HEALTH. THESE WERE MOVED AROUND THE CAMPUS TO REACH A LARGE NUMBER OF STUDENTS AND STAFF.

3 OPTIONS PRIORITISATION

Depending on the Campus location different actions may be more beneficial than others. For example, encouraging the use of **public transport** to the campus if there is very limited public transport available will not be very successful.

4 OPTIONS IMPLEMENTATION

Bike stands, safe walking paths, cycle lanes are important aspects for the walker and cyclist travelling to the campus. Ensuring that there are enough bicycle stands and safe cycle tracks to reach the campus are important elements to ensure that it is easy for cyclists to travel every day. Safe well lit paths for walking are also important.

A good local public transport system that is reliable is also important. Staff and students will want a reliable service that will ensure they reach the campus in a timely manner.

what cit did

CIT PUBLISHED BUS TIME TABLES ON THE GREEN CAMPUS WEBSITE AND PRINTED UP LARGE POP UP POSTERS DISPLAYING THE MAIN PUBLIC TRANSPORT TO THE CAMPUS. BUS TIMETABLES ARE AVAILABLE AT THE INFO DESK AND IN THE STUDENTS' UNION OFFICE.

5 REVIEW OF RESULTS

Constant review of projects is important so that any problems can be identified early and acted upon swiftly.

what cit did

CIT RAN A RECYCLE YOUR BICYCLE WEEK IN MAY 2011 WHEN STUDENTS WERE MOVING OUT OF APARTMENTS FOR THE SUMMER. THE BICYCLES WERE SALVAGED BY A LOCAL BIKE SHED AND RECYCLED AND PARTS REUSED AS APPROPRIATE.

Bicycle stand at CIT

Bicycle lane at CIT

CIT Canteen supplied a bicycle to the winner of a student competition (Maurice Dunigan), as part of their sustainable programme.

GREEN PROCUREMENT

WHY DO IT? - OVERVIEW

Implementing a Sustainable Campus Programme will involve greening procurement. Involving the finance department, heads of departments etc. in **common goals** for purchasing is very important so that all parties are on the same wavelength. Purchasing products that cannot be recycled or are very heavily packaged will work against the ethos of implementing the Sustainable Campus Programme. Devising a list of items or tips on purchasing to include a sustainability element will help the Sustainable Campus Programme become a permanent programme and not just a once off project.

HOW TO DO IT?

1 INITIAL ASSESSMENT

Assessing the current situation in relation to purchasing is a first step in devising improvement options. Each department may purchase items in an ad hoc fashion with no coherence with the overall institution or workplace. Speaking with the finance/purchasing department in relation to this will answer a lot of questions in relation to the current situation.

2 OPTIONS GENERATION

It may be useful to devise a list of options or a green procurement policy which the overall institute can agree to abide by. The sustainability aspect of items should be a major consideration in relation to purchasing. It is not just the cost of the item that should be considered but rather the overall cost of the lifecycle of the product 'from cradle to grave'. Disposal and running costs may also be a substantial cost and an impact on the environment.

3 OPTIONS PRIORITISATION

Options prioritised will depend on the individual situation and aims/objectives, as well as findings in the assessment phase. It may be that the overall procurement system needs to be revised.

4 OPTIONS IMPLEMENTATION

All relevant departments and sectors will need to be informed of any changes made to procurement and procurement methods. It may be useful to consult the relevant departments in devising new procurement systems or amending the current system in place. A trial period with time for consultation may be necessary in order to move to the review stage of a project.

5 REVIEW OF RESULTS

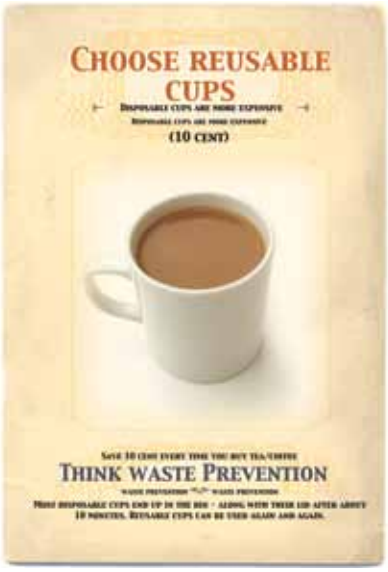
As with all projects constant review is important to identify any problem areas or indeed any well performing areas.

IN CONCLUSION

GATHERING AND REVIEW OF EXISTING DATA	Planning and Organisation is very important for any successful programme. Determining what existing information is available as well as identifying barriers, information gaps etc. are also important. Obtain and review water bills, electricity and gas bills, and review any waste audit data and reports from waste contractors.
ID FURTHER DATA & MONITORING REQUIREMENTS	Carry out an energy use survey. Unannounced weekend or evening surveys can give an idea of what areas/items are being used outside office hours. Carry out waste audits. Track any existing metering system in place and determine additional areas that need to be sub metered. Determine annual spends on resources such as paper, waste bags etc.
PROCURE & INSTALL MONITORING SYSTEMS	Specify, procure, purchase and install a monitoring system for electricity, gas and water consumption in desired areas e.g. the canteen, individual buildings etc. Implement and manage sub metering systems and other requirements to track resources.
ID LARGEST CONSUMERS/ GENERATORS	Compile data from systems in place of largest consumers of water, energy and waste.
OPPORTUNITY ASSESSMENT	Cleaner production opportunity assessments should be performed, in order to generate a range of Cleaner Production options.
PRIORITISATION OF OPTIONS	'Low hanging fruit' or the easy options should be implemented, followed by other options identified in opportunity assessments.
IMPLEMENTATION OF OPTIONS	Implementation of prevention projects to reduce the use of water, energy, and reduce waste generation. Different products can be tested and trialled and their effectiveness measured.
STAKEHOLDER INVOLVEMENT	Senior management involvement is paramount to a successful programme. It is also important to have the Finance Department and the Buildings & Estates office as well as other interested parties such as environmental groups in the Institute involved. Involving the Students' Union and other relevant societies is also useful.

STAFF AND STUDENT CAMPAIGN	A well informed workforce that feels involved is motivated to contribute to the project and take responsibility. Actively encouraging participation from the staff and student body in the on-going identification of prevention opportunities is important. Engaging with key staff such as caretakers, heads of departments, cleaning staff supervisors etc. who have influence over resource use is an important step. Encourage academic staff to incorporate the sustainable campus programme into their student project specifications, and even introduce a sustainability module for students' learning. Incorporate the campaign into student and staff campus life through competitions, events, awareness days, exhibitions etc.
ON-GOING MONITORING AND REVIEW	Monitoring should continue throughout the programme to determine performance against the targets. The project team members need to meet regularly to review status, identify any problems, ensure implementation of identified projects and air any problems or risks. Regular senior management reporting to illustrate progress on the programme, review status and facilitate its on-going implementation, is a requirement.
REPORTING	Produce reports outlining savings/improvements made in terms of tonnes of waste, m^3 water, kWh, CO_2 emissions, costs and payback times, etc. External dissemination of results and activities is important to help spread the message to others and sharing information with similar programmes can help grow ideas.


CIT WATER USE OPTIMISATION
NEW WATERLESS URINALS
CIT AIMS TO REDUCE WATER USE ON CAMPUS
WATERLESS URINALS
43% OF WATER AT WORK IS FLUSHED DOWN THE TOILET!


CHOOSE REUSABLE CUPS
(10 CENT)
THINK WASTE PREVENTION


GUESS THE WEIGHT
of a typical bale of cardboard at CIT
Guess correctly and be entered into a draw to win
Green Campus CIT Environmental Awareness
12 October 2010


GREEN CAMPUS CIT
SWITCH OFF - PLUG OUT
PLEASE CONSERVE ENERGY
SWITCH OFF - PLUG OUT
HELP REDUCE CIT'S CARBON FOOTPRINT
PLAY YOUR PART
It's not just you who likes to switch off at night!
CIT used a massive 5,107,164 kWh in electricity in 2009 - lets all work together to reduce this in 2010.


CIT WASTE WATCHERS
See how much you can lose!
Are you up for the challenge?
See how much you can reduce your waste generation by!
Green Campus CIT


CIT USED 15,000,000 SHEETS OF PAPER IN 2009
USE PC FILES NOT PAPER PILES!
Think before you print


GREEN CAMPUS CIT
RECYCLE YOUR BICYCLE!
MOVING OUT? CLEANING UP?
RECYCLE YOUR BICYCLE AT CIT
ALL WEEK 23RD - 26TH MAY • TYCO BUILDING
THINK WASTE PREVENTION


Dry Recyclables
• Plastic Bottles
• Cans
• Clean Tetra-Pak


Food Waste
• Fruit/Veg
• Bread
• Tea Bags
• Plate Scrapings


Paper Only
• Newsprint
• Clean Paper
• Office Paper
• Magazines

A LIST OF USEFUL WEBSITES AND PUBLICATIONS

Creedon, M., Cunningham, D. and Hogan, J. (2010). *Less Food Waste More Profit – A guide to minimising food waste in the catering sector, 2010* pp31. The Clean Technology Centre, Cork Institute of Technology

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www.stopfoodwaste.ie

www.taptips.ie

www.cleanerproduction.ie

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A STEP BY STEP GUIDE

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